ABSTRACT

In the Ethiopian mountain area of Wag Hamra, the use and knowledge of household plant-based remedies to treat specific crop, livestock and human insect pests represent a large, diversified and complex field of ethnobotany that hints at the antiquity of human presence in the area. From a synchronic perspective, this complexity stems from the intermeshing, within the broader context of pest management, of clear ethnoentomological and ethnobotanical patterns, of which the Orthodox Christian religion, processes of acculturation between the original Agaw people and their Amhara neighbours, gender, altitude and cultural perceptions of altitude are key dimensions. The extreme ruggedness of the landscape, the resulting fluctuations in plant distribution and the very "localised" nature of the ethnobotanical knowledge of farmers converge to raise intracultural variability to very high levels. Current patterns and mechanisms of knowledge transmission, particularly among children, suggest that intracultural consensus on botanical pest management is at its highest at the level of microwatersheds not exceeding 20 km^2. Multipurpose plant use is not random but patterned according to continua of plant use that are indicators of long term processes of innovation, change and knowledge differentiation. These continua reflect the high degree of relatedness between the use of plants for pest management and the use of household fumigants, of cosmetics, of remedies for skin problems and of evil eye protections for crops. The introduction in recent decades of soap and chemical pesticides has had a significant impact on the pest management strategy of farmers. For selected pests, these changes have resulted in sharp decreases in plant use, but the overall figures of plant use and knowledge point to the co-existence of synthetic and plant remedy use and to the absence of significant ethnobotanical knowledge losses. However, the simultaneous sharp decline of the plant resources in the area could disturb this fragile equilibrium in the near future.

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Yädjil däba yägänzäb bäšit'a wäym yäzïndjoro alänga mïn yšalal ?

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INTRODUCTION

The present thesis is an attempt to bridge a gap in the field of Ethiopian studies on several counts. Its first aim is to document and analyse for the first time in a rigorous manner a portion of the ethnobiological knowledge (both ethnozoological and ethnobotanical) held by the inhabitants of Wag Hamra. Second, it aims to re-establish a balance in the broader field of ethnobiology in Ethiopia by rigorously analysing the ethnobiological knowledge of the laymen, i.e. of simple farmers, a vast group of people in Ethiopia, whose knowledge has apparently rarely been deemed worthy of recording and consideration in past ethnobiological studies. Third, this thesis seeks to demonstrate the extent of the ethnobiological knowledge of farmers with respect to the use of plants in pest management. In a way, it is an attempt to "solidify" or "reveal" a very specific ethnobiological domain, which to date has only been hinted at in the literature of Ethiopian studies.

From a wider and more conceptual perspective, the present thesis seeks to highlight the extreme variability, complexity and ultimately fluid and dynamic nature of ethnobiological knowledge in a small area of the highlands of Ethiopia. Taking ethnoentomological knowledge of insect pests as an entry point, this research focuses on the architecture and structure of synchronic knowledge of botanical pest management before focusing on short term and long term diachronic knowledge phenomena.

This thesis will also present the results of an initiative to analyse rigorously the use of plants and the knowledge of their use within a given population. To date, most studies centred on ethnobotanical use have dealt with small samples of small total populations (Hays 1974, Hunn 1977, Zent 2001, Heckler 2002). Larger statistically significant samples of large populations have very rarely been taken as the basis for qualitative and quantitative studies on the knowledge of use of plants. For a notable exception, see the quantitative study undertaken by Browner (1991) to analyse the differential ethnomedical knowledge of men and women on plants used in contraception in Mexico.

1.1 - Background information

History

The northern highlands of Ethiopia, corresponding to the former Abyssinia and including the area of Wag Hamra, are an area of ancient human settlement. They were originally populated by Cushitic people of Hamitic origin better known as the Agaw people, possibly as early as the second millenium B.C. (Ullendorf 1973, Trimingham 1952, Tamrat 1972). The fusion process which characterised their encounter with Sabean immigrants of Semitic origin from the Arabian Peninsula began several centuries before Christ (Tamrat 1972:5). As such, the highlands became "the spearhead of a long process of Semitisation in the Ethiopian region" (Ibid: 5). It is believed that the initial interaction and fusion laid the foundations for the flourishing of the Axumite civilisation, the Semite immigrants gradually diffusing their political, linguistic and cultural systems (Tamrat 1972, Ullendorf 1973). Between approximately the seventh and the tenth century A.D., This process ultimately resulted in the emergence of the Tigrean and Amhara people, two groups with distinct, although related, linguistic and cultural identities. The first recorded traces of a strong Agaw-Amhara opposition appear with the restoration of the Amhara Solomonid dynasty following the fall, in the 13th century, of the Agaw Zagwe dynasty, whose seat of power corresponded approximately to the current areas of Wag Hamra and Lasta. The slow but inexorable acculturation and fusion that followed between the Agaw and their Tigrean and Amhara neighbours throughout the highlands of Ethiopia have resulted in a shrinking of the Agaw populations, to the extent that only isolated pockets subsist nowadays in the Amhara and Tigray regions and in Erythrea. It should be noted that all the remaining Agaw groups trace their origin back to the current area of Wag Hamra.

Very little is known about the history of Wag Hamra after the fall of the Zagwe dynasty, except that it remained fairly isolated geographically and that its rulers refused to swear allegiance to the successive Amhara / Tigray kings and emperors until the 19th century (Pankhurst 1984). Compared to other pockets of Agaw populations in the highlands, the cultural and subsistence fusion described above between Agaw and Amhara people appears to be a relatively recent phenomenon in Wag hamra.

Wag Hamra was christianised as early as the sixth century A.D (Tamrat 1972). While the successive *jihads* led by Ahmed bin Ibrahim – Ahmed Gragn in the 16th century almost succeeded in eradicating the Christian civilisation of Abyssinia and had a profound cultural and religious impact in many areas of the highlands, Wag Hamra retained its Christian identity as its Agaw inhabitants obstinatly refused, with dire consequences, to convert to Islam. It is also known that the area served in the 17th century as a rallying point for all the defenders of the Orthodox Christian faith during the Jesuit attempt to convert Abyssinia to Catholicism (Pankhurst 1984). To this day, the people of Wag Hamra are singled out as champions of the Orthodox Christian faith in Ethiopia.

Ethiopia is the oldest independent country in Africa and, despite a brief occupation of its urban centres by Italian fascist troops between 1936 and 1941, was never colonised. Following the fall of the Emperor Haile Selasse I in 1974, Mengistu Haile-Mariam imposed his marxist dictature through a military regime known as the *Derg*. The guerilla and liberation war, which saw very intense fighting in Wag Hamra, ultimately resulted in the fall of the *Derg* in 1991 and the coming to power of the main guerilla group, known as the TPLF.

Landscape and environment

The administrative Zone of Wag Hamra lies to the northeast of the Amhara National Regional State. In this area, a few medium to high altitude mountain ranges (with peaks above 3000 m) are interspersed with valleys, steep gorges and numerous escarpments and ridges. To the West, the whole of Wag Hamra is separated from the mountain ranges of North Gonder by the lowlands and canyons of the Tekkezze watershed. The topography of Wag Hamra in general, and of the study area in particular, is extremely rugged. It is often jokingly described by its inhabitants as being the result of the Archangel Gabriel's wrath. Until very recently, the area was considered as one of the most inaccessible in the highlands of Ethiopia.

Over the last 30 years, population increases, the expansion of cultivated areas and the encroachment of agriculture onto steep and marginal areas have reached such proportions that significant tracks of forests and woodlands only remain in the very high altitudes (>3000 m), in the lowlands of the Tekkezze watershed (<1400 m), on the banks of certain streams and small rivers and in a few old church compounds.

Human habitat

In the study area as in most "Amhara" or "Amharised" areas of Wag Hamra, people live in scattered villages regrouping between 20 and 100 homesteads and totalling up to several hundreds of inhabitants (see Annex 2.5 for an indication of the various altitudes of the villages surveyed). Each village belongs to a *Gott*, an administrative sub-division of the Farmers Association. Farmers often prefer to define their village in relation to their parish.

In a village, most homesteads comprise one or several large thatched huts, a few smaller huts (kitchen), grain stores, small cultivated areas (particularly in the lowlands), a few trees and shrubs and occasionally bee hives. Inside most homes, separate compartments are prepared for human beings, for cattle and eventually for mules, whereas sheep and goats tend to be kept at night inside smaller and specially made huts. In Wag Hamra as in many other parts of the former Abyssinia, huts are often heavily infested with minute pests. Fleas, lice and bedbugs are known to have been a source of discomfort for numerous travellers in the past centuries (see Pankhurst 1990 for a short review on the subject). Towards the lowlands, large livestock animals are often too numerous in any given household to be kept inside the main residence hut and are instead kept in wooden pens in the vicinity of the house. Above 2000 m, homesteads are separated from each other by live fences whereas towards the lowlands, for fear of snakes and birds of prey, farmers do no keep or plant large trees and prefer to build wooden fences. Above 2000 m, a minority of farmers keep small river gardens.

Livelihoods

The activities of a majority of the people living in the study area are a mix of crop and livestock production and are best described as subsistence farming. The main crops are wheat, barley, pulses (lentils, faba beans) towards the higher altitudes and *teff*, maize, sorghum and beans towards the mid and lower altitudes. Soil preparation is carried out with the ancient animal-drawn swing-plough. With the exception of weeding and harvesting, most activities of the crop production cycle are exclusively carried out by men.

The outcome of agricultural activities is extremely dependent on the climate, notorious in the highlands for its very high degree of errraticness. The volume of the rainfall can either be excessive or insufficient and its spatial and temporal distribution throughout the year is virtually unpredictable. Drought, hale, frost, flashfloods and waterlogging are thus constant threats to crop production and to the livelihoods of farmers.

Moreover, crops are regularly exposed to moderate to large scale infestations of pests, both mammals and insects. The people of Wag Hamra still vividly remember the dark episodes of 1974 and 1984 when the effects of the drought were sharpened by the invasions of, respectively, locusts and army worms. These pest invasions were "the final straw" as they resulted in large-scale famine episodes that forced people to migrate either to the Korem camps or to cross the Tekkeze into the less affected *Worãda* of Belesa in neighbouring Gonder. Important non-migratory crop pests include grasshoppers, the endemic Wollo bush cricket, aphids, ants, termites, and several types of weevils. The distribution of these pests in Wag Hamra appears to be largely driven by altitude gradients.

Livestock production activities play a central role in the livelihoods of farmers in Wag Hamra as domestic animals are either a source of animal draught power (cattle), of transport (donkeys, mules), of petty cash (sheep, goat, poultry) or of social prestige (cattle). Traditionally, men are usually responsible for most livestock rearing activities (herding, health, feed), with women occasionally taking part in specific activities centered around the household (watch over young animals, milking). Poultry production is the sole responsibility of women. Infestations of minute parasitic insects pests (lice, fleas, ticks) are seen as a serious livestock problem by farmers in Wag Hamra, particularly when they affect chicken, young animals (kids, calves) and lactating cows.

The overall picture available today is one of gradual increase in the significance of livestock activities as one moves from the highlands of the study area in Meskelo and Bella to the lowlands of Tsamla in Dehana, and ultimately to the dry lowlands of Ziqualla *Worãda*. In fact, the recently and relatively less populated lowland areas of Dehana and Ziqualla *Worãda*s still have livelihood characteristics very similar to agro-pastoralism. The trend increases as one approaches the lowlands of Ziqualla, where the predominance of livestock in the livelihoods of farmers is apparent in the size of the herds (large by current standards, up to 30 cows and several hundred goats for certain wealthy farmers).

1.2 Ethiopia as a centre of biological and cultural diversity

Ethiopia as a country is renowned for being one of the world's great centres of biological and cultural diversity. From the Danakil depression and the Danakil Alps in the Afar region to the high altitude afro-alpine habitats of the red wolves, from the frankincense forests of the Blue Nile and Tekkeze watersheds in the heart of the former Abyssinian empire to the coffee plantations and lush tropical forests in the Southwest, everything in Ethiopia speaks of altitude, contrast, change and ultimately of diversity in its most striking form.

Ethiopia, as a Vavilov center, is a land where endemism is significant, both in the plant and animal kingdoms. The current Flora project of Ethiopia which is nearing completion has already identified several hundreds of species of endemic flowering plants, including numerous food crop species (*teff*, eleusine, *enset* (false banana), etc) out of an estimated total of more than 7000.

This biological diversity is easily matched by cultural diversity, although geographical distinctions should be introduced to clarify what is meant by "cultural diversity". The southern and South western parts of the country, roughly corresponding to the Southern People Nationalities and Nations Region in its integrity and to portions of the Oromyia Region, exemplifies the concept of diversity as a scattering of different ethnic groups and their attending cultures living in various states of harmony with one another. With the fall of the *Derg* regime and the subsequent development of infrastructures, Ethiopia has become much more accessible both to foreigners and to Ethiopians themselves, with the result that acculturation processes in the South of the country are occurring at a rapid rate.

In contrast, "cultural diversity" in the northern highlands of the country, or Abyssinia, must be apprehended and analysed with a strong historical perspective taking into account the cultural hybridisation between the Agaw and Amhara people as well as the incompletely understood religious, ethnic and political interactions between pagans and people of the Jewish and Orthodox Christian faiths (Tamrat 1988, Pankhurst 1992a). Muslim *jihads*, the subsequent forced conversions and settlements and the Oromo invasions of the Christian and Falacha highlands in the 16th century significantly contributed to blurring, reshaping and ultimately multiplying the number of existing cultural landmarks. In much more recent times, the spread of the Pentecostal faith in urban centres is having a cultural impact which remains to be assessed.

Over the last two centuries, numerous scholars, both Ethiopian and foreign, have begun the complex process of unravelling and deciphering the many question marks, paradoxes and riddles which seem to characterize so well the former Abyssinia, whether in the fields of archaeology, history, linguistics, religious studies, ethnomedicine, ethnobiology, religious and talismanic art. With the possible exception of linguistics, and to a lesser extent ethnomedicine, most studies have tended to rely on the translation and analysis of written documents and manuscripts held in various centres of knowledge and learning spread throughout Ethiopia (Institute of Ethiopian Studies, churches, monasteries) and the world at large (private collections, museums, libraries). This point is important because it indicates a research bias towards the reports and knowledge of literate and educated people. Comparatively less attention has been given to the knowledge of the people that constitute and have constituted the majority of the Ethiopian population, i.e. illiterate and "uneducated" farmers of the highlands.

Given the extent of the biological and cultural diversity available in Ethiopia, and in comparison with other great centres of diversity in the world (Brazil, Indonesia, etc), it can be argued that ethnobiology is a subject which, relatively speaking, has received little attention in scholarly circles devoted to the study of Ethiopian matters. Ethnobotanical knowledge has been more frequently reported and analysed in the Amhara and Tigray Regions, particularly when related to human medicine and magico-religious healing (Griaule 1930, Rodinson 1967, Strelcyn 1966, 1968, Berhane Selassie 1971, Mercier 1976a, 1979b, 1979c, Abebe and Ayehu 1993). These studies and reports have a distinctive quality as they are often based on the translation and analysis of written manuscripts compiled (usually in *Ge'ez*) by *däbtära*s or magico-religious healers.

On the other hand, ethnobotanical knowledge of the laymen, i.e. of simple farmers, has been understudied. Such knowledge is touched upon in passing by Mérab (1912), Cacciapuoti (1941), Messing (1957), Tadesse and Demissew (1992), Kloos and Zein (1993). Medium to large databases of plants and uses based on farmers' knowledge have been compiled for Ethiopia as a whole by Von Breitenbach (1961), Lemordant (1971), Getahun (1976), Bekele-Tesemma (1993) and MacLachlan (1999). However, these compendia fall almost exclusively within the remit of economic botany. They usually amount to no more than "omniscient" and de-contextualised lists of plants with the corresponding uses and lack the depth of analysis that characterises the study of ethnobotanical classification and knowledge held by *däbtäras* or magico-religious healers. By and large, serious and comprehensive ethnobotanical studies of the knowledge held by farmers are rare. A notable exception is the study undertaken by Strelcyn (1973) with twenty young students, sons of farmers.

Lately, ethnobotanical knowledge related to the consumption of wild foods has been reported by MacLachlan (1999) and Asfaw and Tadesse (2001), but for Ethiopia as a whole. Ethnoveterinary knowledge and practices have been explored and documented by the Ethiopian Ministry of Agriculture in partnership with several non-governmental organisations, albeit for localised geographical areas of North Wollo and Wag Hamra (a few Farmers Associations at most) in the northeastern part of the Amhara region. On the whole, there are no known comprehensive accounts of any form of ethnobotanical knowledge held by farmers in Wag Hamra.

Finding written traces of ethnobotanical knowledge of pest management in Ethiopia and for that matter in the Amhara region is a rather arduous task that requires a good deal of patience. The evidence is scarce. Traces of it can be found in the translations and analyses of ethnomedical knowledge held by magico-religious healers (Griaule 1930, Strelcyn 1968, Rodinson 1967, Berhane Selassie 1971, Kane 1983). The only document that focuses on the ethnobotanical knowledge of pest management held by farmers is a short monograph centred on traditional pest management practices in a Tigrean *Worädda* (Vetter 1997). Other traces are literally scattered in the vast store of literature dedicated to Ethiopian studies (Wilson and Gebre-Maryam 1979, Mercier 1979c, Huffnagel 1961, Strelcyn 1973, Getahun 1976, Kloos and Zein 1993).

Before proceeding further, I wish to highlight a few key concepts.

1.3 Defining Botanical pest management

The expression "botanical pest management" is somewhat ambiguous since it can be either interpreted as the "botanical management of pests" or alternatively as the "management of botanical pests".

To clarify this ambiguity, it is critical to define the concept of pest. Throughout this thesis, the term pest will be used to identify mostly insects considered in any way to be undesirable or harmful by human beings. This may be due to their impact on human activities (agriculture, livestock rearing, production of food, storage of food and goods, etc), their direct impact on human beings themselves (parasites, vectors of diseases) or their association with particular cultural beliefs. To avoid any entomological confusion, the term "insect" will be used in the broadest sense to reflect the practical scientific usage currently prevailing (Posey 1977). "Insect" *sensu lato* will equate with the Phylum Arthropoda and therefore designate any specimen either belonging to the Insecta Order *sensu stricto*, the Arachnida order (spiders, ticks, scorpions, mites, etc), the Chilopoda order (centipedes) or the Diplopoda order (millipedes). To limit the scope of this study, the term pest will *exclude* plants (parasites, weeds, lichens, etc), mammals (rats, mice, monkeys, etc), birds and fungi, which are categorised in Ethiopia and in other parts of the world as pests. An important point to bear in mind is the extent to which and the circumstances in which the emic definition of insect pests of the people of Wag Hamra differs from the etic definition presented above. The study of their ethnoentomological knowledge and beliefs, which is the object of Chapter 4, provides the means to qualify and quantify this emic-etic contrast.

Botanical pest management is to be understood as a component of the broader field of pest management. The latter refers to techniques used by human beings to maintain pest populations at levels deemed acceptable. Such techniques can range in nature from practices that reduce pest populations without completely eradicating them; crop rotations, use of multiple crop varieties or resistant varieties in agriculture; fumigation of animals and barns to repel insects for livestock rearing; maintenance of natural enemies of insects inside the household; ointments with insect repellent substances; change of houses to reduce infestation levels; choice of residence based on altitude to avoid ecological range of insect ; to draconian measures which are geared to control pest population levels through the direct and physical elimination of the insect pests. Such practices include the manual destruction of insects (insect picking and beating in fields, louse picking on human beings, tick removal, etc) and the destruction of the insect through the application of chemical substances on the insect itself, its source of food or its natural habitat. These substances are either directly lethal to the insect, inhibit its growth or affect its reproductive capacity.

Throughout this thesis, the term insecticide is employed in a generic sense (*sensu lato*), encompassing the insecticide (*sensu stricto*), insect growth inhibiting, insect behaviour modifying (attractant, repellent and anti-feedant) and adhesive / glue properties of plants.

At this stage, it is also critical to demarcate plants known to have insecticide properties as the result of laboratory analysis and tests or etic screening, from those plants used traditionally by people for their insecticide properties (emic view). This thesis will present the results of a research exercise that was solely concerned with the traditional use of botanicals as insecticides.

With this definition of pest management at hand, botanical pest management now refers to the use of plants to control insect pests. This use may take a variety of forms. This research specifically focuses on plants, plant parts, extracts and ashes that are fumigated, spread or applied for their repellent or insecticide properties and excludes the use of crop varieties selected by farmers for their characteristics of resistance to insect pests. It is indeed a well known fact that living plants may serve as repellent barriers around the main crop (Morlon 1992) and that specific cultivars may be selected and grown by farmers for their capacity to withstand pest attacks in the field or during storage. It is clear that this aspect of botanical pest management is still practised by numerous farmers around the world, in Ethiopia (see Teshome *et al* 1999) and in the area under study in Wag Hamra. However, in addition to the study of local knowledge of botanical pest management, the combined study of crop diversity and crop resistance to pests in an area even geographically limited like Wag Hamra would have proved extremely time consuming. In fact, farmers of Wag Hamra are probably as knowledgeable as those interviewed by Teshome *et al* (1999) in the neighbouring zone of Wollo and it is reasonable to assume that the study of crop resistance to pests in Wag Hamra would deserve to be the focus of an independent study.

1.4 A focus on intra-cultural diversity

The concept of variation and intra-cultural variability, of which gendered knowledge is a part, has been and remains an object of debate in cultural anthropology (Werner 1969, Pelto and Pelto 1975, D'Andrade 1995, Sperber 1996, Aunger 1999, Romney 1999), in that it hinges directly on how anthropologists define culture. The position in ethnobiology reflects that in anthropology more generally. Thus for Posey (1992: 26):

> Another fundamental barrier to research into traditional knowledge is the methodological problem of assessing the degree to which knowledge is shared within a society. Even in the smallest of societies, individuals do not know the same things. Scientists who have worked with native peoples have learned this painfully-or ignored it in their data analysis.

I wish to highlight here the fact that there is usually a significant discrepancy and contradiction between the often cursory respect paid in writing by many ethnobiologists to intra-cultural variation and its actual consideration and inclusion as a significant feature of their study. Several studies claiming to make intra-cultural knowledge variation their central focus of investigation are somehow flawed because of their definition of culture. I base my account here on the examination of several well-known ethnozoological and ethnobotanical accounts with occasional reference to case studies from the broader field of cultural anthropology.

1.4.1 The model of the omniscient hearer-speaker

In the early stages of the development of ethnoscience, studies undertaken by anthropologists and ethnobiologists shared the implicit and unspoken view of culture as being intrinsically shared by all its members at one point in time. Each member of a given culture was assumed to carry the "grammar" of his culture in his head (Manning and Fabrega 1976). This anthropological perspective justified in the eyes of many the reliance on a few key informants as sources of ethnobiological information or even on one single key informant (see Heinz and Maguire 1974 for instance) to study ethnobiological classification models.

Oswald Werner had published an article in 1969, which was to profoundly influence the orientations and cultural representations of cultural anthropology and ethnobiological knowledge studies in the following three decades. He argued that there existed such a thing as individual variation in knowledge and that no individual had a total knowledge of his culture. He then described two views of "shared" culture, one as defined by the common element that all members of a culture share as the set theoretical intersection of individual competences, and the other as the union of individual competences. The second model of culture became famous as representing the "range of culture as defined by an ideal omniscient speaker-hearer" (Werner 1969: 333). Of course, implicit in Werner's statement was the fact that the task of constructing the omniscient hearer-speaker was the responsibility of the anthropologist alone.

In the 1970s, many anthropologists adopted this omniscient view of cultural competence. It almost appeared like a written alibi, for the ways in which many were already conducting their research with a few key informants. Thus, we hear that the Tzeltal folk botany and folk zoology were constructed by both interviewing 64 informants, including respectively four and seven primary informants (Berlin *et al* 1974: 23, Hunn 1977: 31), representative of age, sex, language and ecological zone (Berlin *et al* 1974). Two years earlier, Hunn (1975) had published his Tenejapa Tzeltal version of the animal kingdom based on the interview of six informants, who he claimed were representative of all altitude zones. The picture that emerged was that of a hearer-speaker with (ancestral) omniscience in languages and knowledge and temporal and geographical omnipresence at all altitudes. Yet, we are warned by Berlin *et al* (1974: 57):

> It is impossible to speak literally of the "Tenejapa Tzeltal classification of plants". In actuality, there are many such classifications, some idiosyncratic, others best described as micro-dialectical or ecological variants.

Despite this warning, Berlin does not pay much attention to this diversity of classifications (one page on intra-cultural diversity in a 300 page document hardly denotes a strong preoccupation with the subject). Hunn further argues that ethnozoological knowledge is attributable to an idealised Tenejapaneco of indeterminate sex and age, ignoring geographical and personal limitations on knowledge (Hunn 1977). Basically, we seem to have come back full-circle to the origins of ethnoscience, one study, one "idealised" informant.

By comparing the compilation of the omniscient hearer-speaker to a transmutation and to the creation of an abstract knowledge entity, Hays (1974) illustrates quite clearly that the concept is ill suited for the discovery of patterns of variation. For Ellen (1979b), the aggregate data of the omniscient hearer speaker will not reveal unique abilities or those shared by only part of the population, thereby confirming the incompatibility of the model with the concept of intra-cultural diversity.

While this approach to cultural knowledge has somehow lost ground in anthropological and ethnobiology circles, it is still regularly the foundation assumption of numerous ethnobotanical studies that are typical of recent plant-focused studies (for examples see Bonet *et al* 1994 or Lemordant 1971, Getahun 1976, MacLachlan 1999, Asfaw and Tadesse 2001 in the Ethiopian context).

1.4.2 Culture defined by what is shared

In the meantime, the omniscient hearer-speaker model of culture had come under the close scrutiny of several anthropologists who had observed, not so much that knowledge was variable among individuals, this was considered more or less to be a truism, but that there were cases of disagreement between informants as epitomised by Two Crows' disagreement (Sapir 1938). The observation that indigenous people could actually argue about cultural beliefs seemed to crystallise the notion that cultural knowledge variation among informants was indeed a reality. In any case, it seemed to spark the publication of several articles dedicated to the study and analysis of intra-cultural variation (Sankoff 1971, Pelto and Pelto 1975, Manning and Fabrega 1976). The debate gradually spread to the field of ethnobiology (Friedberg 1974, Gardner 1976, Trotter and Logan 1986). In contrast with large scale investigations of Berlin *et al* (1974), Hays (1974), Hunn (1977) or Ellen (1993), which were tailored towards the identification and classification of a maximum number of plants or animals in a given cultural environment, these ethnobiological studies were much more focused, being restricted to single semantic fields: birds for Gardner (1976) or medicinal plants for Trotter and Logan (1986). Overall, it is important to bear in mind that the concept of culture pervading these analyses was defined in terms of beliefs and knowledge shared within a group. This caused variation to be gauged not for its own sake but against the referential of culturally shared norms.

By the eighties, Werner's model of culture as the intersection of individual competences had gained a firm foothold in the ethnobiological literature. In his study of intra-cultural diversity among the Aguaruna people, Boster (1985) argued that consensus or agreement reflected knowledge of a cultural model. A year later, the concept of culture as consensus emerged fully formed (Romney *et al* 1986, Trotter and Logan 1986). It was released with a statistical package to measure it and a minimum sample size was now required (Romney *et al* 1986). It gradually diffused to various sub-disciplines of ethnobotany, predominantly dealing with plant oriented studies (Kainer and Dureya 1992, Phillips and Gentry 1993) and more recently the quantitative measurement of ethnobotanical knowledge losses (Zent 2001, Heckler 2002). Initially, this model of culture as a consensus was conceived to provide answers to some fundamental epistemological questions in anthropology such as "How do we know when we know" (Romney *et al* 1986: 313). It is also likely that it was meant to provide certain ethno-biologists with safe etic cornerstones to guide them through the complex maze of emic descriptions (see the concept of the "correct [cultural] answer" in Heckler 2002). Hays (1974: 24) provides some insight into this type of "pre-conceived" approach to a given culture:

> The fact of individual variation in knowledge, with respect to even the most clearly delimitable domains, has not gone unnoticed, but it has been regarded as evidencing imperfect familiarity with the "real" system.

The study of cultural consensus was to take a distinctive direction and acquire a dimension of its own in the specialised field of ethnomedicine. One issue central to this subject area was the extent to which the emic efficacy of medicinal plants was matched by laboratory efficacy or etic efficacy. It was believed that to answer this question would substantially reduce the time necessary for identifying efficacious indigenous remedies. Therefore, the central assumption developed by most ethnomedical researchers was that the greater the degree of group consensus regarding the use of a plant based therapy, the greater the likelihood that the remedy in question would be physiologically active or effective (Trotter and Logan 1986). The assumption was taken as the foundation stone for several other ethnopharmacological studies (Friedman *et al* 1986, Johns *et al* 1990, Bonet *et al* 1994). Whatever the semantic field or cultural domain, all these studies share a view of culture as the intersection of individual competence or knowledge. If the omniscient hearer-speaker model is a clear case of transmutation of individual knowledge into one global anonymous body of knowledge, this new process of defining culture as a model of shared knowledge is more akin to a selective and reductionist filtration exercise. Depending on where the limit of shared knowledge is set, i.e. how many people should share certain knowledge for it to be categorised as shared, a significant proportion of knowledge that is restricted to a few individuals (for example low frequency uses) will not be considered for analysis. Aunger (1999: 94) mentions the operational difficulty of determining the critical degree of prevalence in the continuum of sharedness. Similarly, individuals who share knowledge with few people will be rated with a low degree of knowledge or competence. It is then a model, which does not handle specialised knowledge very well (Zent 2001), since a cultural consensus analysis will usually group specialised knowledge, idiosyncrasies, mistakes and ignorance together. Analyses of culture and knowledge then become so restricted, that the knowledge of a significant proportion of the population may be left out of the study. Studies that claim to be focused on intra-cultural variation become nothing more than investigations to understand how those who share knowledge differ. Interestingly, in several studies, competence is initially and clearly defined as the consensual knowledge that is supposed to be computed, represented graphically and analysed according to various criteria (age, sex, etc) (Zent 2001, Heckler 2002). Because culture is defined as the "information pool" which is shared (Romney *et al* 1986: 316), as the analysis proceeds, consensual knowledge becomes simply the cultural or 'true' knowledge / competence (Ibid) of a given people, in a process that is reminiscent of a transmutation. Thus we may hear that the ethnobotanical knowledge of such and such people, taken as a whole, may be correlated with various factors, ignoring the people whose unique views and knowledge have been purely and simply left out. Few ethnobiologists, using the cultural consensus model, actually consider that plants known or used by a few members of a group must be also considered as culturally significant (for a rare example, see Turner 1988). In their study of ethnomedicinal plants among the Luo people, Johns *et al* (1990) recognise that inconsistency in response between various informants is not necessarily equivalent to unreliability.

In short, and in a majority of cases, studies and analyses of intra-cultural diversity have been carried out with an approach that is clearly biased against individual variation, expertise and idiosyncrasies.

D'Andrade (1987:194) summarises the ambiguity of this view as follows:

> For a long time, there has been a minor scandal at the heart of the study of culture...Culture is shared belief and knowledge; but when we study human groups, we find that there is considerable disagreement concerning most items.

Posey (1992: 26-27) provides a very clear illustration of the risks entailed in neglecting specialised or even semi-specialised knowledge when studying intra-cultural diversity in ethnobiology:

> Roughly 15 percent of Gorotire inhabitants can identify and name at least thirty-five species of stingless bees (Meliponidae). The remaining 85 percent have difficulty recognising more than eight. But some specialists can tick off sixty-five

> species.....To complicate matters, specialists frequently do not agree on details of their knowledge.

Aunger (1999) is one of the few anthropologists who have tried to demonstrate the inadequacy of the cultural consensus analysis model. Taking his own large database of food avoidances recorded among the Ituri people in the former Zaire, Aunger took several samples of people from those he interviewed and showed that the consensus analysis method produced different sets of beliefs considered consensual for each sample. Furthermore, he highlighted the fact that individuals' cultural competence can vary significantly depending on with whom they are grouped (Aunger 1999: 97).

As in the case of the omniscient hearer-speaker model, the use of the model of cultural consensus is still quite widespread in ethnobiology nowadays (See Zent 2001 and Heckler 2002 for example). Its attraction to researchers lies partly in the fact that an apparently true representation of a cultural domain can be obtained using relatively few informants (Aunger 1999). The software to undertake the analysis is also conveniently packaged.

In conclusion, the two models of culture suggested by Werner (1969) for the study of intra-cultural variation of knowledge are often successful in creating abstract, reified and biased representations of the variability of ethnobiological knowledge. In one case, the corpus of knowledge created as a suitable and abstract representation of culture is biased towards the knowledge of those interviewed (key informants or the omniscient hearer speaker) and in the other towards those who know what most know (intersection of competence or consensus analysis model).

Although the present study is methodologically sceptical with regard to the two models of cultural competence discussed, and their underlying approach to intra-cultural diversity, it was not begun with the view of subordinating diversity to culture or of abstracting an idealistic view of culture from the existing diversity. I rather share the views of Hays and Ellen that cultural domains are more honestly apprehended and described by analysing with the same degree of interest both what is shared and what is not shared. For Hays, this amounts to identifying patterns of variation or the "distribution" of culture (Hays 1974: 27) as well as plausible explanations of such regularities. Ellen simply presents this dichotomy as N + n, N being shared knowledge and n knowledge that is not shared (Ellen 1993: 133).

In a similar line, D'Andrade (1995: 216) believes that there are two kinds of knowledge systems: consensual, sanctioned domains created by the need to communicate effectively and share expertise and less shared knowledge systems marking subgroups as somehow distinct:

> The issue is not 'how shared is culture', but rather to understand both distributed and high consensus aspects of cultural knowledge.

In opposition to those who put forward the "culture defined by what is shared" model, I am not over-concerned with the need to confirm that there is one "real" or "correct" cultural system, to the point of rejecting any aspect of knowledge deemed "deviant" because it is different or rare. Rather, I find it more useful and accurate to begin the study of a cultural domain without knowing or assuming beforehand its shape, size, and degree of fuzziness as well as the distribution frequency and structure of the knowledge systems that constitute it. I am prepared to accept that there may be no valid single system of knowledge defining a cultural domain. If it also happens that there is a shared and uniform system of knowledge which best describes a cultural domain, then so be it. Nor is this thesis limited to highlighting intra-cultural diversity in the field of botanical pest management from a static and synchronic perspective. The aim of the study is to decipher knowledge dynamics both in space and in time. More recently, temporal or diachronic intra-cultural diversity, the measurement of intergenerational knowledge divides and the fact that the essence of knowledge is more fluid than static have become subjects of increasing concern to cultural anthropologists and to ethnobiologists.

1.5 Culture and knowledge viewed from a processual and dynamic perspective

Most ethnographic studies have ignored or chosen to ignore the temporal dimension and inherent fluidity of cultural knowledge (Ellen and Harris 2000). In the light of the numerous conceptual rifts between anthropology and history identified by Thomas (1989), this comes as no real surprise. Anthropology remains largely a-historical and grounded in synchrony (Ibid). At best, the fluidity of knowledge has been referred to as an obvious fact, but without any further attempts to analyse or understand its dynamism, reminiscent in a way of how intra-cultural diversity has too often been deliberately ignored despite it been considered to be an unavoidable reality in any given culture. It was therefore simply known that knowledge was constantly learned, transmitted, selectively retained, created, (re)- or (mis)- interpreted. References to the extinction or loss of knowledge were scarce. This probably had a lot to do with the use of omniscient or shared knowledge models of culture by a majority of ethnographers, temporal knowledge variation not being integral to either of the two models. For a long time, ethnobiology was no exception to this trend. Until recently, ethnobiological knowledge and its variability were presented in a static and synchronic two-dimensional form. For a few examples of studies dealing exclusively with synchronic variation among many others see Boster (1985), Trotter and Logan (1986). Remarkably, these static and synchronic studies are embedded in the familiar idiom of culture as consensus. For a study of variation and diachrony building on cultural consensus, however, see Zent (2001) and Heckler (2002).

The recent surge of interest in the study of diachronic variation in knowledge (Browner 1991, Ohmagari and Berkes 1997, Maffi 2001, Martin 2000, Heckler 2002, Zarger 2002, Ross 2002, Fitzpatrick 2004) may be the sign of a conceptual shift in ethnobiology and the study of ethnobiological knowledge. In due fairness, Stross (1973) should be heralded as a real pioneer in this field since he went beyond merely stating that knowledge acquisition was contextual, processual and correlated with age but actually demonstrated it. Unfortunately, the quality and depth of his findings regarding the processes and contexts of acquisition of botanical knowledge among Mayan children were clearly too advanced for his time, when ethnobiologists heatedly debated cognitive processes but hardly mentioned children in their studies, let alone interviewed them and referred to what they knew or how they had learned it. Conklin (1967) and Hays (1974) did observe that children became knowledgeable about plants quite rapidly but pushed the issue aside and returned to their study of culture as defined by the knowledge and competence of adults only. In his approach to temporal variation, Hays (1974:8) seems to adopt an ambiguous stand; he is intent on finding patterns of variation correlated with age but states that:

> Important as they are, such investigations that focus on children and adolescents as if the subjects were «on their way to become culture-bearers» can carry the implication that adults grow out of these imperfect states and become "real", i.e. homogeneous.

For Ellen (1975: 222), who laid most of the theoretical foundations for the study of dynamics and diachronic variability in knowledge but did not explore the underlying assumptions further:

> Productive processes and man-made relations are never completely static, so classification of that environment must be assumed to be in a continual state of flux, having to accommodate new needs and new responses to environmental, economic and, for that matter, ideological constraints.

Ellen (1979a: 22) adds:

> The classification systems of all societies tend towards integration, economy and structural conformity.....however, despite this, some behavioural traits do not fit. This is because socialisation is never perfect, there is always a large element of individuality, and because societies and their environments change. Thus we have the paradox that integration takes time but time itself disintegrates.

Although specifically applied to classification processes, the first idea is critical as it firmly establishes the concept that knowledge, including knowledge of plant uses, has the potential to be continuously created or recreated within a society. Twenty years later, Ossewiejer (2000) similarly makes a clear distinction between local and indigenous knowledge, the latter interacting with external knowledge to re-create the former.

Regarding the second statement, two central issues need to be emphasised. First is the underlying concept that people share knowledge and communicate in different ways within a society. Second and foremost is the fact that knowledge at any given point in time is being shaped by various forces of change. It is in this connection that Ellen mentions conflicting forces of integration and disintegration. More recent diachronic studies of knowledge variation have tended to focus either on the forces at play which are active over time in eroding knowledge in a society (Zent 2001, Heckler 2002, Ross 2002) or on the mechanisms and process that characterise knowledge acquisition (Maynard 1999, Lancy 1999, Zarger 2002). For an example of a study focusing both on knowledge erosion and acquisition mechanisms see Fitzpatrick (2004).

Synchronic knowledge, diachronic knowledge and knowledge transmission are intimately related. Knowledge transmission can be seen as a sub-field of the broader field of cultural transmission (Hewlett and Cavalli-Sforza 1986). Communication, as the "process of encoding and decoding and the associated generation of new knowledge in the sender's and receiver's minds" (Mundy and Compton 1995: 113), is one of the processes necessary for the continuity and spread of knowledge and contributes to the larger process of social reproduction (Hewlett and Cavalla-Sforza 1986). In addition, Mundy and Compton (1995) stress the point that the use or application of the knowledge, when applied for example to technical skills or practices, is another form of repetition of the knowledge. As far as environmental knowledge in traditional societies is concerned, it is believed that informal, experiential and observational means of sharing information are often relied on to transmit knowledge (Zarger 2002).

Modes of cultural transmission or communication channels can be either of a vertical nature from parent to child, or of a lateral or horizontal / contagious nature (Hewlett and Cavalli-Sforza 1986, Mundy and Compton 1995), between any two individuals irrespective of their relationship. Cavalli-Sforza (2000) makes a further distinction between intra-generational and inter-generational or "oblique" horizontal transmission modes. Both sets of authors agree that vertical or inter-generational mechanisms are *conservative* or *stabilising* in nature. Grandparent to grandchildren vertical transmission is thought to be even more conservative as knowledge jumps two generations (Cavalli-Sforza 2000). Because this form of transmission is conservative and is observed over the time span of a generation, cultural change is believed to occur at a slow pace (Hewlett and Cavalli-Sforza 1986, Cavalli-Sforza 2000). In contrast, horizontal modes of transmission building on lateral communication are more *dynamic* (Mundy and Compton 1995: 120) or *contagious* (Hewlett and Cavalla-Sforza 1986: 923) in the sense of bringing about change and evolution.

Overall, the types of knowledge transmission (vertical and horizontal) and the processes and factors affecting mechanisms of transmission of knowledge have been understudied (Mundy and Compton 1995). Recent research strongly suggests that mechanisms of knowledge acquisition and transmission during childhood are more complex and diversified than previously envisaged. Thus for Zarger (2002: 599-600):

> The possibility that much of the transmission of environmental knowledge may actually be more horizontal (older sibling/peer transmission) than vertical (parent or grand parent to child) needs to be further explored....In the Belize field site, make-believe play by children ages 2 to 6 or 7 often involves imitation of adult activities such as cooking, etc...Although we realize that much environmental knowledge is acquired in the production of daily life, it may be through participation in loosely defined play and / or work activities that much knowledge and skill acquisition occurs.

One of the primary objectives of this study is to elucidate processual and diachronic phenomena in the field of botanical pest management, taking into account the strong patterns of technical, environmental, and to a lesser extent social, change in Wag Hamra over the last 30 years. In addition, the thesis will provide answers to some of the issues imperfectly understood to date surrounding knowledge acquisition and transmission. Whilst looking at the distribution of types of knowledge transmission, attempts will be made to compare patterns, benchmarks and rates of knowledge acquisition for a specific sphere of competence, botanical pest management, which arguably differs from the subsistence activities studied to date (general ethnobotanical knowledge for Stross (1973), plants used as wild food for Zarger 2002 and Fitzpatrick 2004).

1.6 Long term diachrony in plant use

In the study of diachrony, the factors affecting what Thomas (1996) describes as short-term dynamics should be contrasted with the notion of long-term change. A virtually untouched field of ethnobiology that ought to play a critical role in helping us understand the long-term dynamism and hence variability of knowledge, is the overall study of the genealogy of ethnobiological domains, particularly in ethnobotany with respect to the knowledge of plant uses.

The interest in and the study of plant use by western academics have had a turbulent history during the last century. Advocates of the new ethno-science looked down upon the de-contextualised enumerations of plant uses of the colonial era as naive cases of economic botany. However, the issue resurfaced in the debates surrounding the study of cognitive processes in the seventies and eighties. It clearly drew the line between those who like Berlin believed that universalistic principles of human cognition are derived from humans' perception of nature as a series of discontinuities (Berlin 1992) and those who viewed the utilitarian factor as a driving cognitive force (Hunn 1982, Morris 1984). Ellen (1975: 222) provides us with a useful shortcut into the debate:

> We are dealing here not with collectors [like biological taxonomists] but users.

On the periphery of this debate was the unspoken question of whether ethnobiology should be dealing with mundane issues surrounding technology and subsistence. Despite his earlier aversion of such utilitarian considerations, Berlin has recently demonstrated (Berlin

1995, 1999) that the study of plant use can somehow be reconciled with more classical ethnobiological and people-based approaches and at the same time avoid the still commonly observed pitfalls of simplicity and de-contextualisation, which characterise the field of economic botany. For examples of de-contextualisation in studies of plant use for pest management, see Secoy and Smith (1983), Wilson and GebreMaryam (1979), Matzigkeit (1990), Rees *et al* (1993), Vetter (1997) and Stoll (2000).

Generalisation and de-contextualisation are thus responsible for descriptions of plant use, which often fail to analyse multi-contextual or multipurpose plants. To date, there have been few attempts to decipher the patterns and mechanisms that underlie multipurpose plant use. Notable are the hints provided by Ellen (1979a), the study of the dynamics of multipurpose plant use presented by Campos and Ehringhaus (2003) and the pioneering comparative work undertaken by Etkin with the Hausa people of Northern Nigeria (Etkin and Ross 1982). Ellen observed the existence of areas of fuzziness at the boundaries demarcating different semantic fields, put forward the notion of integration of semantic field due to the marginal overlap in content between fields and raised the important question of the logical and historical primacy of different semantic fields and the processes which created new ones (Ellen 1979a). By independently and concurrently investigating the local diet and the medical system prevailing in the same area, Etkin and Ross (1982) measured a significant overlap in the knowledge of people. They observed that more than half of the plants used as source of food (wild or cultivated) were simultaneously being used in the traditional pharmacopoeia, mainly to treat gastro-intestinal disorders. From this set of data, they introduced the concept of "diverse dimensions of plant utilisation", multidimensional or multi-contextual use of plants. This reported duality of uses triggered a number of studies on the subject in different geographical areas (Etkin 1986, Fleuret 1986, Iwu 1986, Johns 1990, Ogle *et al* 2003). The study of multi-dimensional use of plants became synonymous with the analysis of *continua of plant use* (Johns 1990, Etkin 1994). In his chemical-ecology model, Johns (1990), in particular, broadened Etkin's initial food-medicine continuum by adding the two dimensions of use of plants as condiments and as poisons and also explored the wild food-domesticated food continuum taking Andean tubers as an example. Golob (1999) makes a similar link between medicinal plants and spices and plants used to control pests during storage.

With the expansion of investigations into the diversity of uses arose the issue of precedence in knowledge or between semantic fields, outlined almost two decades before by Ellen (1979a). Etkin (1994) argues that the multipurpose use of plants provides a basis for questions of precedence and interpretations of order. It is conventionally believed that the knowledge of the use of plants as medicines or as poisons was acquired during the pursuit of wild foods, although, in a different chapter of the same book, Etkin claims that the opposite could also be true. Johns (1990) suggests that the deliberate use of condiments as food additives may have originated from their first use as medicinal plants.

This thesis will present evidence supporting the existence of continua of plant use in or related to the cultural domain of botanical pest management. Distinctions will be made between weak and strong continua of plant use.

1.7 Organisation of the thesis

This thesis is organised as follows. Chapter 2 and 3 provide all the background information necessary for apprehending the main body of the document. Chapter 2 describes the information-gathering phase that took place during 18 months between March 2002 and October 2003 as well as the range of methods, which were used in the process. Particular attention is given to the complementarities and coherence between the qualitative and quantitative information gathering phases. The main purpose of Chapter 3 is to present as succinctly as possible ethnographic information on the study area in Wag Hamra, which is of direct relevance to the synchronic and diachronic analyses presented in subsequent chapters. This information includes a brief description of the continuum of livelihoods found between high altitude mixed farming and lowland agro-pastoralism. Specific sections focus on the space and time dynamics of the agrarian systems of the area and the crisis that these systems are undergoing, which is greatly accelerating the decline of the natural resource base of the area. The aid dependency and culture, which have developed in Wag Hamra over the last 20 years, are also briefly touched upon. There follows a more conventional account of the so-called "culture" of the Amhara people with an emphasis on traits which, in my view, have not been sufficiently considered in the vast literature dedicated to the former Abyssinia, for instance, emic and differential perceptions of altitude, the Agaw-Amhara relationship in modern Ethiopia, the Amhara culture of the "vague", etc. I close this chapter with a focus on traditional population movements and migrations in the study area.

Chapter 4 introduces the ethnoentomology of pests in Wag Hamra and constitutes the first step in the process of deciphering the dynamics of botanical pest management. Priority is first given to the analysis of the ways in which farmers compare living organisms and pests and to how they classify pests in varying contexts. Of importance to the understanding of the "ethnobotanical" chapters that follow is the way specific environmental contexts (altitude, agrarian system) and social / cultural factors (religion, sense of masculinity, resilience) affect the identification and classification of pests. Second, the analysis of how farmers view misfortune and certain forms of pest infestation provides us with clear indications that botanical pest management in the study area may not be exclusively empirical. A qualitative and synchronic analysis of ethnoentomological knowledge of pests forms the bulk of this chapter.

Chapter 5 opens with the presentation of key cultural perceptions of plants in the area under study and continues with an analysis of the synchronic variation found in the ethnobotanical knowledge of botanical pest management as a potential function of gender. In subsequent sections, I proceed to analyse the extent to which the contextual and environmental factors such as altitude and livelihood specialisation identified in Chapter 4 have a bearing on ethnobotanical synchronic variation. The analysis combines the use of quantitative and qualitative tools (including the construction of an artificial omniscient hearer-speaker against which all interviewees of the quantitative phase are evaluated). From the information collected, an attempt is also made to understand the relative position of botanical pest management within the broader sphere of pest management.

Chapter 6 and 7 are exclusively dedicated to the study of diachrony, both in the short term and in the long run. In the former, I try to correlate diachronic knowledge variation with several key factors such as pest incidence, plant use, the natural resource base of the area, soap and chemical pesticide use, to name but a few, whilst in the latter I consider long term patterns of change through the analysis of continua of plant use.

Chapter 8 summarises the main conclusions of the study and highlights critical issues with regard to intra-cultural variability and ethnobotany in general.

CHAPTER 2

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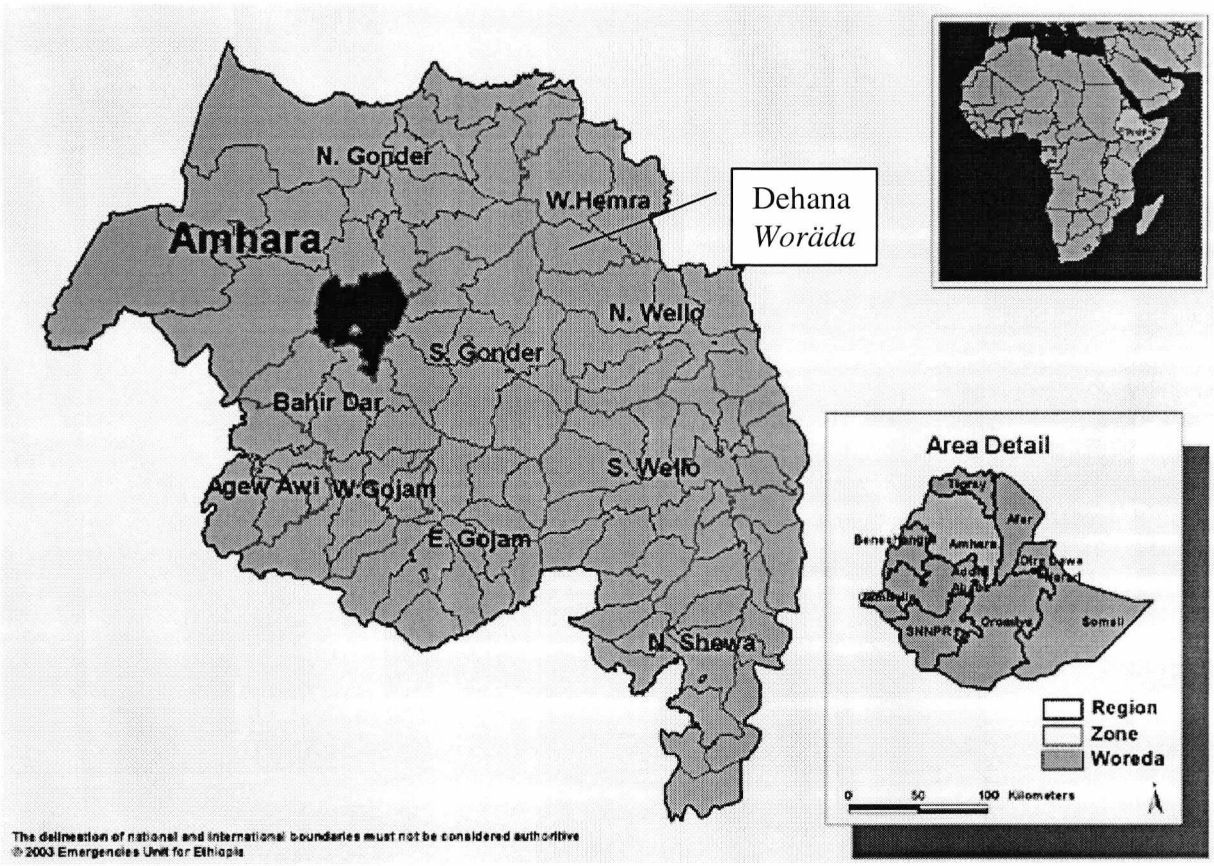
BACKGROUND AND METHODOLOGY

2.1 - Field work

2.1.1 Research area

Prior to the fall of the Marxist *Derg* regime led by Mengistu, the current Wag Hamra Zone was part of the Wag *Awraja*. The Transitional Government of Ethiopia, established in 1992, abolished the previous administrative divisions, established the Amhara National Regional State (ANRS)[1] and created 11 zones within the new regional structure (Map 2.1).

Map 2.1: Amhara National Regional State with Zones and *Worädas*



[1] There are four basic administrative levels in Ethiopia. By decreasing order: Region, Zone, Woräda and Farmers Association.

The Wag Hamra Zone, which emerged as a result of this reshuffling, is smaller than the previous Wag *Awraja*, as portions of the latter were either integrated into North Wollo Zone (ANRS) or the TNRS (Tigray National Regional State). The administrative Zone of Wag Hamra lies to the northeast of the Amhara National Regional State (Map 2.1). The central and eastern parts of Wag Hamra belong geographically to the North East Central Highlands of Ethiopia. In this area, a few medium to high altitude mountain ranges (with peaks above 3000 m) are interspersed with valleys, steep gorges and numerous escarpments and ridges. To the West, the whole of Wag Hamra is separated from the mountain ranges of North Gonder by the lowlands and canyons of the Tekkezze watershed.

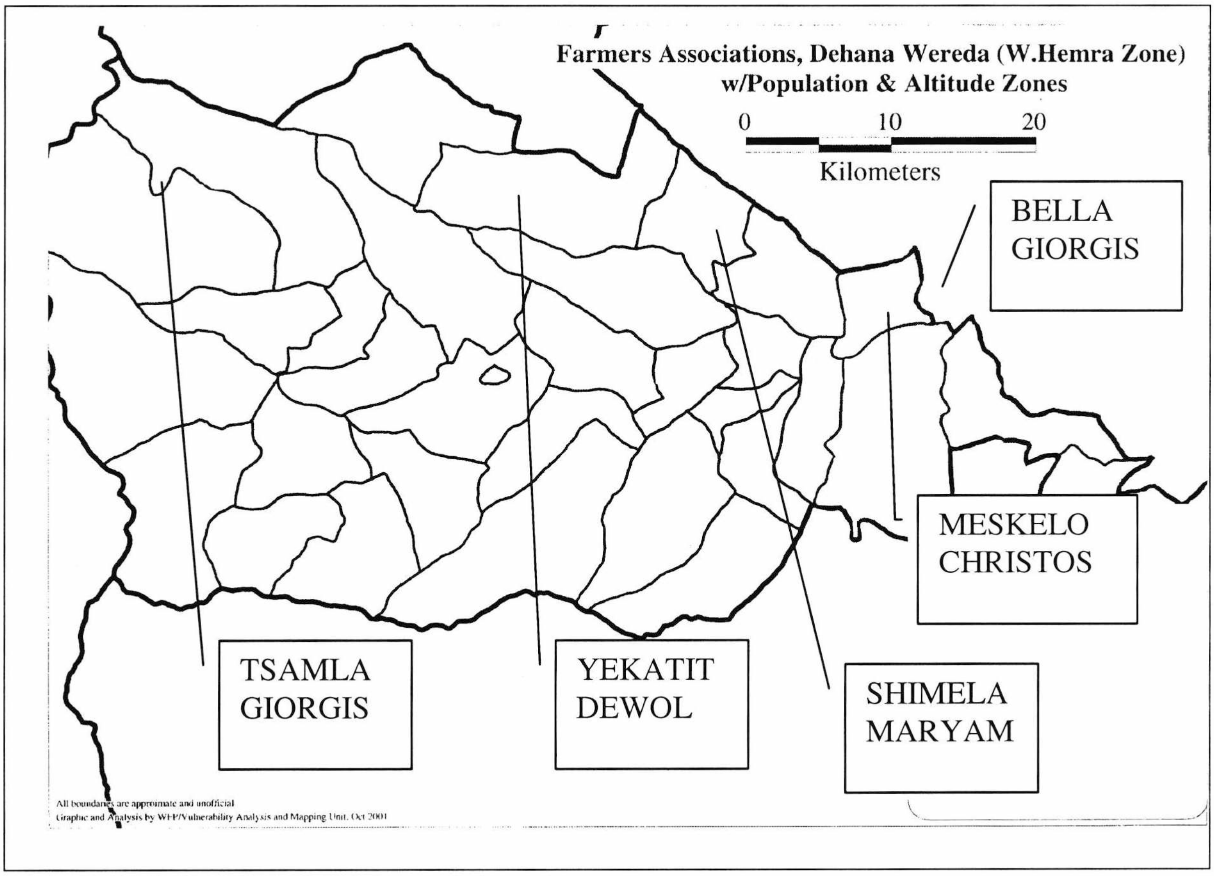
In contrast with other parts of the former Abyssinia such as today's North and South Gonder, North and South Wollo or North Shoa, the mythical highland plateau, which has become over time some kind of generic geomorphologic marker to describe the highlands of the former Abyssinia, does not exist in Wag Hamra. The topography of Wag Hamra is extremely rugged and is often jokingly described by its inhabitants as being the result of the Archangel Gabriel's wrath (This anecdote is also often heard in North Wollo). Several travellers have commented on the inaccessibility and ruggedness of the area. Scholars have pointed out that such geographical characteristics may explain in part the relative ease with which its inhabitants have resisted any form of domination and taxation by successive Ethiopian emperors (Pankhurst 1984), as well as the much slower and often unsuccessful process of "Amharisation" of the Ethiopian Cushitic Agaw substratum by the Amhara elite (Gamst 1969: 117).

The Wag Hamra Zone is currently divided into the three *Worädas* of Ziquala, Dehana and Sekota (Map 2.1). Each *Worräda* is split into a variable number of Peasant Associations (PA). With the exception of Bella Giorgis, which is located in Sekota *Woräda*, all the research sites of Meskelo Christos, Shimela Maryam, Yekatit Dewol and Tsamla Giorgis are Farmers Associations, which form part of Dehana *Woräda* (Map 2.2).

According to one of the altitudinal and agro-ecological typologies currently prevailing in Ethiopia, Bella Giorgis and Meskelo Christos would be categorised as *däga* or high altitude communities, Shimela Maryam and Yekatit Dewol as midland or *woyna däga* communities and Tsamla Giorgis as a lowland or *qolla* community. See Table 2.1 for a more detailed description of the various agro-ecological typologies that are commonly used in the Ethiopian litterature. GPS measurements gave the following altitude ranges (from the lowest to the highest point in the community):

Bella Giorgis:	2300 – 3500 m (asl)
Meskelo Christos:	2200 – 3500 m (asl)
Shimela Maryam:	1800 – 2500 m (asl)
Yekatit Dewol :	1700 – 2400 m (asl)
Tsamla Giorgis :	1300 – 2200 m (asl)

Map 2.2: Farmers Association in Dähana Woräda surveyed during the research



Source: WFP (2002)

In terms of travelling distances (on foot), a person can travel without load from Meskelo Christos (church) to Tsamla Giorgis (church) in 12 to 14 hours (covering approximately 50 kilometres of mountain track), which corresponds to one day's walk for the average Wag inhabitant. The longer trek from the highest point of the Meskelo PA to the lowest point of the Tsamla Giorgis PA would take a day and a half.

2.1.2 - Research phases

The fieldwork for this study was carried out between March 2002 and October 2003. The necessary government authorisations were secured during the months of March and April 2002, both with the Federal government authorities and the Addis Abeba University in Addis Abeba and with the Zonal, *Woräda* and Farmers Association authorities in Wag Hamra Zone.

Table 2.1: Example of agro-ecological zonation used to segment and categorise the environment in Ethiopia

***Wurč'* (>3500 m):** this is the sparsely populated highest altitude belt (inhabited at the highest altitudes), often described as the frost band. The only crops grown are barley and pulses. Livestock is limited to cattle, sheep and horses.

***Däga* (2500-3500 m):** this is a cool high altitude belt where rainfall ranges from 600 mm to well over 1000 mm per year. Barley, wheat and pulses are the dominant crops grown. Sheep, cattle and equines are the main livestock raised.

***Woyna-däga* (1600-2500 m):** this belt corresponds to the warmer middle altitude areas and contains the greater part of the agricultural terrain and population. Rainfall is in the range of about 500 mm-900 mm per year. It is best described as a transition area where crops from both higher and lower altitudes can be grown and where sheep, goats, cattle and camels in the lower areas are raised.

***Qolla* (1300-1600 m)**: this belt is commonly described as the lowlands. It is more sparsely populated than the *woyna-däga* belt. Temperatures are high and annual rainfall does not amount to more than 500 mm. Sorghum, maize and *teff* are the predominant crops grown. Goats, sheep, cattle and camels are raised.

***Bärha* (<1300 m):** this belt corresponds to the desert rangeland, which is the domain of pastoral nomads.

(SOURCE: Wolde Maryam 1991)

The actual gathering of information was completed in four successive trips:

- A first long trip between May 2002 and September 2002 when I introduced myself to the farmers in the five Farmers Associations of Bella Giorgis, Meskelo Christos, Shimela Maryam, Yekatit Dewol and Tsamla Giorgis and began the process of collecting qualitative information.

- A second shorter trip to several neighbouring Farmers Associations in Ziqualla *Worӓda* (Ka Maryam, Dil Betigil, Telladje Hamusit) during the month of November 2002.

- A third long trip between January 2003 and March 2003 to the four Farmers Associations of Bella Giorgis, Meskelo Christos, Shimela Maryam and Tsamla Giorgis to launch a comprehensive botanical survey and inventory and to continue the qualitative interviewing of farmers.

- A fourth long trip to the three Farmers Associations of Meskelo Christos, Shimela Maryam and Tsamla Giorgis to run a questionnaire survey with one hundred households. This questionnaire survey was completed in five months (May 2003 to September 2003).

2.1.3 - Living and research conditions

The research area(s) being moderately to very remote from the main dirt roads, travelling to and from the Farmers Associations was done on foot exclusively. The logistics (whether food, camping gear or research material) were managed using pack animals. Tents were set up as accommodation in each community and we prepared our own food. This last point has some importance since official visitors travelling to distant communities (usually government officials) rely on communities themselves to supply them with food and accommodation. This seems to be an inheritance of the former feudal system whereby a lord travelling on his estate could call upon any of his farmers and expect to be fed and lodged. Although the government authorisations that I had secured entitled me to such a "reception", I decided not to rely on this system for two reasons. I believed first that introducing myself as an outsider with government authorisation rather than as an outsider behaving like a government representative would help minimise the government and aid biases in my research (see paragraph 2.3 Problems encountered during the study). On a more practical level, I thought it more acceptable not to impose on villages the burden of having to feed three additional people (myself and one or two assistants) for several months during the lean, "hungry" season of June, July and August (the bridging period before the first harvest in September). In fact, during the course of the information gathering, people chose themselves to invite us for meals or coffee ceremonies when they felt like it. This proved to be a better, or at least more natural, way of establishing "rapport" (the very important Ethiopian tradition of welcoming guests or foreigners) than through the more rigid government system.

2.1.4 - Language

All the interviews were carried out exclusively in Amharic, the official language of Ethiopia. Approaching near native fluency in Amharic, I conducted the qualitative interviews with farmers in Amharic and my assistant occasionally stepped in to clarify unknown terms if necessary or to explain expressions in old Amharic. If ever there was "translation" during this research, it was from an ancient and "rural" form of Amharic used by farmers to a more modern (and urban) type of Amharic. In the last Farmers Association in Tsamla, the Amharic was so different that it even took my assistant several weeks to adjust to the language used in the community.

2.1.5 - Days for interviewing

Interviews with farmers were only conducted on religious holidays. To someone unaware of the way of life in the rural highlands this may seem odd. In practise, however, this is the only time when one can reasonably expect to find farmers in their homes. During working days, farmers leave their household very early in the morning and come back very late at night. They are always on the road or busy for one reason or the other. All in all, including Saturdays, Sundays and religious holydays during the week time, the window of opportunity for interviewing farmers in any given month varied between 15 and 20 days. Religious holidays which were systematically observed throughout the study area included the celebrations of Saint Gebre Menfes Kiddus (Also referred to as 'Abbo'), the Holy Trinity, the Holy Cross, the Archangel Michael, the Covenant of Mercy, the Virgin Mary, Saint Georges, Saviour of the World and the day of the celebration of God (*Bal Igziabher*). Depending on the religious figure (excluding those already mentioned) to which a parish is dedicated, other days are also considered as holidays within the said parish. In the area under study and therefore on a limited geographical basis, these additional holydays included the celebration of Jesus, Saint Cherkos, the Archangel Gabriel and Saint Tekle Haymanot. Regardless of the holiday being celebrated, I always chose to interview people from a parish, whose central religious figure was being celebrated during that particular day. Not only did this approach help to widen the window of opportunity for interviewing, but it also provided a socially and culturally acceptable way of introducing myself into a new parish or community.

No attempts were made to interview farmers during their work on working days. This was common sense since locating a person or a particular field in highland Ethiopia is usually time consuming and likely to raise levels of suspicion to undesirable levels.

2.1.6 - 'Free' interviews

Before the interview, farmers were always informed that the choice of answering my questions was entirely theirs, that the interview would remain confidential and that there were no strings of any kind attached. Nor did I offer any type of remuneration or compensation for their participation in the interview. This proved useful in helping to reveal and sort out a range of attitudes of farmers to the interview process. Attitudes that emerged ranged from enthusiastic to polite cooperation and, at the other end of the spectrum from polite refusal to reluctant grumbling and angry refusal. On the whole, and with this approach, cooperation was obtained in a large majority of cases (more than 90% of the cases).

2.2 - Range of methods used

2.2.1 - Qualitative methods

2.2.1.1 - Semi-structured interviews

Semi-structured interviews were carried out with key informants (farmers, traditional healers and *däbtära*s or magico-religious healers). Recall techniques were used not only to probe the direct knowledge of informants but also to stimulate memories and recollections of use and knowledge of use from the previous generation. In doing so, it was hoped that knowledge of pests and botanicals used 30 years or a generation ago as well as knowledge of botanicals used two generation ago would be retrieved. However, in practise, this distinction between the knowledge of different generations made little sense since informants were adamant that the knowledge and know-how that they had received from their parents differed little from the knowledge that their grandparents had passed on to their parents. My informants agreed that some knowledge might not have been transmitted if their grandparents or parents did not have the opportunity to put this knowledge into practise. In any case, they were not aware of it and did not consider it to be significant.

My original intention was to interview farmers, traditional healers and *däbtäras*[2] from different age groups to get a feel for intergenerational knowledge divides. This could be done with farmers but not with traditional healers and *däbtäras* as I had to content myself with interviewing those who agreed to take part in the exercise.

In most cases, the semi-structured interviews were carried out with one person at a time. Neighbours often joined the interview out of curiosity. To maintain a certain atmosphere of privacy with *däbtära*s and traditional healers, onlookers were politely asked not to take part in the interview process. With farmers, onlookers and neighbours were allowed to take part in the interview. Such improvised semi-structured interviews with small spontaneous groups proved very useful, especially in highlighting the virulence of cultural dissensus, even for small everyday matters such as how to deal with chicken lice or how ashes differ in quality. See Annex 2.1 for an exhaustive checklist of the key points discussed during these semi-structured interviews. See Annex 2.2 for a list of the people interviewed.

When interviewing farmers, traditional healers or *däbtära*s, I always at some point in the interview adopted the method already successfully tested by Negussie (1988) with midwives and indirectly suggested an exchange of knowledge by discussing and implicitly revealing some elements of knowledge and in some cases recipes with my informants. This method was very fruitful with farmers, a few traditional healers and young "unconfirmed" *däbtära*s in that it contributed to revealing low frequency knowledge and use remedies. However, this approach did little to ingratiate myself with reputed healers and confirmed *däbtära*s but probably had the opposite effect of increasing their reluctance to answer my questions.

Informants were usually interviewed in one session and informed in advance of the subject of discussion, so as to maximise the quality and quantity of knowledge and information recalled. Several informants were interviewed several times. Subjects that dealt with more sensitive issues such as the possible association of pests with spiritual forces were only discussed once a climate of confidence had been established.

[2] The *däbtära* is an ambiguous character of the northern highlands of Ethiopia. He is simultaneously a professor of religious studies (poetry, liturgical dancing and singing, etc), a healer and occasionally a sorcerer. According to tradition, the *däbtäras* are the descendants of the clerics who accompanied the Ark of the Covenant on its journey from Jerusalem to Ethiopia. See Chapter 5 for more details on this multi-talented character.

2.2.1.2 - Identification of pests and botanical pesticides

During these semi-structured interviews, ethnoentomological and ethnobotanical identifications were carried out in several steps.

First, informants were interviewed inside their household and asked to free list insect pests. Whenever possible, I then asked children to collect as many of the named pests as possible, so that an immediate identification and confirmation of identification could take place with the informants. In the case of field pests, migratory pests or any other pest, which could not be captured easily or at the time of the interview, identification in Amharic and confirmation of identification was done at a later stage and involved the expertise of pest control experts and veterinarians from the Ministry of Agriculture in Sekota. An aggregate body or database of knowledge of pests held by farmers, traditional healers and *däbtäras* in Wag Hamra was the second output of this identification process. Ant species and one type of fly maggot could not be scientifically identified.

The same procedures were repeated for the identification of botanicals used as traditional insecticides. In several instances, identification could not take place immediately (rarity of the plant, seasonality, long distance to travel). Photographs with markers to indicate scale were taken as well as specimen vouchers using standard botanical collection techniques (standard collection techniques, field press and drying techniques as outlined in Martin 1996). As in the case of the knowledge of pests, an aggregate body or database of knowledge of botanicals used for pest management held by farmers, traditional healers and *däbtäras* in Wag Hamra was the second output of this identification process. The scientific botanical identification took place in several steps. I first identified common and well-known species and genera. Further refinements to the identification were introduced after consulting the various volumes of the Flora of Ethiopia (volumes 2.1, 2.2, 3, 6, 7) and secondary botanical and forestry sources (Edwards 1976, Kelecha 1987, Bekele-Tesemma 1993). For unknown or still unclear species, specimen vouchers (with flowering material) were sent for identification to the National Herbarium in Addis Abeba.

As for pests, an aggregate body or database of knowledge of botanical pesticides held by farmers, traditional healers and *däbtäras* in Wag Hamra was the second output of this identification process.

2.2.1.3 - Pair-wise ranking

Simple pair-wise ranking techniques were used on two occasions to determine degrees of priority. I first asked farmers to prioritise pests according to the degree of harm that they caused. This attempt to rank pests was met with very little success as farmers found it impossible, in their own terms, to compare the regular, annual infestation of pests causing damage on a limited but regular basis with sporadic but massive large scale infestation which occurred rarely but resulted in the near complete destruction of crops.

In a more straightforward exercise, I asked farmers to compare the degree of resistance of different types of wood to termite attacks. Answers and results elicited with this technique gave little room for ambiguity.

2.2.1.4 - Botanical survey methods

Except for a few church compounds and very remote areas in the highlands and lowlands, there are virtually no significant patches of closed forest left in the communities under study, at least within medium range of human habitats. The encroachment of agriculture and cultivated land also means that significant patches of natural vegetation (open shrub or woodland savannah) are becoming scarce in many areas. Small patches of natural vegetation are scattered between fields and wild trees may still be found in the fields. Significant patches of natural vegetation are often only found on marginal, sometimes inaccessible steep mountain slopes and in large river gorges.

This situation implied that conventional methods of botanical surveying could not be systematically used in the research area. The selection of survey quadrats proved problematical, particularly in areas where there were no sizeable patches of natural vegetation or where the vegetation was not accessible without climbing equipment. Belt transects were ruled out for the same reasons. In such circumstances, I decided to survey only river and large stream gorge areas, which are, together with field hedges, the last semi-marginal and therefore accessible areas where medium to large patches of natural vegetation are still found in the communities under study. This implied going up and down gorges whilst surveying the natural vegetation growing within a zero to one hundred meter range of the streams. Whilst moving up and down the river, I stopped whenever necessary to record the GPS position and the name and number of plants used as pesticides found growing in that particular location.

The presence of home gardens around households and on the banks of small rivers was also noted and recorded. Rapid botanical inventories were carried out in passing whilst doing river transects but I made no systematic attempt to make precise inventories or record their numbers and location. Such an initiative would have been considered extremely rude. Unwritten and protective signs equivalent to "do not trespass" are found everywhere in these gardens.

The botanical survey on the ground was complemented by the structured interviewing of several key elderly informants to determine qualitative variation in the availability of botanical pesticide species over the last 30 years.

2.2.2 - Quantitative methods

2.2.2.1 - Structured questionnaire survey

2.2.2.1.1 - Questionnaire

The final version of the questionnaire was organised in three sections (see Annexes 2.3 and 2.4 for details of the questionnaire in Amharic and English). The first section focuses on general (name, community, parish, age group, position) as well as more specific descriptive information (place of birth of mother, number of years in school for children, ownership of livestock, number of years in migration for men, altitude of the household, latitude, longitude, distance of the household from the nearest veterinary clinic). Owing to the difficulty of asking or determining the precise age of people in the highlands of Ethiopia, I decided to code age according to broad age groups. For children and adolescents, I introduced three shorter age groups (5-10, 10-15 and 15-20). From 20 years onwards up to 60, age was split into intervals of 10 years. Beyond 60 is an age group of its own. This gives a total of eight different age groups.

The second section is intended to investigate local knowledge of pest management in the broadest sense (including botanical pest management). Questions on several other ailments were also asked to measure possible connections, overlaps and continua between botanical pest management and other disease/ailments, both for livestock and human beings. The order of the pests and ailments in column 1 is the result of a random selection from the initial list of the aggregate body of ethnoentomological knowledge. I decided to exclude several pests from the list for practical reasons (see paragraph on field testing).

During the interviewing, no hints of any kind were given. Informants were simply asked: “how do you deal with such and such a type of pest when it occurs?” If a first answer was given, the same question was repeated (twice if necessary) by adding, “how do you deal with such and such a type of pest when it occurs and when the first remedy is not available?”. Informants were then asked if they had themselves made use of the remedy (column 8), what was the year in which they had last made use of it (column 9). In columns 10, 11 and 12, informants were asked to describe the origin or source of their knowledge of the remedy: whether it was from a family member or from outside of the family (column 10) ; if from a family member, then who (column 11): sibling, parents, grandparents or uncles and aunts; and if the person was a man or a woman (column 12).

If the remedy was a specific botanical species (as opposed to indeterminate botanical products for example such as ashes, straw, grass or charcoal), additional questions were asked concerning the plant part used (column 3), whether the plant part was used immediately after harvesting or whether it was dried and stored before use (column 4), the mode of administration of the remedy (column 5), possible additives to the main plant ingredients (column 6) and the time of the year when it was most likely to be used (column 7). Except for the name of the remedy, which was precisely recorded in Amharic script, the answers for all the other columns were recorded in code numbers.

Section 3 of the questionnaire dealt mainly with ethnobotanical knowledge of pest control. An album made of plant pictures, numbered and with scale markers, of plant species unambiguously identified as remedies for pest management, was presented to each informant, who was then asked whether he knew each plant (column 1), if so the name of the plant (column 2) and the possible uses of the plant. The exploration of potential plant use was performed in two steps. The informant was first asked to free list the different uses that he knew for the given plant. After a short while he was then asked precisely whether the plant could be used for specific pests and ailments. The informant only had to answer yes or no and to give details on the plant parts used, the mode of administration and possible additives to the botanical preparation. This type of question is believed to minimise non-cognitive variation due to boredom, shyness or laconism (Zent 2001: 201).

To minimise variation due to interview context, relationship between researcher and informant, informant talkativeness (Martin 1996: 168) and potential errors, a 'fill-in-the-blank' format was not used. The specific questions on pests and ailments were all based on the aggregate body of ethnobotanical knowledge of pest control, which was an output of the qualitative information-gathering phase. The advantage of asking direct yes/no questions to farmers was that they were, in their vast majority, honest about answering these questions. They replied in a straightforward manner if they knew the remedy or not. Most would add "Yes they say so" or "I have heard so" or "Yes but I have not tried it" or "No idea", "No idea, I have not tried it", "No I am a simple uneducated farmer", etc. In any case, if a farmer claimed to know a remedy, his precise and coherent description of the "recipe" (plant part or extract, mode of administration and possible additives) contributed to authenticating his knowledge. To reduce the boredom factor in the interviewing process, the pictures and plant questions were interspersed at regular intervals with questions on specific religious figures that had emerged during the qualitative phase as being associated in one way or another with pest management and control. Knowledge related to non-religious spiritual beliefs and pest control was not probed during the process, as it would have radically changed the atmosphere of the interview and most likely reduced the quality and quantity of information collected. This included knowledge of plants used to repel the evil eye, devils and *Saytan* (see Chapter 3). However, when farmers mentioned such particular plant uses in the free listing exercise, the knowledge was recorded on the questionnaire.

2.2.2.1.2 - Field testing

Field-testing of the questionnaire in its original version was useful to highlight the fact that the questionnaire was too long and that certain questions were politically sensitive. Informants would start loosing interest in the questions half way through the last section. I consequently decided to shorten the questionnaire by cancelling several questions in the three sections (issue of migration in section 1, details of timing of use and several pests in section 2, generic plant and animal products remedies in section 3).

2.2.2.2 - Sample selection

The unit of study for this questionnaire survey was defined as a household with at least two children above the age of five, ideally a boy and a girl, still living with their parents. For practical reasons (time and financial constraints) I decided to limit the sample size to 100 households (100 being the minimum sample size for simple statistical analyses at 90 % level of confidence (IIRR 1996)). Since no reliable list of all households living in the study area (communities of Meskelo, Kewzba, Shimela, Yekatit Dewol, Tegel Andnet and Tsamla), could be obtained, given the size of the area, the fact that people lived in numerous small villages scattered in the communities and my financial and time constraints, I opted for a multistage cluster sampling to draw my sample. I chose three communities at random from the total of six (see above) by drawing lots. In the second stage, I decided that I could cover a maximum of 25 villages during the survey. After listing all the villages in the three communities, I again drew lots with numbered pieces of papers to select 30 villages, giving myself a security margin of five spare villages in case I ran into trouble in any of the first 25 villages (see Annex 2.5 for details). In one community, I managed to obtain from the Ministry of Agriculture lists of the households with two or more children and drew lots to select eight households for each village. Upon arrival, several households could not be properly interviewed for a number of reasons: some parents did not have the number of children they claimed to have, some of their children had married recently and left the house, children were too small, more than two members of the household were absent, etc. In practice, drawing an initial sample of eight households proved sufficient to obtain satisfactory interviews from three or four households in each village. When no official list was available, I asked several people (community leaders, village representatives, elderly people knowledgeable about their village, etc) to free list the households with two or more children in their village. I usually asked three people to perform this exercise for the same village, cross-checked the information obtained and as in the previous case drew an initial sample of eight households with numbered lots. In the end, a total of 349 people were interviewed (182 adults and 167 children).

In this multistage cluster sampling, the choice of three sample communities out of a total of six (50 %) and the choice of 25 villages out of 57 villages (40-50%) (see Annex 2.5) at the first and second highest cluster levels does perhaps not ensure the maximum heterogeneity of the sample that certain authors recommend (Bernard 1994: 90). I must however again emphasize that my choice of three communities was a trade-off between ensuring adequate heterogeneity in the sample as appropriate when doing multistage cluster sampling, the time and financial constraints that I was facing, and the need to maintain my team's good health, as well as mine, in what proved to be a five months mountain marathon.

2.2.2.3 - Context of the interviews

To interview all household members in optimal conditions and to reduce interviewer/informant biases, all informants were interviewed separately, starting with the children. The assumption was that children were more likely to hover around and gather information from their elders if the latter were interviewed first. To minimise the gender bias and to minimise social frictions, my male assistant interviewed men and boys and my female assistant always interviewed women and girls. The interviewing always took place within the vicinity of the household on holidays (see section 2.1.5 - Days for interviewing). Onlookers, neighbours and passers-by were systematically and politely asked not to take part or listen to the interview. To minimise the risks of too much questionnaire information diffusing to the whole village before we had actually completed the process in that village, we tried as much as possible to finish the interviewing of three or four households in one or two days.

2.2.2.4 - Cognitive versus non cognitive variation

While few ethnographers and anthropologists have cared to focus on variability, even fewer have sought to untangle the cognitive from the non-cognitive in their data. Thus for Boster and Weller (1990:172):

> There are still no criteria for identifying variation [in responses] as either cognitive, contextual, or simply noise.

However, some anthropologists, for example those developing the cultural consensus analysis model, by building complex probability models that negate what is not shared, are also indirectly making attempts to eliminate this type of confusion between various forms of variation. As Romney *et al* (1986: 313) put it:

> The model [the cultural consensus model] provided... is an attempt to make objective the criteria by which we might measure our confidence in inferring correct answers to cultural questions, i.e., to help answer the epistemological question of "How do we know when we know?"

Aunger (1994:3) observes "there has been little concern for the intricacies of human interaction during data collection in either ethnographic theory or practice". While recognising that "each interview's context (i.e., situation in space and time) and metacontext (i.e., the participants' perception of the situation of the interview) are necessarily unique" and that an extremist interpretation would lead to the realisation that scientific interpretation of interviews is impossible, Aunger argues that a middle way exists to sort out cognitive variation from other forms of variation. He suggests the use of the reflexive analytical method to distinguish between four sources of variation: 1) contextual or situational factors, 2) the interviewer, 3) interactions between characteristics of the interviewer and informant, 4) the informants own unbiased beliefs or values.

Within the context of my study, the set-up of the survey was designed to ensure that factors 1) and 3) would become negligible. Contextual variation was minimised by always interviewing people on religious holidays within the private vicinity of their household on a one-to-one basis. When we found people engaged in extra-ordinary situations (funerals, family gatherings, illnesses, etc) I chose not to interview the household members. Interactions between characteristics of the interviewer and informant were also reduced. I recruited two interviewers with very similar backgrounds (12^{th} grade graduates, Orthodox Christians, living in small towns but with a good experience and understanding of countryside traditions and values, etc). In fact, the factor which may have induced the greatest amount of non-cognitive variation is the different way in which the interviewers conducted their interviews (corresponding to factor 2)). Phenomena such as boredom, tiredness, and forgetfulness undoubtedly contributed to generating non-cognitive variation from informants. It was my task to see to it that interviewers would take a rest, revise the lists of predetermined questions (for section 3) or rectify their attitude when necessary. In order to do so, I always remained in the background of the interviews switching from one interview to the other and occasionally correcting situations on the spot. The one element of interviewer bias, which was never eradicated, was my presence on the site of the interviews.

To sort out errors from cognitive variation, I first checked whether a piece of recorded knowledge had some degree of historical or consensual depth, that is, if the same element of knowledge was at least cited by two people either during the questionnaire survey or during the qualitative information gathering phase. Knowledge mentioned only once was then screened for errors, usually detectable by observing the incompatibility between the plant part used, the mode of application and the targeted pest. The residual knowledge was categorised as very low frequency knowledge (One occurrence only).

2.2.2.5 - Quantitative data analysis

Plant use knowledge recorded during the quantitative survey was measured against the initial aggregate body of knowledge yielded during the qualitative phase. If new knowledge emerged from an interview and was subsequently corroborated by another family member or by a member of another household, that is, if it had some degree, even marginal, of historical and consensual depth, it was added to the global aggregate ethnobotanical knowledge of pest control and included in the statistical analysis of data.

Several types of variable were calculated on the basis of the information contained in each questionnaire. These included variables of plant use (USE), variables of primary plant use knowledge (RAW K: based on information extracted from section two of the questionnaire), variables of secondary or total plant use knowledge (TOTAL K: based on information extracted from section three of the questionnaire) and simple indices of plant knowledge (extracted from section three of the questionnaire).

Simple calculations (average, variance) and statistic tests (t tests, X^2, linear regression) were run on the overall quantitative data and the variables using a simple Excel spreadsheet package.

2.3 - Problems encountered during the study

In two instances, I found it very difficult to obtain any kind of information from farmers. Interestingly, the two villages where this happened were the most remote of the study areas, located at both extremes in terms of altitude: the highest village of the highest community in Meskelo Christos, and the lowest village in Tsamla on the edge of the Tekkeze River. Both villages shared the same feature of being in semi-isolation from government structures. As such, any foreigner or outsider visiting these villages was seen as an emissary of the government trying to re-affirm governmental authority and activities. Even though I clearly introduced myself as a researcher intent on discussing traditional knowledge, farmers from both villages viewed me with great suspicion, believed that I was a government envoy and systematically played dumb during the interviews. In a third case (the community of Yekatit Dewol), my questions were immediately tied to perceptions / expectations of government food aid. This area is notorious for having supported the guerrilla movement during the *Derg* regime and for having hosted (and fed) some of the politicians now in power in Addis Abeba. Consequently, more than 10 years after the fall of the *Derg*, farmers in this area expect the government to continue to repay its debt and to fulfil their needs (food aid, packages of the Ministry of Agriculture, etc) on a regular basis. Compared to neighbouring communities, farmers from Yekatit Dewol are relatively privileged. During my first and only stay there, they refused to answer my questions in most cases, arguing that they wanted something in exchange (usually food aid). Despite my staying three weeks in this community, I only managed to interview six farmers.

My assumption that it would be easy to find and interview magico-religious healers was extremely naive. There are few of them (as far as I know, not more than four or five knowledgeable ones in the whole of the five communities) and they are extremely reluctant to meet foreigners and to share information even on benign plant uses.

My assumption that interviewing women with a female assistant would yield more valuable information was not entirely confirmed. The barrier here is not a gender one but a social one. Anyone Ethiopian or foreigner, male or female, perceived as not being a farmer, is immediately classified as an outsider. I was also wrong to believe that women would feel more comfortable being interviewed alone. In some cases, I found that women being interviewed need to have either their husband or other members of their family in the nearby vicinity.

CHAPTER 3

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THE SOCIO-ECONOMIC AND CULTURAL CONTEXT OF KNOWLEDGE DYNAMICS IN WAG HAMRA

3.1 - The altitudinal continuum of farming livelihoods and the importance of livestock

During the course of their peregrinations, most foreign visitors travelling through the highlands of Abyssinia rarely paid much attention to farming activities. When they did, their accounts amounted to little more than the description or enumeration of discrete productive activities (growing of such and such crop, rearing such and such ruminant, etc). In particular, see the narratives of Alvares (Beckingham and Huntingford 1958), Lobo (1985), Bruce (1790) and Prutsky (1991).

In more recent times, the expansion of development and humanitarian activities, concomitant with the introduction of new analytical concepts and methodologies in rural development, has led numerous foreign development actors, government staff and scholars to describe rural farming activities in terms of, for example, 'systems' or 'food economy zones' (to name but a few), in an attempt to reflect and simplify the complex interactions and interdependencies that exist between various household farm activities (trade, crops, pastures, livestock, horticulture, forestry, etc). Within this new paradigm, and in the best of cases, the farming activities prevailing in the "highlands" of the Amhara region have been categorised and regrouped under a generic "mixed farming" label, regardless of the existence of a range of diverse and highly variable interactions of livestock and crop production activities. Moreover, the general tendency has been to overemphasise the importance of crop production in the overall system to the extent that livestock activities have been almost systematically portrayed as secondary or subordinated to crop production activities. The proportional and relative scarcity of livestock and veterinary-oriented development projects in the Amhara Region is, in part, an indicator of this tendency. The use of the Amharic term (*arsoadär* literally: 'to rest having ploughed') as a generic term by the Ministry of Agriculture to designate rural beneficiaries is also a symptom of this bias.

In addition, to deal with the issue of altitude variation, artificial agro-ecological altitudinal belts were introduced (Table 2.1). While the altitude boundaries of these belts remains a subject of debate (Mesfin Wolde Maryam (1991) cites more than 10 different boundary definitions), the use of generic altitude labels (*däga, woyna-däga* and *kola* corresponding respectively to highland, midland and lowland) to simplify and categorise often complex and very variable agro-ecologies is now widespread. It has further contributed to blurring the description and understanding of equally complex productive rural activities and areas.

In the case of Wag Hamra, to describe the whole area and the existing farming or agrarian systems as 'mixed' is an oversimplification, and in some cases a misrepresentation of the reality on the ground. It is true that most farmers combine crop production with livestock production systems but certain key points and trends ought to be emphasised:

- First, the current predominance of crop production activities from the highlands down to the midlands is recent. Livestock activities were much more developed in the past when population densities where much lower and when pastures and grazing areas did not compete with cultivated areas, as is the case nowadays. It was not infrequent to find farmers owning cows, oxen and sheep by the dozens and hundreds respectively, to the extent that the recruitment of full time herders and shepherds was a necessity. According to much more recent studies, a farmer with two oxen and a cow is now considered wealthy (Sharp *et al* 2003).

- In contrast, the recently and relatively less populated lowland areas of Dehana and Ziqualla *Worädas* still have livelihood characteristics very similar to agro-pastoralism. The trend increases as one approaches the lowlands of Ziqualla. This predominance of livestock in the livelihoods of farmers is apparent in the size of the herds (large by current standards, up to 30 cows and several hundred goats for certain wealthy farmers). As one moves north towards Ziqualla (the communities of Ka Maryam, Dil Betigil, Telladje), herd sizes continue to increase (up to several hundred heads of cattle for wealthy people). Herders (and shepherds) are often employed on an annual and contractual basis and receive payments in cash or in kind. Ziqualla *Woräda* is widely known as a source of employment for young men and boys willing to endure certain levels of hardship to acquire the start-up capital for their own herds.

- The annual and temporary migration of otherwise sedentary farmers to look after herds is a second strong indicator of the existence of traces of pastoralism in the livelihoods of the lowland inhabitants. In the community of Tsamla (villages at the lowest altitude close to the Tekkezze river), as well as in the neighbouring communities of Ziqualla, boys and young men spend most of their time in the wilderness herding cattle between water points and grazing areas. They either come back to the villages once a week to collect food or someone from the villages brings it out to them. In a similar fashion, but as an intermediary system between this system and the more balanced mixed systems of the midlands and highlands, the majority of farmers living in the upper reaches of the Tsamla community pool their (smaller) cattle holdings during the more favourable grazing season and take turns to herd the animals a few days a month. During the 'lean' season, the cattle are brought back to the villages on a daily basis.

- In contrast with the regular herding of cattle and goats in shrub land and woodland areas that are within the immediate reach of the communities (maximum one to two days walk from the villages), episodes of drought and the ensuing shortage of suitable grazing areas in the immediate vicinity of the villages trigger a range of coping mechanisms in the lowlands. If the drought episode is moderate but sufficient to result in partial fodder shortages in the woodlands, community or village elders can decide to enforce temporary grazing restrictions on well delimited portions of the grazing areas. The basic idea is to restrict access to the best grazing areas until March or April, that is, a few months before the onset of the rainy season. This system ensures that animals still have suitable grazing during the livestock 'bridging' hungry period that precedes the rainy season (roughly April to June). These local arrangements have specific community by-laws and are not related to government activities (multi-annual enclosures). If the drought episode is severe and if fodder shortages are acute, lowland people may decide to send a fraction of their herds to distant, less affected grazing areas in the neighbouring Zone of Gonder (Belesa *Woräda* in particular) or in the neighbouring Tigray Region. Authorisations are sought both with local community elders and more recently with government administrative authorities. For security reasons, groups of men are formed to accompany the usually large aggregate herds. In previous times and to this day, the lowlands of Dehana (including the Tsamla community) were largely uninhabited and served as a potential buffer zone in times of drought and grazing shortage. Such livestock migratory mechanisms in times of moderate drought are largely unheard off in the midland and highland communities. Some highland farmers, fortunate to have family ties with people living in the lowlands, are sometimes known to send one or two animals from their small herds to their lowland relatives if they foresee fodder shortages.

- In addition, farmers in the lowlands display unusual levels of knowledge about livestock characteristics and illnesses to the point that no clear specialisation of ethnoveterinary knowledge is apparent among them. One is inclined to believe that they can all perform as traditional livestock healers or, alternatively, that there are no traditional livestock healers among them. Although no comprehensive survey was carried out in the midland and highland communities, the trend that emerged after the qualitative information gathering phase was that specialisation of ethnoveterinary knowledge was stronger in these altitude areas. Even more surprising is the attention and care that lowland people pay to their animals. Beating with sticks and stones are rare and strictly forbidden among children, as such treatments are known to be potentially harmful to animals that live and graze, sometimes acrobatically, on steep escarpments. Finally, it is striking to observe the presence, in a small area such as the lowlands of Dehana *Worӓda*, of three distinct races of goat (a hornless race apparently originating from Belesa *Worӓda* across the Tekkeze in neighbouring Gonder, the long horned acrobatic Tekezze goat, and finally the more typical and widely distributed midland goat).

The overall picture available today is therefore one of gradual increase in the significance of livestock activities as one moves from the highlands of Meskelo and Bella to the lowlands of Tsamla in Dehana, and ultimately to the dry lowlands of Ziqualla *Worӓda*. While no precise information could be obtained regarding past herding practises in the highlands areas when grazing areas were plentiful, it is obvious that livestock activities play or have played in the recent past a much more significant role in the livelihoods of farmers than what is hinted at by the description ‘mixed farming’.

Beyond the economic importance of livestock, it is important to stress its cultural significance. Without entering into great detail, the following facts are worth remembering.

The co-existence (and often physical co-habitation) of poultry, sheep, goats, equines, cattle and human beings is clearly an ancient one in highland Ethiopia. Specific compartments are allocated for cattle and equines inside the house. With the exception of the lowlands, where ferret attacks are frequent and where specific niches are specially built for them, chickens in Wag Hamra usually roost on the rafters of the house roof.

A wealth of ethnozoological, magical and religious beliefs and practises related to newborn calves and other livestock are still persistent. In some areas, young calves can still be seen wearing protective talismans or amulets against the evil eye or other "evil" influences. Young sheep and goats born with a uniform white coat are smeared with charcoal to deflect the evil eye. Oxen prepared for the threshing of crops are sprayed with a mixture of *fiet'o* (fenugreek) and *näč' šinkurt* (garlic) to repel any evil influence and to ensure that they peacefully turn in regular circles for hours without end. Sheep and chicken with specific coat colours are chosen for pre-Christian pagan ceremonies (*zar*, *qole*, etc). The holy water of Saint Cherkos and churches dedicated to this saint are widely known in Wag Hamra for having strong healing powers on sick livestock. Much could also be said about the art, in Wag Hamra as in other parts of the highlands of Ethiopia, of naming cattle and equines according to coat colour and patterns. And, to witness the amazing scenes of small Ethiopian toddlers relentlessly beating long-horned, huge, imperturbable bulls and lactating cows, or to observe how the same cattle are trained to recognise the voice and orders of their owner, is proof enough that Ethiopian farmers living in Wag Hamra and elsewhere in Ethiopia share a very old and long history with livestock.

Considering the Agaw origins of most of the inhabitants of the Amhara Region (Tamrat 1972, Ullendorf 1973, Trimingham 1952), the historical importance of livestock rearing should come as no real surprise. Several authors (Trimingham 1952, Ehret 1979) have made comments on the contrast between the essentially agricultural livelihoods and sedentary life style of the Semitic immigrants from the Arabian peninsula and the livestock domestication and herding specialisation of the local Hamite populations of Cushitic origin (mainly Agaw), that they encountered upon their arrival in the highlands of Ethiopia. Based on comparative linguistic analysis of several Cushitic languages, however, Ehret (1979) also reaches the conclusion that several Cushitic groups were already familiar with crop domestication, production and ploughing before the Semitic migrations occurred. Because of the scant information available on the various Agaw languages, however, his argument seems to concern more the other East African Cushitic groups than the northern Agaw groups.

Trimingham (1952:32-33) suggests that the subsequent cultural fusion process which gradually took place over the centuries between the Yemeni Semitic immigrants and their Cushitic pastoralist hosts was also felt in the day to day subsistence activities of the emerging Abyssinian people:

> Agriculturalist mountaineers never become nomad shepherds and the Yamanites crossed the plains and settled on the plateau....The Semitic migrations from Arabia, we have said, were not of nomad tribes but the immigration of peasants and agriculturalists who came as settlers and colonisers...they settled...in the regions most suitable for agriculture.

This cultural and subsistence fusion between Agaw and Amhara has only begun to occur in much more recent times in Wag Hamra (see paragraph 3.3 for more explanation). It is therefore logical to assume that the livestock and pastoralist-like strategies of the Agaw people would continue to play a predominant role nowadays in the livelihoods of farmers in Wag Hamra.

In practise, these theoretical considerations are largely confirmed by the relative scarcity and poverty of the soils in Dehana *Woräda* in the area under study. There is a clear decreasing quality gradient of the soils, in terms of depth, texture and fertility, as one moves downwards from the "Amharised" Meskelo area to the Agaw lowlands of the Tekkeze. Similarly, there is a decreasing quality gradient as one moves north towards the lowlands of Ziqualla *Woräda*. The lower and more erratic rainfall patterns recorded (source Zonal Ministry of Agriculture, Wag Hamra) as one moves towards the lowlands provide us with the final elements to understand the predominance of livestock herding activities at the expense of notoriously unreliable crop production activities. The jagged and rocky woodlands, shrub lands, woodlands and grasslands in the lowlands of the Tekkeze watershed have never been and will never be areas particularly suitable for crop production. It follows that livestock activities have always been the most reliable and predominant productive activity in this area, which for the purpose of this study, encompasses the lower reaches of the Tsamla community, the northern and lowland portion of Shimela and small stretches of the Yekatit Dewol community.

3.2 Livelihoods in crisis

There are numerous signs that the systems governing the livelihoods of people in the area under study are entering a serious crisis phase. Shortage of land for agriculture and grazing ranges from very acute in the highlands (Bella and Meskelo communities) and the midlands (Shimela and Yekatit Dewol communities) to moderate in the lowlands, where farming land is becoming scarce but where grazing areas in the Tekkeze area are more or less intact. As a logical consequence, mechanisms of fertility regeneration have collapsed (with the notable exception of the very highland area around the villages of Dink and Zoamba above 3000 m), the encroachment of agriculture onto very marginal areas has become very visible even over the short time span of two agricultural seasons and the remaining and already seriously degraded shrub land and woodland areas are reaching points of complete degradation. From 3000 m to 1800 m, degraded woodland patches are now only found on steep escarpments and river/stream gorges. Moderately degraded forests are still preserved in the very high lands of the Bella mountain (>3200 m) and in the extreme Tekezze lowlands (<1500 m). A recent study focusing on destitution has shown that it is increasing at an alarming rate in the Wag Hamra, North Wollo and South Wollo zones of the Amhara Region (Sharp *et al* 2003). Livestock and land holdings are in sharp decline.

Concurrently, population levels are on a sharp increase. This trend is largely confirmed on the ground where the number of villages in a given community has almost doubled in the last 30 years. To the visiting outsider, this trend is made explicit by the high number of villages/settlement simply named, *addis mändär* (or 'new village') and the number of new parishes established recently in the study area: five new parishes, including three in the last decade, out of a total of 15 parishes in the five communities being studied. Food aid has flowed regularly into Wag Hamra since the eighties. Its regular distribution has clearly contributed to establishing aid dependency in the farming communities of the area. Farmers have come to view the government as a 'father' figure that looks after their lives[3].

This attitude also applies to the provision of phyto-sanitary products, both for crops and livestock. If a pest infestation is reported and confirmed by the Ministry of Agriculture, pesticides are distributed and sprayed for free. In this respect, the Wag Hamra zone is a

[3] In feudal times, the Emperor assumed this role.

notable exception in the Amhara region, where pesticides are normally handed over to farmers on a credit basis[4]. Veterinary drugs and treatments are heavily subsidised. For example, the spraying of one goat with ecto-parasiticides will only cost the farmer 25 centimes. Veterinary clinics providing this type of treatment were opened in Kewzba and Arbit during the last decade. In short, government aid to farmers in its various forms is slowly becoming an institution in Wag Hamra, including in the area under study.

3.3 Agaw-Amhara: an ancient and turbulent relationship

It is a widely accepted fact that the highlands of northern Ethiopia were originally populated by Cushitic people of Hamitic origin better known as the Agaw people (Ullendorf 1973 Trimingham 1952, Tamrat 1972). For Ullendorf (1973:37), the Agaw people represent the "substrate population *par excellence*". The fusion process which characterised their encounter with Sabean immigrants of Semitic origin from the Arabian Peninsula began several centuries before Christ (Tamrat 1972:5). According to the same author, the highlands became "the spearhead of a long process of Semitisation in the Ethiopian region" (Ibid: 5). Although "nothing precise is known about the nature of the initial confrontation between the settlers and the indigenous people of northern Ethiopia" (Ibid: 6), it is believed that the initial interaction and fusion laid the foundations for the flourishing of the Axumite civilisation, the Semite immigrants gradually diffusing their political, linguistic and cultural systems (Tamrat 1972, Ullendorf 1973). After this initial period, the picture that begins to emerge is a very contrasted one. War on the one hand appears to be a regular feature of the non-semitized Agaw populations. Tamrat (1972:18; 28) remarks that Agaw populations to the south and south west of Axsum were in regular confrontation with the armies of King Ezana during the fourth century:

> The local resistance put up against the Aksumite attempts at expansion was strongly organised and suggests a fairly high degree of political evolution...In these documents the Agaw are presented as the objects of intensive wars of conquest led from the North against them, and it is apparent that by the middle of the fourth century...a decisive break-through had been achieved by the kingdom of Axum into the very heart of their country east of the river Tekkezze.

On the other hand, post war or post colonisation periods seemed relatively peaceful. Following the establishment of military colonies, non-violent acculturation and

[4] According to staff from the Ministry of Agriculture, this privilege on phyto-sanitary treatments is about to be abolished.

Semitisation processes took place. Agaw people began to learn Semitic languages and intermarriages became the norm (Tamrat 1972:37). The Amhara nucleus emerged as a result, after the southern outposts of the Axsumite Empire were cut off from their capital.

It appears that following this first phase of violent confrontation, the still un-subordinated and isolated areas of Wag and Lasta remained relatively immune to this widespread Semitisation process. Thus for Tamrat (1972:28; 53):

> The centre of Agaw resistance seems to have moved to the area south of the river Telleri, in Wag and Lasta...
>
> ...The Agaw people of the broken country of Wag and Lasta...It is apparent that, despite the early progress of the church among them, the compact and inaccessible nature of the area, which is almost totally enclosed by the rivers Tsellari and Tekkezze, had preserved the tribal and linguistic identity of the local people. This appears to have been the case even long after the spearhead of the Aksumite expansion had outflanked these people and almost encircled them with a semitised zone extending from southern Tigre through the highland district of Angot...

The first recorded traces of a strong Agaw-Amhara opposition appear with the fall, in the 13^{th} century, of the Agaw Zagwe dynasty, whose seat of power corresponded approximately to the current areas of Wag and Lasta. The handover of power from the last Zagwe King Ytbarak to the new Amhara Emperor Yekuno-Amlak is portrayed in traditional Ethiopian hagiographies (Kebra Nagast in particular) as the peaceful restoration of the Solomonid dynasty[5]. Listening to the wise suggestions of Saint Tekle Haymanot, King Ytbarak is pictured as having agreed to step down from power, in return for which the King of Wag was granted the permanent title of Wagshum. Close scrutiny and careful examination by several historians (Conti-Rossini 1928, Tamrat 1972, Ullendorff 1973, Pankhurst 1984) of this pivotal period in Ethiopian history have revealed that:

- The central role of negotiator between King Ytbarak and Yekuno-Amlak ascribed to Saint Tekle Haymanot is an artificial reconstruction, with strong political connotations internal to the Orthodox clergy.

[5] The Kebra Nagast (Glory of Kings), an Ethiopian hagiography written in the 13th century, describes how Menelik the First, son of King Salomon and Queen of Sheba, returned to Ethiopia with a group of Israelite noblemen and priests, becoming thus the founder of the Solomonid dynasty in Ethiopia (see Brooks 1996).

- The Zagwe rulers faced strong Amhara and Tigre opposition in the second half of the 13th century and that Yekuno-Amlak attacked the Wag and Lasta area, defeated the Zagwes and killed King Ytbarak.

This politico-historical imbroglio is further obscured by the religious history of both groups. Christianity officially takes root in Ethiopia at the Axum court during the fourth century A.D (Ullendorf 1973, Tamrat 1972). Less favoured versions claim that the eunuch baptized by Saint Phillip (Acts of the Apostles 8 verse 38) brought back the new religion to his country in the first century A.D. In any case, by the sixth century, evangelisation is taking place in the highlands of Ethiopia and it is during this period that the Agaw areas of Wag and Lasta, although still politically independent and probably engaged in a semi-permanent state of warfare with Axsumite forces, are christianised (Tamrat 1972). From this time onwards and to this day, the Wag and Lasta areas will often be singled out as champions of the Orthodox faith in Ethiopia (Tamrat 1972, Pankhurst 1984, Mercier 1988, Cassiers and Bessette 2002). Excluding the religious fervour which culminated in the construction of numerous and amazing rock-hewn churches found both in Wag and Lasta (Lalibela), it is important to note that these areas became the rallying point for all defenders of the Orthodox Christian faith rebelling against the proselytising efforts of the Portuguese Jesuits during the 17th century (Pankhurst 1984). Inhabitants of Wag familiar with their history pride themselves on the fact that it was a *Wagshum*[6] who finally succeeded in killing Gragn, the mighty *jihad* leader of the 17th century who was on the brink of destroying completely the Christian heritage of Abyssinia (Mekonnen 1996). Referring to the same period and the forced conversions of farmers from Christianity to Islam that occurred throughout the highlands as the armies of Gragn progressed, there is a famous saying in Wag: *YäMuslim Agaw yällam,* literally: "There are no Agaw Muslims"). To this day, Wag Hamra is portrayed as a very devout Orthodox Christian area (Cassiers and Bessette 2002:340-341). Several farmers interviewed draw an invisible line, roughly from Meskele Christos, to Bella and Meskelo Christos, between the "real" Christian Wag and the "lesser" Christian Wag towards Lalibela, where *däbtära* and *t'ankway* (sorcerers) of the worst kind are said to abound. It is interesting to note that the *däbtära* interviewed by Mercier (1988:262-268) was thoroughly interrogated by the *Wagshum* at the beginning

[6] literally "the one appointed for Wag". Hereditary feudal title granted to the Agaw king by the newly appointed Amhara emperor following the overthrow of the Zagwe dynasty and the restauration of the Solomonid dynasty.

of the 20th century to ascertain his degree of acquaintance with occult and demonic practices.

In addition, one must consider the Hebraic factor in the history of the highlands of Ethiopia. Regardless of the numerous theories brought forward by scholars concerning the question of the existence of pre-Talmudic Jewish practices and beliefs in Ethiopia[7], the fact remains that the first recipients of this Hebraic influence were (once again) the Agaw populations of northern Ethiopia (Trimingham 1952, Ullendorf 1968, Tamrat 1972, Pankhurst 1992). Whether elements of the Jewish faith diffused to the whole of the Agaw groups is unclear. Some authors speak of a mix of pagan and Jewish influences among the Agaw people (Trimingham 1952: 19-20).

Owing to the scarcity of written documents from this period, in what constitutes a notable black hole in Ethiopian history (see 'the eclipse of Ethiopia' Ullendorf 1973: 55), the fall of the Axum Empire that occurs between the eighth and 11th century is shrouded in mystery. Conti-Rossini has suggested that the mysterious but decidedly anti-Christian queen of the Bani al-Hamwiah reported in the History of the Patriarchs (Conti-Rossini in Tamrat 1972: 38) was of Damoti (Sidama) origin and rose from the south of Ethiopia. Other theories suggest that there was more than one queen, one or more of whom may have been of Falasha (Jewish) and Agaw origin. The oral traditions, that persist in the Amhara and Tigre regions today (heard on many occasions by me and confirmed by Cassiers and Bessette 2002), credit a certain Jewish Agaw Queen called Yodith with the repeated sacking and plundering of the Axsumite Empire. Despite the vagueness surrounding her origins, several authors suggest that she would have had little difficulty in enrolling rebellious Agaw tribes in her campaigns (Ullendorf 1973, Trimingham 1952). This would seem to exclude Wag and Lasta Agaw tribes who might have been rebellious, but who were probably not anti-Christian to the extent of destroying churches.

After the fall of the Zagwe dynasty, the Agaw people of Wag and Lasta share the common feature with the Falashas people of being more or less in a continual state of warfare with the ruling Amhara emperors, the former in the isolated and inaccessible jagged mountains of Wag and Lasta, the latter in their high altitude fortress of the Semen mountains.

[7] See Pankhurst (1992) for a useful summary of the various theories concerning the origin of the Hebraic dimension in Ethiopia and Ullendorf (1968) for a very detailed presentation of these beliefs and practices.

Historical details of the numerous rebellions and resistance wars led by the Wag and Lasta people until the 18th century have been assembled by Pankhurst (1984). On one occasion, highlighted above, the religious and political interests of the Wag people merged with those of the Amhara Orthodox rebels engaged during the first decades of the 17th century in a civil war against the Amhara armies of King Susneyos, recently converted to Catholicism by Portuguese Jesuits and intent on, or under pressure to convert all his subjects to Catholicism.

During the 18th century, the Falashas were finally defeated and their populations dispersed. This period also coincided with the end of the resistance to integration of several population isolates of Agaw people in the Amhara Region, the areas of Wag and Lasta being the last to pay allegiance to the Amhara emperors (Gamst 1969, Pankhurst 1984). To explain the relatively smoother and faster integration of other Agaw groups such as the Awi and Qemant into the Amhara Empire, several authors have emphasised the geography and inaccessibility of the Wag, and to a lesser extent Lasta, areas (Gamst 1969, Pankhurst 1984, Tamrat 1988).

From the 18th century onwards, the history of Agaw-Amhara relationships appears to be one of peaceful integration into the Abyssinian Empire at all levels (Pankhurst 1984). Agaw soldiers gradually assume an increasing number of positions within the armies of the successive emperors due to their superior fighting skills[8] (Bruce 1790 in Pankhurst 1984). In rural areas of Wag, and to this day, slow acculturation occurred as intermarriage and the rhythm of migrations from the high or midlands to the lowlands increased. With respect to the overall history of acculturation or Semitisation of the highlands, Gamst (1969:15) makes the distinction between a cultural fusion phase and a cultural assimilation phase, the latter being likened to an 'Amharisation' of the Agaw people:

> As the Middle Ages progressed, the Amhara proper became a large majority of the population. The earlier process of fusion had been possible because of the large size of the Agaw population, but the influence of the Agaw waned as their number dwindled. Acculturation gradually changed from fusion of Amhara and Agaw to assimilation of the Agaw by the Amhara. This assimilative acculturation will be

[8] During the guerilla fighting against the Derg, the Agaw populations of Wag Hamra directly and indirectly played a central role in the defeat of the government forces. Many Agaw soldiers joined the ranks of the guerrillas. Using the inhospitable areas of Wag Hamra to their advantage as a natural fortress, the Agaw populations provided protection and shelter for the TPLF forces in times of crisis.

called 'Amharisation', a process of change that emerged by the end of the fifteenth century.

In several of the communities studied (Bella, Shimela, Yekatit Dewol and Tsamla), men who describe themselves proudly as Amhara have a strong tendency to chose Agaw brides. The opposite seems to occur much less frequently. When the bride is brought into an increasingly Amharic speaking environment, the likelihood that she will teach her children Agawigna, or that her children will learn Agawigna by being immersed in an Agawigna speaking environment, gradually decreases. Most men and some women who define themselves as Agaw are bilingual (either Tigrigna-Agawigna in the north of Wag or Amharic-Agawigna in the area under study). The fact that they speak another language is not a tangible sign of Amhara or Tigray assimilation. Most Agaw men resort traditionally to long distance migrations to the west and east of Wag in predominantly Amhara or Tigray areas in search of seasonal labour or during livestock herding activities and learn an additional language by necessity. When back in their villages, Agawigna is the main language used.

In addition, the administrative boundary reshuffling initiated by the current Ethiopian government during the last decade which culminated in a new demarcation of the borders of Dehana, Ziqualla and Sekota *Worädas* has probably also indirectly contributed to the increasing rate of 'Amharisation' in certain areas of Wag, including the one under study. In particular, portions of the communities of Shimela and Yekatit Dewol were previously part of a wider administrative area, that included most of the current Ziqualla *Woräda* and that was largely perceived as an Agaw area. One of the factors governing the reshuffling was ethnic coherence. It was subsequently decided to regroup all Amhara dominant areas on one side and all Agaw dominant areas on the other. Intermediate or mixed areas were attached to the former (including the communities of Shimela and Yekatit Dewol). After more than 10 years of slow assimilation through intermarriage, of being partially cut off from the Agaw speaking Ziqualla (at least for administrative purposes) and of having to systematically adopt Amharic as a medium of communication in both official and non-official circumstances (since Amhara or already 'Amharised' farmers from neighbouring villages no longer speak Agawigna), the Agawigna language is dying in Yekatit Dewol and in the lower reaches of Shimela (villages of Tsatsu Selassie, Gulamadjer (Gudia Yesus), Nichiro Kidane Mehret, Behabena Michael, Derimsig Abbo). Villages in both communities are undoubtedly becoming Amharised at a faster rate than if they had remained part of Ziqualla. As a result, it is now more accurate to speak of small residual and disappearing pockets of Agaw populations amidst Amhara people. Tadesse Tamrat (1988:10) probably would not recognise the Dehana *Woräda* he was describing more than 10 years ago:

> Yet, even in the region to the east of the Tekkezze River, there seem to have been significant corners, such as Bora, Seloa, Aberghele and parts of Wag and Lasta, which resisted the process of cultural assimilation for a long time. It is reported that there are still today some pockets in Sekota and Dahna *Worädas* speaking Agaw.

In Tsamla, the Amharisation of the lower reaches of the community is almost complete. A few flat-toped Agaw houses remain but the Agawigna language is hardly spoken any more. Overall, the geographical orientation of this assimilation process has been a northwestern push towards the lower altitudes of Ziqualla *Woräda*.

And yet this peaceful acculturation or assimilation process sometimes does not appear all that straightforward. Living in Wag Hamra for a prolonged period of time makes one accustomed to detecting undercurrents of tension, or difference at the best, between Amhara (or Amharised) people and their Agaw neighbours. Everywhere in Wag, but particularly in towns, ambiguous references to Agaw people abound. People considering themselves as Amhara regularly describe the Agawigna language of their neighbours as one that can only be spoken by birds (*yäwof qwanqwa*: literally 'the bird language'). The comparison is more than ambiguous in Amharic since birds can sing but are also animals. Others, half joking, will describe Agawigna as being the language of the Devil. In an overwhelmingly rural Christian environment, this type of deliberate and direct judgement expressed publicly, in what is otherwise a very conservative and polite society, would tend to underline some lack of harmony, or to say the least some kind of cultural divide. In fact, the most common and accepted description of Agaw people by Amhara people is the reference to their "nine hearts". The latter often use this expression to highlight the impossibility of fully trusting an Agaw person since no one usually knows with which heart that person is interacting. To make matters worse, Agaw people live essentially in the lowland areas of Wag, which makes them even less worthy of trust from "highland" Amharas (see paragraph 3.4 on cultural perceptions of altitude).

And yet most Amhara men, if given a choice of marrying an Amhara or an Agaw woman, would, without hesitation, choose the Agaw woman.

To measure the significance of the current presence of Agaw people still speaking their language in several parts of Wag Hamra, it is perhaps fitting to conclude this section with Tamrat's (1988:6) sobering thoughts:

> Among the many peoples of Ethiopia...the Agaw stand out as some of the ancient inhabitants of the region. Their tenacity is such that, despite what must have been the most intensive onslaughts on their institutions and culture by the central state and neighbouring communities for over twenty four centuries, they have managed to retain at least their linguistic identity in some isolated-even if dwindling- islands dispersed unevenly from Keren in the region of Eritrea to Agawmedir in Gojjam.

3.4 - Cultural perceptions of altitude

As mentioned earlier, most outsiders categorise Ethiopian mountains into neat homogeneous belts (see Table 2.1 and Mesfin Wolde-Maryam (1991) for a compilation of the various altitude categorisation models proposed in the last 30 years) and apply linear patterns of thought to apprehend the concept of altitude as well as its variability. The choice of large altitude scales (bands of 500 m for example) reinforces this trend. Any newcomer to Ethiopia is given to believe that the mountains of Ethiopia follow a simple and straightforward *däga-woyna däga-kolla* gradient. The constant use of these local Amharic terms commonly used by Ethiopian people[9] (Ullendorf 1973) suggests that they are accurate, reliable and applicable everywhere in Ethiopia. The reality in the northern highlands of Ethiopia is unfortunately not as straightforward. In particular, this simple type of categorisation seems inadequate to portray the erratic nature and high degree of ruggedness of the Wag mountains and the predominance of cliffs, gorges and canyons, concentrated over very short distances and at all altitudes. In short, it fails to highlight the extreme variability of the landscape and the amplitude of the altitude variations in this part

[9] Ullendorf's sources on the subject of altitude are unclear. In particular, it is unknown whether he obtained them from urban educated people or from farmers themselves. The urban/rural distinction is particularly important in Ethiopia as it more or less coincides with class distinctions and value beliefs that were prevalent in the former feudal system until the fall of the Emperor Haile Selassie in 1974. To this day, (*gäbare* literally: "with his ox" or "peasant" or "farmer") is an insult used by descendants of the former nobility to stigmatise a lack of subtlety, education and sophistication. Educated Ethiopian people, often of urban origin and descent, have a strong tendency to look down upon their fellow countrymen farmers as uneducated and backward. Hence, the need to treat "urban" information with care as urban people are likely to have their own specific views on rural matters and as Ethiopia is one of the most rural countries in the world with urban populations not exceeding a fourth or a fifth of the total population.

of Ethiopia. In line with the initiative taken by other Ethiopian scholars (see Wolde-Maryam 1991 in particular), the choice of an altitude scale of no more than a hundred meters would appear much more useful to apprehend this high degree of variability.

These considerations are etic in nature and only serve to apprehend the Cartesian character of altitude. The more subtle realms of relative altitude, or how people living at different altitudes view themselves and their neighbours combined with the ways in which the people of Wag Hamra put a cultural value on different altitude levels, make the emic study of altitude an important complement to the Cartesian approach.

Historically and to this day, Amhara people consider that the highest altitudes represent their rightful dwelling place. When the first Semites migrated from Yemen to Ethiopia in the first millennium B.C., it is in the highland areas that they began their process of fusion with local inhabitants and first settled (Trimingham 1952, Tamrat 1972, Ullendorf 1973). Since then, this perception has had ample time to mature and to become specific. The high ground of course appeals to the Amhara warrior, who uses it to his advantage to protect himself from invaders or to imprison the unofficial heirs to the throne (Pakenham 1999). To the Amhara farmer, the abundant rainfall and the fertile soil are a benediction that ensures generous yields and continuous pasture for very large herds: see the descriptions of Lobo (1985) and Alvares (Beckingham and Huntingford 1958). The cool crisp air of the high altitude areas guarantees an environment almost devoid of most serious diseases and illnesses (Pankhurst 1966b, 1990a). By and large, insect pests attacking crops, livestock and human beings are few (see Chapter 4). With the exception of migratory crop pests (locusts and army worms) and the notorious highland flea, they do not represent a regular threat to human activities.

But it is probably in its religious dimension that the "high" land finds its most potent representation. To understand the process by which it occurred one must consider simultaneously:

- The geographical uniqueness of the Ethiopian highlands in this part of Eastern Africa and their likeness to a natural fortress, particularly on the eastern side (sometimes called the Eastern escarpment).

- The geographical scope of the Semitisation process which began more than two thousand years ago (from the onset it occurred mainly in the highlands and rarely in the lowlands)

- The concurrent predominance of crop production activities in the livelihoods of the Semitic immigrants and the above mentioned conditions that make agriculture more suitable and relatively life less difficult in highland areas

- The political and military consolidation of the Amhara empire between the 14th and 16th centuries through a series of wars and conquests in the eastern lowlands (Tamrat 1972), which also made the highlands more secure.

- The expansion of Christianity and the strong symbiosis of church and state in this process (Tamrat 1972)

- The evolution and maturation of Orthodox Christianity into a unique branch of Christianity (Ullendorf 1968, 1973)

- The global history and geography of the Christian/Muslim armed confrontations in Ethiopia

Over time and as a result of combinations of these various factors, high altitude has become closely associated with Ethiopian Orthodox Christianity and a strong sense of ethnic domination, whether Amhara or Tigrayan. As a logical consequence, high altitude has become synonymous with Amhara and Christianity. Thus for Cassiers and Bessette (2002:189) :

> Pour mieux asseoir leur pouvoir, les amharas se prévalurent d'être les champions du christianisme et le terme « amhara » fut constamment employé dans le sens de « chrétien »...l'étiquette amhara désignait autant le pouvoir et la richesse que l'appartenance ethnique ou religieuse[10].

[10] Translation: "To strengthen their hold on power, the Amhara people professed themselves to be the champions of Christianity and "Amhara" became synonymous with "Christian"..."Amhara" was as much a symbol of power and wealth as one of ethnicity and religion."

With such antecedents and the belief that the high ground is also a moral one, it is little wonder that Ethiopians have a tendency to elitism and present themselves as God's chosen children (Ullendorf 1973) living in the equivalent of the Garden of Eden.

In the worldview of the Amhara people, all of the above exists, and is of course reinforced by the existence of everything that threatens it or runs contrary to it. At the other end of the Amhara spectrum of values we therefore find the lowest altitude areas and all the negative connotations associated with it. Foremost, lowland areas are reputed as dangerous, as they are believed to harbour diseases (malaria, typhus, etc), pests (locusts, army worms), devils and robbers (*šifta*) of the worst kind. By extension, everything that is non-Amhara and non-Christian is said to proliferate in these so-called "ungodly" areas: essentially pagan idolaters and Muslims. Highlanders remember that it is from the eastern lowlands that the *jihad* led by Ibn Gragn in the 16th century almost succeeded in erasing the Christian culture of the Abyssinian highlands and that it is from the western lowlands that the Soudanese Madhists attempted to invade the highlands in the 19th century. It becomes quite clear that the Christian descendants of the former Abyssinians have inherited their sense of feeling both isolated and secure in their natural highland fortress encircled by lowland opponents on all sides. To the present day, very devout Christian people genuflect or give alms before entering and upon exiting the "dreaded" lowlands on the road between Addis Abeba and Dese.

In the context of Wag Hamra and of the area under study, this altitudinal "ostracism" has developed in an almost endemic manner. It is weighted by the association of the lowlands with the Agaw ethnic factor and their very "un-Amhara" language. In modern Dehana, farmers from Bella and Meskelo look down scornfully upon farmers from Tsamla on the borders of the Tekkeze, describing them as second-rate Christians, in part because of their alleged higher degree of familiarity with pre-Christian ceremonies (spirit possession and *zar* celebrations). Lowland farmers are themselves very distrustful of highland inhabitants, whom they describe as aloof, secretive, manipulative and not to be relied on, even for the simple task of indicating directions.

This modern jesting and form of competition / segregation between various stereotypical "terroirs" does not withstand serious scrutiny. Inhabitants from both areas are aware of the complementarity that exists between different agro-ecologies and altitudes. Until recently, highland Dehana was one of the breadbaskets of Wag Hamra and a significant source of seasonal agricultural labour (weeding, harvesting, and threshing) for neighbouring areas and lowland farmers. Literally, *dähana* means "Poor people, come!" Similarly, and as mentioned previously, the lowlands have always been regarded as reservoirs of livestock, also providing seasonal opportunities to young midland and highland farmers for the restocking of small and large ruminants (cattle and goats). On a practical level, and given the erratic nature of altitude variation in every community, many farmers are likely to farm fields in both highland and mid or lowland areas. One of the old coping strategies resorted to by highland farmers in times of scarcity was the temporary migration to the western or eastern lowlands in search of seasonal agricultural labour (weeding, harvesting, threshing, etc).

Moreover, everyone in Wag Hamra knows that accelerated "Amharisation" is taking place nowadays because of increased rates of intermarriage between highland/midland men and lowland women usually of Agaw origin. Every priest is familiar with the frankincense (Boswellia spp.; mainly Boswellia papyfera) of the Bible, whose fumigation is central to the religious services of the Ethiopian Orthodox Church, and knows that it is a typical product of the "heathen" lowlands. Alternatively, lowland farmers wishing to acquire robust and powerful mules head straight for the highlands to seek mule contracts.

Considering how farmers are attached to their parish, their village and their place of birth, altitude difference appears as one way among many others to differentiate themselves from their neighbours. If altitude is a favourite subject of differentiation, age, colour of skin, quality of paths available in a community and even the age and nature of a parish can also be used to re-affirm local identity.

The many ways in which farmers segregate each other indirectly answers the question of how people, living in between the two defining poles of the extreme low and highland areas, categorise their neighbours and define themselves. Farmers that one would consider as living in the midlands define their relative altitude position and status by simply making references to both higher and lower altitude, but at a local level. Expressed in another way, every farmer in the so-called midlands is the lowlander and the highlander of somebody else. Regardless of Cartesian altitude and of the amplitude of altitude variations, any farmer will describe villages located above him as *däga* and villages located below him as *kolla*, in what forms a relative orientational system.

Therefore, the first point to observe is that, rather than defining their position altitude-wise as intermediate or *woyna-däga,* as many scholars and outsiders have assumed, midland farmers use *däga* and *kolla* as relative markers of altitude. Because of the density of villages in the area under study and of their distribution at all altitudes, if a farmer describes an area as belonging to *kolla* or *däga*, it becomes absolutely impossible to guess the altitude range he is referring to. In 18 months, I only heard once a farmer defining himself as living in a *woyna-däga* area. This phenomenon has already been noted by Levine (1965:74) in the Amhara area of Menz and shows clearly that the sense of place of the Wag farmer cuts right through the artificial administrative zonation superimposed on the environment. In the Farmers Association of Shimela Maryam, farmers living in the parish of Suluta Tekle Haymanot declare openly they don't really consider themselves as members of this community. They see themselves as *däga* farmers forced to cohabit with the rest of the community that they describe as a homogeneous and indiscriminate *kolla* area. The rest of the Shimela community in return retaliates by considering this part of the Farmers Association to be only inhabited by monkeys (*Sulut'a, yätot'a agär näw*).

The jesting and competition that occurs within parish boundaries between villages that are close geographically (sometimes, a few hundred meters only) suggests the existence of a sense of place beyond the parish level, almost a micro-local sense of belonging.

A second point to note is that Cartesian altitude seems to have a limited influence on how farmers define their own position, i.e. on whether they see themselves more as lowlanders or highlanders. There is a clear tendency for most farmers to describe their own position as highlanders. One would assume that farmers living in the vicinity of altitude extremes would tend to associate themselves with that altitude area, but it was found on several occasions that some farmers in the lowland communities of Yekatit Dewol and Tsamla will define themselves as *däga*, i.e. living higher than the others in the same community and with a clear sense of superiority even if, altitude-wise, they are the village before the last on the whole altitude ladder. However, the same is not true in the highest altitude areas. A farmer living at 2700 m will not define himself as *kolla* because another village still lies ahead of him at 3000 m. Because of this inequality in perceptions at both extremes, it is very likely that the sense of belonging to a *däga* area is statistically more pronounced than the sense of belonging to a *kolla* area. It is further suggested that this relative predominance of the *däga* or highland sense of belonging is somehow tied to past and current "Amharisation" processes and to the emergence of a double superiority complex of altitude and Amhara ethnicity in the area under study.

Altitude-wise, the orientation of a farmer's sense of belonging is critical, as it seems to determine also the orientation of his life aspirations, activities, social relationships and ultimately knowledge. For instance, a farmer perceiving himself as living in a *däga* area will obliterate most references to communities, places, paths, roads, land marks, rivers, animals and vegetation, which do not lie above him. This does not imply that a *däga* farmer will not travel to lower areas and acquire new knowledge of that environment. Simply, when interacting with others, he will adapt his attitude and knowledge to reflect his perception of belonging to an altitude group. In extreme cases, farmers travelling to lower areas with that type of exclusive attitude will refuse to absorb any information pertaining to the area. Similar patterns of thought and attitude were observed with farmers identifying themselves as *kolla* people.

This relative sense of altitude and of one's position in society sometimes gives rise to bizarre situations. In the community of Shimela Maryam, a group of people living on a very small and abrupt plateau of approximately two or three hectares at the altitude of 2300 m are isolated in the midst of lower and smoother hills. Over time, the inhabitants of this small plateau have developed a form of very high altitude aloofness, which contrasts heavily with the much more relaxed attitude of their immediate neighbours, who only live 500 m away, and 50 or a 100 m lower.

3.5 - People on the move

Amhara men are always keen to walk (Levine 1965) and in this respect Wag Hamra farmers are no exception. Any reason is good enough to leave the household and start a short trek: a visit to a sick relative, a visit to a distant field during a holiday to check on the state of the crop, a trip to the church, hearings of the local community court, or a government meeting in the neighbouring town or community. Except during the peak agricultural periods of the rainy season (ploughing, weeding, harvesting and threshing), farmers travel at least once a week to visit the nearby market(s). Farmers in Bella and

Meskelo can travel up to three times a week to visit markets in Sekota, Chilameda and Kewzba. Farmers in Shimela and Yekatit Dewol will travel to the Kewzba and Telladje markets while lowland farmers in Tsamla have a more limited choice and travel occasionally to Amdework or Arbit if the market day is a holiday.

Women have a much more restricted travel pattern since they only walk to markets once a month (usually if the market day coincides with a major holiday). Their presence in the fields is seasonal (peak activities such as weeding and harvesting) and their only regular travels are between their household, the stream or river where they collect water and the local church. They spend the vast majority of their time confined in the vicinity of their houses, performing domestic chores. In fact, it is during childhood up to the time of puberty that girls are most free to roam around with other children, either during games or during the herding of the livestock if there are no boys in the household to perform this duty. As young women approach the time of their wedding, their movements are much more controlled and restricted (Gamst 1969, Levine 1965). For many women, the biggest travel experience occurs during or immediately after the wedding ceremony when the young bride follows her husband to their newly build household, usually located in the vicinity of his father's homestead. When the bride is from the same village or community, the adjustment is less demanding. If, however, the bride has come a long way from a distant community, the adaptation process is likely to take time as the young woman is left alone in a new environment and context which are partly foreign to her.

Historically, the seasonal migration to distant areas of the Amhara region (Raya lowlands in the East and far western lowlands) was a means for young men to accumulate capital or to compensate for a poor season and harvest by working as seasonal labourers on semi-commercial farms during the peak times of the agricultural cycle (weeding, harvesting and threshing). Although no comprehensive study on the subject has been carried out, it appears that this form of coping strategy for Wag Hamra farmers has lost some of its appeal in recent decades. No statistics are available, but residents in the area under study are adamant that young people are less brave than in the past and that fewer take the risk of undertaking short term seasonal migration to the Western lowlands than previously. Some elderly farmers believe that the regular distribution of food aid in one form or another is likely to have created a strong disincentive for young men. If faced with the alternative of a stable food aid "income" through the government or NGO programmes and long unpleasant treks to the malaria infested lowlands of western Amhara without any guarantees of finding a decently paid job, most men would chose to remain in their communities, close to their families. This trend was evident in 2003 when the government launched a major program to resettle farmers in virgin areas of Western Amhara. One of the factors that clearly emerged to explain the low turnout and registration on the scheme was the simultaneous kick-off of a large road construction project in neighbouring Ziqualla *Woräda*, providing seasonal employment to thousands of men at the very advantageous rate of *birr*[11] eight / day, compared with the normal rate of five birr / day in most parts of Wag Hamra.

Finally, there is another form of migration for men which concerns those students willing to endure years of begging for food and hardship to become *däbtära*s by gaining proficiency in the arts of poetry (*qïne*), liturgical dancing and religious studies (*zema*), or to acquire the secret esoteric and ethnobotanical knowledge of the magico-religious healers and diviners (*t'ankway*). Whether they wish to acquire esoterical or clerical knowledge, these young boys often have to travel to distant provinces to find respected schools, masters and teachers. Because of the more than ambiguous reputation of the *däbtära*s and *t'ankway*s among the Christian population and also because fathers often have different plans for their sons, young boys are forced to run away from their families (Mercier 1988, Young 1970). At some point during this formative period, the young *däbtära* student will either chose to pursue his education by travelling to other masters and centres of knowledge or decide to settle and resume a sedentary life either as a farmer / *däbtära* or as a full time *däbtära* if he settles in a city.

[11] Ethiopian currency: £ 1 = birr 16.

CHAPTER 4

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ETHNOENTOMOLOGICAL KNOWLEDGE AND BELIEFS

4.1-The general concept of pest

In the Amharic language, one of the commonly accepted meanings of ተባይ (*täbay*) is 'vermin' or 'insect' (Leslau 1976: 104) or 'any animal which eats grain' (Kane 1990: 978). When asked how they would define the same word or concept, farmers in the study area take a much broader view. For most of them, *täbay* refers unequivocally to any living creature that attacks, damages or harms their crops (whether it be when planting, harvesting or storing), or which harms their livestock herds or belongings (cattle, sheep, goat, bees, chicken). It is this harmful influence on the key productive activities of the Wag farmer that distinguishes the *täbay* from other living animals. If pressed further, some will also mention that a *täbay* is also something that can bother and harm human beings directly. Pressed even further, by asking directly whether there are no *täbay* in the household or *täbay* on human beings, most informants agreed that there are many and that all the small troublesome creatures known to us as vermin also belonged to the *täbay* group. But intuitively, this broadening of the field of *täbay* is always done on a secondary level compared to the initial definition.

For farmers, *täbay* is part of the broader group of all moving, living creatures called **ነፍሳት** (*näfsat*) that includes broadly speaking three categories: wild animals (**አራዊት**: *arawit*), domesticated animals (**እንስሳት**: *ensasat*) and human beings (**ሰው**: *säw*). *Täbay* is included in the category of wild animals. This local definition contrasts with the Leslau dictionary where *näfsat* refers precisely to insects. Farmers in Wag do not have a specific term to describe insects. The closest term they use is **ቢምቢ** (*bimbi*). However, it is only used to describe some small, common and usually flying insects (some flies, midges, some beetles). The difference between the dictionary and farmers' reality in Wag does not come as a surprise though, considering the extreme variability and micro-embeddedness of the Amharic language in the northern highlands and in Ethiopia in general. It seems that the

Amharic definition used by Leslau is based on a more urban and modern worldview. A comparison with other older dictionaries would probably highlight some of this variability.

In any case, *näfsat* is a term used in the area under study to identify any moving creature in the air, in water and on/under the ground. For the average farmer, it is understood as the sum of all moving creatures created by God. A second important point to note is that a creature categorised as *näfsat* must be visible to the human eye. A physical and invisible living creature is an aberration to the Wag farmer. The tangibility of a *näfsat* becomes apparent to him when he sees it reproducing itself. If a living organism fails to give birth or to lay eggs, then it is a sign that it does not exist. As such, the concept of **ረቂቅ ነፍሳት** (*reqiq näfsat*) or 'tiny insect', i.e. microbe, presented in the Leslau dictionary (Leslau 1976: 408) does not exist in his worldview. If a creature or an entity is invisible, then it is of the domain of the supernatural (God, angels, spirits, *zar*, etc). It is therefore reasonable to assume that such emic conceptions of *täbay* and *näfsat* are closely linked with the existence of at least one notable emic-etic divide in the definition of insect pests.

4.2 - Etic-emic contrasts and ambiguous pests

To modern veterinary science, **የፍየል እከክ** (*yäfiäl ïkäk*) is a skin condition affecting goats and to a lesser extent sheep. Caused by the attack of microscopic and invisible mites (Psoroptes spp.), it is responsible for what is otherwise known as goat scabies or mange mites. To the Wag farmer, however, *yäfiäl ïkäk* is a much feared livestock wound disease because of its capacity to cover large parts of the animal and to spread rapidly through a herd. It is often referred to by farmers as 'a wound that spreads'. Until the recent availability of veterinary chemicals, death was the most likely outcome of this 'disease'. The farmer lost both the animal and its hide. In the past and in the absence of herbal remedies with proven efficacy, most farmers were left with no other options but to impose a form of quarantine on their herds by travelling to distant uninhabited lowland areas. They hoped that the animals would recover by grazing certain lowland shrub and grass species, known to grow only on certain rocky soils of volcanic origin. Alternatively, some farmers would chose to resort to religious remedies, thereby confirming the identification of the skin condition as a disease and its possible spiritual aetiology (*yäfiäl ïkäk* as a disease caused by a demon). It was apparently not infrequent in the past to witness farmers dragging their infected animals several times (usually three) anti-clockwise around a church dedicated to a specific saint. Saint Cherkos, in particular, is widely venerated for his capacity to heal most livestock afflictions.

Similarly, farmers consider that የሰው እከክ (*yäsäw ïkäk*) is a disease. Its aetiology is more complex than its equivalent for livestock as farmers believe that it can be caused by simple spreading of the 'disease', by touching water that has been contaminated by a demon (ልክፍት (*lïkïfït*) phenomenon; see Young 1970: 7) and by being the target of a malevolent spell cast by a *däbtära*.

When the disease is not cured by traditional herbal remedies (see Chapter 5 for details), it is a sign that its origin is mainly spiritual and that the services of the church or of a *däbtära* are required. This question of aetiology is only resolved through trial and error (Young 1970). Young also argues that *lïkïfït* contaminations and the resulting *ïkäk* are non-purposive, in contrast with spells cast by a *däbtära* and that implicitly, the degree of purposiveness identified in the disease will determine the type of treatment required (herbal versus religious or magico-religious). In etic terms, *yäsäw ïkäk* is in most cases a form of scabies caused again by microscopic mites. Mercier (1979c: 123) defines it as a generic term regrouping a heterogeneous range of skin conditions, including onchocercosis, scabies, prurigo and eczema. Due to the scarcity of cases encountered and the absence of laboratory analysis, this information could not be confirmed in the area under study. While it is not unrealistic to assume that *yäsäw ïkäk* may designate several identical-looking skin conditions in Wag, most farmers interviewed were sufficiently familiar with the symptoms of scabies on goats (wrinkling and lumping of the skin) to recognise them on the skin of human beings.

The condition affecting horses, mules and donkeys and known as ኩሮ (*kurro*) represents a slightly different kind of discrepancy, in that farmers believe that a special type of small buzzing fly (unidentified) is the agent responsible for the disease. They have observed that these small flies start surrounding and bothering the animals towards the end of the afternoon. The first signs of *kurro* are strong back and forth shakings of the head and loud snorting sounds. Farmers interpret this as a sign that the small flies have entered the nostrils of the animal, causing *kurro*. For Ethiopian veterinarians, the symptoms of *kurro* unambiguously match the symptoms of the strangles disease that affects equines. Caused by the bacterium Streptococcus equii, strangles cases typically develop a yellow nasal discharge, coughing and swollen lymph nodes of the head and neck which form abscesses that restrict the airway and oesophagus (giving the disease its English name strangles). This example is less obvious than the *ïkäk* 'disease'. While veterinarians are not inclined to consider the explanations of the disease brought forward by farmers, the origins of the Streptococcus equii infection are not entirely clear.

There is a third possible ambiguity regarding ear pests. *Yädjoro kunkun* has been alternatively translated as ear worm (Strelcyn 1968, Abebe and Ayehu 1993) or as an insect (Griaule 1930, Mercier 1979c). It has also been indirectly suggested (but the formulation in French is ambiguous) that the Ethiopian aetiology of *yädjoro kunkun* corresponds in fact to the ear condition known as otalgy. According to Mercier (1979c: 115), the remedies used to treat *yädjoro kunkun* would expel particles from the ear similar to worms, thereby confirming the aetiology in the eyes of the healer and of the Ethiopian people affected by it. On the other hand, most farmers interviewed on the subject were adamant that *yädjoro kunkun* is a small fly. *Yädjoro kunkun* is considered distinct from *yädjoro dukundukit*, which is described as a type of worm. Towards the lowland areas, *yädjoro kunkun* is differentiated from *yädjoro mäžgär*, which is a species of small tick (Ripicephalus spp.). Moreover, it is known that small insects entering the ear tract can cause otalgies. Since no specimen of *yädjoro kunkun* was available for identification, the identification remains unclear.

Finally, there is a large category of household insect pests with an ambivalent status. Farmers view them both as despicable or feared pests and as objects of respect and protection. In this category, we find insects that are known to be potential sources of harm to humans but whose "secondary" activities are believed to be beneficial. They include spiders (*šärarit*) and (*t'inziza*), a large black and orange bumble bee (unidentified). It is widely believed in Wag that the contact of the skin with the urine of the former is responsible for skin rashes. In such cases, the best cure consists in applying a paste of spider's web. Similar beliefs were reported from Begemder (an area roughly corresponding to Gonder Zone in the Amhara Region) by Young (1970: 8):

> *Lïkïfït* powers are also associated with crawling insects, spiders, lizards and the infrequent highland snake. As with the *ganel*, these creepers are innately contaminating either through direct contact with their persons, or indirectly through media which they have touched such as clothing and water, or which they have

expelled such as urine and saliva. This *lïkïfït* results in ringworm, varioloid and eczemoid skin diseases.

And Griaule (1928: 23):

Il existe une maladie, nommée l' « urine d'araignée », qui ressemble à l'herpés[12].

Spiders can also repel bees and disorganise beehives and honey production, if they succeed in penetrating the hives. On the other hand, they are kept deliberately inside corners of the house because they contribute to reducing fly populations. Moreover, it is a bad omen in Wag to kill spiders. Farmers interviewed could not clearly substantiate this belief. A few mentioned a possible connection with Saint Mary but without giving further details. According to Griaule (1928: 22), children in the Shoa and Tigre provinces were prevented from killing spiders in the past. In Shoa, adults said to children: "It is my aunt" and in Tigre, people said that the stomach of the spider reminded them of a pregnant woman.

As for the large black bumble bees, they can inflict very painful stings, which sometimes cause death. Despite this risk, the insect is allowed to build its nests in the vicinity of households because its honey is sought for its pronounced medicinal properties.

Much more intriguing are the temporary reprieves from which all household pests benefit at regular intervals during the month. On fixed dates corresponding to the celebrations of at least two particular saints, Abuna Gebre Menfes Kidus (or Abbo) and Tekle Haymanot, one is advised not to clean the house or to upset in any way, let alone kill, its usual pest inhabitants:

ቤቱን እሁድ ቀንና የአቦ ቀን ያለው ቤት አየጠረግም ተበየ እንዳየፈራ የባላል

Literally: 'On Sundays and Abbo days, don't clean your house so that pests don't multiply'.

ኣቦን ቤት አንጠርገም በጌጣ ፍቃድ የተወገዘ ነው ሰለተወገዘ አየበላም የደነዘዛል ኣለቃው ኣቦ ነው

Literally: 'On the day of Abbo, don't clean the house; it is forbidden by God's will; because it is proscribed by God, pests don't attack and fall asleep; Abbo is their master.'

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12 Translation: "There is a disease called "spider urin" which is similar to herpes.

ኣቦ የሚትዘክረው ቶህዋን አየበለህም

Literally: 'The bedbugs don't bite those who honour Abbo.'

If someone fails to comply with this omen or order, people consider that the person lacks respect for the patron saint of the day and that he potentially exposes himself to levels of household pest infestation much worse than if he had not cleaned his house. Alternatively, if the omen is followed, farmers believe that they will get reprieve from the main household pests during the rest of the month. The restricted time protection applies also to rats (usually under the protective wing of Saint Tekle Haymanot). The belief is so strong among farmers that some will go as far as to prepare a little food and water in a dish for the rats to obtain protection from the saint against the same rats during the rest of the month. Popular anecdotes describe the targeted torment inflicted by rats upon the absent-minded that forgot to deposit food on the specified date. Outside of these dates, insect pests and rats are left to their own fate. The sanctified holy waters of the two saints who grant them occasional protection is considered most lethal for the same pests by those who believe in their healing powers. This duality of healing power surrounding Christian saints has been observed in other Christian cultures. Thus for Appel (1976: 22):

> To be afflicted with the "male of San Donato" also means to have received a call from this Saint. In the words of a man whose wife was thus afflicted, "the sickness of San Donato is sent by our own Saint: he sends it and he removes it.

It is interesting to note that Michel Leiris (1996: 1000) observed a similar interdiction in Gonder on killing household pests during *zar*[13] ceremonies:

> Défense de tuer les insectes tels que mouches, moucherons, puces, punaise, poux ou toute espèce de vermine car « dans une maison d'*awlya* on ne doit tuer que des bêtes qui se mangent » c'est-à-dire des animaux domestiques comestibles[14].

In the absence of further information on the subject (no interviews were conducted to elucidate *zar* issues), it is impossible to ascertain whether there is any correlation between the Christian (household pest infestations controlled by saint Abuna Gebre Menfes Kidus

[13] Agawigna. Spirit possession cult found throughout the highlands of Ethiopia.

[14] Translation: "(It is) forbidden to kill insects such as flies, midges, fleas, bedbugs, lice or any kind of pest because "in the house of an awlya, only edible animals should be slaughtered", that is, domestic animals that are edible.

and a ban on killing household pests during the celebration of the saint) and pre-Christian traditions (no killing of household pests during *zar* ceremonies). It is well known that a number of pre-Christian celebrations and beliefs, both pagan and hebraic, have merged with important Christian celebrations (Trimingham 1952, Ullendorf 1973), as in the case of *Genbot Lideta*[15].

On the other hand, Gebre Menfes Kidus had the unique ability of being able to communicate with all animals. He is commonly depicted surrounded by lions, leopards, and with a bird drinking from his eye. It could simply be that Leiris made his observation on the day of the celebration of Abbo...

4.3 - Factors influencing the categorisation of insects as pests by farmers

4.3.1 - Character and scale of infestation

The scale of damage and destruction caused by an insect is obviously the first factor to determine whether it is a *täbay* or not. Well ahead of any other pests are the notorious migratory locusts and army worms (respectively *anbäta* and *deri*), whose massive and sudden migratory infestations have been a permanent threat to harvests in the northern highlands for centuries, irrespective of the crops. The former has been known to swarm over the highlands more regularly than the latter (Pankhurst 1985). The 1984 famine episode in Wag is remembered as the result of the unfortunate combination of three natural catastrophes: three successive years of drought, an infestation of locusts and an infestation of army worms. Similarly, the 1882-1892 famine, which is believed to have killed almost a third of the Ethiopian population, only reached such dramatic proportions because of the combination of three years of drought, a very large scale rinderpest epidemic and the joint onslaught of locusts and army worms (Ibid 1985). Numerous foreign travellers to Ethiopia have commented on the scale of infestation and destruction caused by locusts (Alvares, Lobo, Almeida, Bruce; see Pankhurst 1966a, 1985 for a more detailed list, and for descriptions of highland locust infestations). The description of Alvares (Beckingham and Huntingford 1958: 132), written more than four centuries ago, is explicit enough and very similar to what farmers in Wag experienced in 1984:

[15] This particular day marks the annual celebration of the birth of the Virgin Mary, whilst also being for some people the day during which animals are sacrificed and food offerings are presented in front of the abode of spirits in various places (big trees, rivers, household, etc) in order to obtain blessing and household protection for the rest of the year. These pre-Christian spirits have been generically regrouped with the fallen angels under the Christian generic *agannent* or *Säytan* (devil, Satan). They are sometimes still called by their pre-Christian names such as *qolle*, *wuqabe* and *adhbar*.

> In these parts and in all the dominions of the Prester John there is a very great plague of locusts which destroy the fresh crops (and trees) on a very big scale. Their multitude, which covers the earth and fills the air, is not to be believed; they darken the light of the sun. I say again that it is not a thing to be believed by any one who has not seen them. They are not general in all the kingdoms each year, for if they were so, the country would be a desert in consequence of the destruction they cause: but one year they are in one part, and another year in another...wherever they come the earth is left as though it had been set on fire.

Different species of grasshopper, including the Wollo Bush Cricket (Decticoides brevipennis), also inflict heavy damage on crops. Being non-migratory pests, however, the scale of their infestation is inferior to that of the migratory pests.

Other non-migratory insect pests inflict damage on specific targeted crops: a category of ants (*kinč'eara*) feeds on newly sown *tef*, pea cultivation is no longer carried out in the area under study because of a new type of weevil, *atär näqäz* (Bruchus pisorum or pea weevil) and the sorghum of the lowlands has come under the new and recent threat of a green beetle (Pacnoda spp).

4.3.2 - Insect versus non insect pests

Depending on the state of the natural resources in their neighbourhood and the related incidence of mammal predators and pests, farmers will establish a clear hierarchy between the most damaging pests and the others. In particular, it was observed in the very highlands and lowlands, where patches of semi-degraded forests and wilderness are still found, that most farmers do not even bother to consider small pests such as weevils for crops or ticks and fleas for livestock since the biggest threat to their livelihoods are baboons and monkeys for crops and jackals, leopards and hyenas for livestock. In this respect, and mirroring folk classification of animals elsewhere (see for example the importance of context in the ethnozoological classification of the Nuaulu people (Ellen 1993)), the categorisation of animals as pests by Wag farmers is largely determined by their immediate experience and circumstances in time and space.

Despite their ability to establish a clear hierarchy in the scale of infestation, farmers find it sometimes difficult to rank certain pests targeting either their crops or their livestock. For instance, they argue that it is impossible to compare a very large-scale invasion of locusts or army worms that will destroy the whole harvest once every 10 or 20 years with another pest, say ants, rats or grasshoppers that might nibble a small portion of their harvest but on an annual basis. Similarly, they refuse to make a distinction between *yäkäft quniča* (livestock flea) and *k'imandjär* (livestock lice). The former regularly attacks their calves and kids while the latter only attacks their animals in years of drought, and when animals are already weak and suffering from the low availability of fodder. The onslaught of lice can then be so bad as to hinder any form of migration of the cattle with their owners to other areas. Farmers interviewed remember distinctly how lice finished many of their young animals during the 1982-1984 drought episode and how they were forced to migrate into the neighbouring Belesa district without a significant portion of their herds, left behind to die.

It is therefore necessary to take into account two supplementary dimensions to refine the concept of *täbay* in the worldview of farmers in Wag: time and altitude.

4.3.3 - Seasonality and frequency of infestation.

Several insects are described as pests because of their numbers and the harm they cause peaks at certain times of the year. The rest of the time they are considered harmless and negligible because of their limited populations or their incapacity to harm. Classic examples of seasonal pests are of course all the crop pests described above, bedbugs and fleas which peak respectively towards the middle and the end of the rainy season, forcing many farmers to change houses to sleep or even to sleep outside of their houses, and ticks, livestock fleas and lice, which tend to attack livestock when the animals are at their weakest, usually in the few months preceding the onset of the rainy season. On the contrary, other insects are *täbay* because they can potentially cause harm at any time during the year. These include several parasites of the ear such as the ear pest (*yädjoro kunkun),* the ear tick *(yädjoro mäžgär)* and the ear worm *(yädjoro dukundukit*), the jigger flea (*mujälle*), flies (*zïmb*) and head and body lice (*yäras kämal, yälïbs kämal*).

4.3.4 - Altitude as the key arbiter of pest distribution

It is the altitude of a given environment and the temperature variations that it induces that will ultimately determine the distribution of pests and their perception as pests by farmers. Most crop pests, whether migratory or non-migratory, follow a straightforward altitude gradient. The higher up, the less likely they are to survive, paralysed by the chilly nights. The main weevil species or *näqäz* (Sitophilus zeamais) present in Wag is the most classic example of this gradient. This gradient has largely influenced the perception that highland farmers have of their neighbours and of the areas of the lowlands (see Annex 4.1 for more details of the distribution of pests according to altitude in the area under study). In addition, the lowlands are perceived not only as areas where pests abound, but also as their site of predilection for breeding. In the past, differences in the altitudes of field of less than a hundred meters could mean the difference between total harvest failure, famine and abundance. Farmers observe very precisely the altitudes beyond which crop pests cease to create damage. They adjust their choice and timing of crop cultivation accordingly.

Ticks and biting flies *(dibara)* are the only livestock pests to follow this type of gradient. The others (livestock lice and fleas) are uniformly distributed at all altitudes. Some household pests have become so associated with perceptions of altitude by farmers that they have entered everyday language as markers of altitude and difference. The expression **የቆላ ዝምብ** (*yäkolla zïmb*: literally 'the fly from the lowlands') is quite rude and can be used as an insult to stigmatise non-Christian and non-Amhara inhabitants of lower altitude areas (see Chapter 3 for a description of the Amhara sense of superiority related to altitude). It is a reference to the abundance of flies in the lowlands, their lazy flight patterns, their stickiness and very irritating tendency to return quickly after they have been chased away. Inhabitants of the lowlands retaliate in their own way by adding a geographical marker each time they refer to human fleas (*yäsäw qunič'a*). What everyone knows as *yäsaw qunič'a* becomes for example:

የአምድወረቅ ቁኒጫ በምንግድ ላይ የገኛል (*Yamdäwork qunič'a bämängäd lay ygägnal*: literally "Amdework fleas are so numerous you find them on the road " (Amdework being the capital of the *Woräda* located in the highlands of Dehana at 2500-2600 m)).

This seemingly innocent jest is also a subtle way of alluding to the antagonisms and power tensions that characterised the relationships between the highland "rulers" and their lowland "subjects". It possibly also has undertones of Amhara / Agaw opposition. Amdework is located in an area which has been 'Amharised' for quite some time (Appleyard 1987), whereas the lowlands of the *Woräda*, although largely "Amharised", are still closely associated with the Tekkezze river and the Agaw people.

Finally, ticks (*mäžgär*) and jigger fleas (*mujälle*) tend to favour and occupy the intermediate altitude zones. *Mäžgär* is also used as an insult (without any connotation of altitude though) to describe a rapacious and exploitative person, in the same way as, say, British people would describe someone as a leech. In addition to its altitude preferences, the jigger flea prefers stony and rocky soils. Accordingly, it is only found in geographical pockets and does not have a straightforward altitude distribution. The jigger flea was, and continues to be, a subject of inspiration to poets and *azmari* (local itinerant popular singers, equivalent to European troubadours of the Middle Ages). This insect is the object of great puns and merriment (for a more precise compilation and analyses of this type of poetry see Pankhurst 1991). Without making any specific attempts to compile such oral literature and poetry, several traces of it were found in the course of the interviews and it was concluded that this form of local ethnoentomological knowledge is still alive in Wag.

Annex 4.1 summarises the relevant information pertaining to all the insects categorised by farmers as pests during the study (scientific name, altitude, seasonality, intensity of harm, preferred target, etc).

4.3.5 - Insect size, gender and confusion

Most of the household and livestock insects described by farmers as pests are small in size, barely visible and numerous. They are also ubiquitous and minutely but constantly harassing people and animals. It was observed on many occasions during semi-structured interviews that some farmers would often interchange names of pests (and several times during the course of an interview) to describe one or several pests. If probed further to clarify the apparent confusion, farmers would without hesitation rectify their initial categorisation and unambiguously describe *tohwan, k'imandjär, mäžgär, yäsäw qunič'a, yäkäft qunič'a, yädoro qunič'a, yäras kämal, yälïbs kämal* and *näqäz* as distinct species with characteristics of smell, size and colour of their own.

This kind of variability or confusion in naming is illustrated in Table 4.1.

Table 4.1: Reported cases of variability in naming

K'imandjär – yäkäft qunič'a :	at all altitudes
K'imandjär – yäkäft qunič'a – yäkäft mäžgär,:	at higher altitudes
Yäsäw qunič'a – tohwan – dukundukit:	at all altitudes
Tohwan – yäsäw qunič'a:	at lower altitudes
Tohwan – dukundukit:	at higher altitudes
Yädoro qunič'a - yäsäw qunič'a:	at lower altitudes
Yädjoro kunkun – yädjoro mäžgär:	at higher altitudes
Yädjoro awore – yädjoro dukundukit – yädjoro mäžgär:	at lower altitudes

Apparent confusion or looseness in the ethnozoological identification and classification process for very small organisms has been reported elsewhere. Thus, for Hunn (1977: 56):

> The folk classification of invertebrates generates scientifically valid groupings in about the same proportion as among vertebrates. However, many invertebrate species are simply left out of the system of named taxa or are peripherally related to named taxa, or they may be attributed to a residual category. This fact is no doubt due to the multiplicity of invertebrate species, their small size, and their cultural insignificance.

Hunn (1999) has also demonstrated that size can be the predominant factor determining the level of classificatory detail in folk domains and that smallness is likely to constrain the recognition of biodiversity. In his study of ethnoentomological beliefs and knowledge among Malawian people, Morris (2004: 41) found that 'names given to insect vary widely', and that 'there are numerous cases of interchangeable synonyms'. Posey (2004: chapter 9) in his analysis of Kayapo ethnoentomology, found that the groupings of insects were based on recognition of gross morphological features. However, none of the above suitably relates to the phenomenon discussed in that the patterns observed are patterns of ethnobiological classification reflecting cognitive processes. They don't concern the identification or naming of species "in which…informants assign observed animal specimens to terminal categories" (Ellen 1993: 65).

If we consider this flexibility in naming of pests as an indicator of peripheral relationships of taxa to other named taxa, we could partially agree with Hunn that the small size of the insect pests is a suitable explanatory factor. However, we would have to reject Hunn's assertion that this peripheral relationship is also potentially explained by cultural insignificance. I have already made reference above to the celebration of several Christian saints and their association with household pests. It is proof enough that these minute pests have acquired an extra dimension in the daily lives of the farmers in Wag.

Grouping according to gross common morphological features fails to explain the amalgamation of *tohwan, dukundukit* and *qunič'a* ; *dukundukit* is a type of maggot, *tohwan* a bedbug and *qunič'a* a flea. According to farmers interviewed, the three differ notably in size, shape, colour and smell.

A more plausible explanation appears to be the "chaining" phenomenon (Posey 2002: 93), a cognitive process which he observed in Kayapo ethnoentomology, whereby some super-ordinate (usually covert) categories are made of insects loosely grouped together due to their perceived similarities in morphology, behaviour or use. Without explicitly calling it chaining, Ellen (1993: 70 my emphasis added) observed a very similar phenomenon in his study of Nuaulu ethnozoology:

> Also terminal categories may be covert. This is not to say that Nuaulu do not recognise distinct genera, species and variants where there are no names, but that they find no necessity to label them, or to do so consistently. The existence of such entities was made palpable to me by the ease with which informants were able to describe differences between types of animal which indicated recognition of separate breeding populations, while assigning to them the same terminal label. **In such cases, names would sometimes be invented on an *ad hoc* basis, examples including the colour morphs of certain species of skink, and the unsystematic and occasional labelling of parasitic lice**. Indeed, parasites are particularly variable. Sometimes the existence of such categories could be inferred by the suggestion that *x* was more like *y* than *z* although *z* could definitely be none other than *y*.

It cannot be fully confirmed because no systematic categorisation of insects using the sorting tools of cognitive anthropology was carried out, but it seems plausible to assume that this variability in naming and extreme looseness of names observed in this study is a reflection or an indicator of a chaining process due to perceived similarities in behaviour and/or morphology, and I would add ecology (preferred habitat, preferred host, etc).

This would certainly appear to be true for some of the above groupings. *K'imandjär* (livestock lice) and *yäkäft qunič'a* (livestock flea) are both small insect pests that infest young animals. Although the former targets more often calves and the latter kids and lambs, the latter is also known to attack calves, particularly when the animals are housed together. In certain circumstances, both can cause the death of the animal if the infestation is too severe. *Yäsäw qunič'a* (human flea), *tohwan* (bedbug) and *dukundukit* (ground worm) are all small household pests that disturb the sleep of people by inflicting numerous little and very irritating bites. Even if bedbugs breed in the thatched roof and the other two on the ground, they all attack the farmer inside the household, especially at night during his rest. *Yädjoro kunkun* (ear pest) and *yädjoro mäžgär* (ear tick) are small enough to enter the auditory tract of the ear and cause discomfort. The former requires the service of a specialist while the latter does not.

Even if such chaining processes are at work and partially explain the temporal variability in identification, they cannot account for all the name groupings observed and in particular for some of the groupings heard more often at specific altitude ranges (spatial variability). Three possible and not mutually exclusive cultural factors are suggested to further explain this phenomenon:

Ideal of masculinity: Highland men have a very strong sense of their identity and of their past. They know that they are the descendants of a nation of farmer-warriors. The case is even more pronounced in Wag where native soldiers have often enjoyed a superior reputation as fighters in the Imperial armies (see Pankhurst 1984). Their contribution to the overthrow of the *Derg* in the late eighties tends to confirm this reputation. Boys are brought up to be endurant, brave and stoical. In such a context, the ideal pest opponent for a grown up man is a leopard or a baboon and definitely not a minute body pest. If by accident a man is "attacked" by small pests, his education dictates him to brush it off as a minor discomfort, there being much graver problems in life. To make matters worse, most of these small pests hover around the household, which is traditionally the domain and area of responsibility of women. To recognise household pests as a source of discomfort can then be perceived as a definite sign of "unmanliness". By association of ideas, any minute pest becomes synonymous with another, epitomising "unmanliness". This cultural trait does not apply for livestock pests. Despite the great pride that men derive from their oxen and livestock in general, they are far too attentive to the health of their animals to treat small livestock pests as insignificant, especially if they target the young and more vulnerable animals.

Vagueness and ambiguity or *'flou artistique'* as a cultural principle: one of the most difficult aspects of life in Ethiopia that a foreigner has to accustom himself to is the apparent absence of organisation which seems to characterise most activities, whether in towns or in the countryside. For example, according to Cassiers and Bessette (2002: 321):

> Peut-être est ce là un des paradoxes de l'Ethiopie: l'Abyssin accepte de remettre son sort entre les mains de figures d'autorité puissantes : empereur, église. Mais il ne supporte pas d'être privé, au quotidien, du droit de vivre dans la fantaisie et dans un certain désordre[16].

An important corollary to this observation is the way in which Ethiopian people do not give value to time, precision and exactitude in general. This attitude is largely driven by their religious conception of fate. Regardless of confession, they strongly believe that God is responsible for everything happening in their lives. As such, to rely too heavily on precision can be considered a form of negation of the Almighty. A discrete form of aloofness or even evasiveness constitutes then the most acceptable behaviour, which pervades many domains of public and domestic life. This type of attitude has the advantage of helping a person to maintain his sphere of privacy against intrusion, particularly in a society that thrives on rumour and gossip (Levine 1965: 9). Thus for Levine (1965: 9):

> In essence, wax and gold is simply a more refined and stylised manifestation of the Amhara's basic manner of communicating. This manner is indirect, often secretive. Amharic conversation is larded with vague remarks...It provides the medium for an exhaustible supply of humour, among a wry people who prefer the clever double-edged remark to comic actions or incongruous situations.

Levine goes as far as to suggest that this cultivated ambiguity in the language is a distinct sign of Amhara identification, to the extent that Amhara people would derive from it a certain sense of superiority over their non-Amhara countrymen and particularly those who are precise or "dry" (Ibid: 8). One should simply bear in mind that the people of Menz in Shoa (where Levine carried out his field work) have believed for many centuries that their

[16] Translation : "This is perhaps one of the paradoxes in Ethiopia. Abyssinian people are always willing to entrust their destiny to a powerfull figure (Emperor, Church). But they find it unbearable to be deprived, on a daily basis, of the right to live their lives with a certain degree of fantasy and disorder."

area represents the cradle of the Amhara nation [17]. While this is certainly true to some extent, they cannot pretend to be representative of the whole of the Abyssinian highlands, let alone of the current Amhara people.

In fact, after living and working in Wag Hamra for almost 18 months in what is a mosaic of Agaw, Amhara and different shades of "Amharised" Agaw people, one soon realises that this famous aloofness and vagueness is certainly not exclusively Amhara. To the contrary, I often heard Amhara government workers from other parts of Region 3 working in Wag complain about the complete lack of understanding they had of Agaw people, the extreme opacity and unreliability which characterised their relationship and the all too frequent "Agaw people cannot be trusted because they have nine hearts" (see Chapter 3).

The bottom line is that farmers in the area under study, whether they are Agaw or Amhara or somewhere in between, equally enjoy mixing, confusing terms, especially if it is to answer the straightforward, precise and sometimes boring questions of an outsider.

Ignorance and the altitude divide. Finally, there is the case of people who give vague or incorrect answers out of ignorance, genuine or deliberate. They sometimes do it on purpose to mark their rejection of a concept or a concept associated with a given area, particularly if there is an implicit association with altitude references (see paragraph 3.4). This proved to be the case with people from either the higher or lower attitude areas who were often amalgamating pests not commonly found in their areas but rather at the opposite end of the altitude spectrum. For instance, the amalgamation of *yädoro quničʼa* (chicken flea) with *yäsäw quničʼa* (human flea) which seemed to occur in the lower altitude areas would appear to be yet another way for lowland inhabitants to demarcate themselves from highland people. In reverse, highland people were adamant that no *dukundukit* (ground maggots) were found in their neighbourhoods since it was a typical lowland pest but on the other hand they often confused it with *tohwan* (bedbug). In practise, both insects are noticeably different, the former is a stinking bedbug (Cimex lectularius) and the latter the maggot of a species of fly (unidentified). All farmers know this basic distinction.

[17] The Menz area is very isolated in the highlands and difficult of access. According to tradition, it is in Menz, that Yekuno-Amlak, considered as the rightful "Amhara" bearer of the Solomonid dynasty, launched his campaign which culminated in the defeat and overthrow of the Zagwe dynasty (Tamrat 1972). The late Emperor Haile Selassie traced back his roots to this area, and Menz subjects always received special treatment when travelling to meet their Emperor (Cassiers and Bessette 2002).

Of course, to distinguish genuine from approximate or deliberate ignorance is in some cases an arduous task, particularly when dealing with young children who are in the process of acquiring entomological knowledge and have not sufficiently travelled to different altitude areas and have not observed the few insects not present in their own communities.

For adults, of all the insect pests identified, the ear tick (Ripicephalus sp.), which is only found towards the lowlands and is relatively rare, is probably the only one that farmers living at higher altitudes are likely to confuse with another, usually *yädjoro kunkun* (unidentified ear pest), out of genuine ignorance. The fact remains that some adult farmers, in order to reinforce their sense of identity, have a tendency to distort elements of the reality with which they are otherwise quite familiar. This identity, as exposed previously, is intimately linked with their cultural perception of altitude.

4.4- Change in pest over the last 30 years

Farmers observe with satisfaction that they have not witnessed invasions of the dreaded locusts and army worms for more than 20 years. Some want to see in this the result of chemical spraying campaigns, but a vast majority, despite their appreciation of the radical and fast eradication power of chemicals, continue to pray that the situation remains as it currently is. Regarding crop pests, this positive note on migratory pests is balanced by the proliferation of new, unheard-of non-migratory pests such as the pea weevil, the Wollo bush cricket and *yämašila zinzinna* (Pacnoda sp.). The pea weevil in particular is more than anecdotal since it has contributed to reducing the cultivation of legumes (peas, lentils, etc) in large portions of the five communities under study. Farmers comment that the Wollo bush cricket, on the other hand, is slowly moving into higher altitudes.

No new livestock pests have been registered but farmers observe with a certain apprehension the drastic increase, the adaptation to higher altitudes and the longer infestation period of the tick populations. The timing of this change is bad as it coincides with the crisis of the agrarian systems (increased shortages of ploughing oxen), the decrease in fodder availability, the decrease in livestock holdings per household (Sharp *et al* 2003) and the reduction in milk and ghee production. Cattle, particularly lactating cows, become more susceptible to tick infestations on the udder, thereby further affecting the quality and quantity of milk and ghee production. Farmers attribute this change in tick distribution and prevalence to the deforestation and agricultural expansion processes of the last 20 years. In the communities of Bella and Meskelo, small shrubs (Dodonea angustifolia, Eucla shimperi, Rumex nervosus, etc) have greatly increased in numbers and are replacing the degraded forests at increasingly higher altitudes. As they constitute the preferred habitat of ticks, their spread has also contributed to increasing the prevalence of ticks. A similar phenomenon is observed towards lower altitudes in Shimela and Yekatit Dewol where the prevalence of ticks has also increased.

Farmers mention neither new pests nor increased pest prevalence in the household. As they are fond of saying, they have a contract with household pests (*kädjämäro* and *läzälalem*: literally "since the time of Adam" and "for eternity").

4.5 - Epidemics and pests

Recorded epidemics of cholera or plague go as far back as the 12th century (Pankhurst 1985). People classify them as diseases that are born from the influence of spiritual forces. Two scenario or versions (co)-exist. For religious people, epidemics are perceived primarily as a sign of God's retribution for man's sins on earth. Several hagiographies portray the Archangel Michael as the Messenger and leader of these plagues (Ibid, 1985). Most people also believe that these diseases result from the influence and activities of evil spirits (*zar*, *qolle*, fallen angels), all regrouped under the generic Satan (*Säytan*). This has already been noted by Young (1970) and Mercier (1988) for whom:

> Les qolle sont les maitres des épidemies. Ils sont apparentés aux zars... (p. 472).
> Les fièvres sont considérées comme des zars[18]. (p. 184)

A 14th century hagiography cited by Pankhurst (1985: 17) provides us with an interesting example of a fusion of both beliefs:

> That...towards the end of the life of Tekle Haymanot "a terrible epidemic" decimated the monks, and that a frightful female demon emanating from the disease attacked the saint himself....The genie directing the illness, justly frightened by this, thereupon came to the saint, saying, "Father if we act in this manner we do so with regret, but it is the Lord who sent us".

[18] Translation: "The *qolle* spirits control epidemics. They are related to the *zar*... Fevers are considered to be *zar*."

Farmers in Wag simply refer to the generic *Säytan* to explain contagious diseases. They make absolutely no link between small household insects (fleas, lice) and contagious diseases (plague, smallpox, etc). The concept of an insect carrying a disease is a non-starter. A few people who have taken part in the recent sanitation campaigns of the government mention half-heartedly that flies carry dirtiness and diseases but they don't appear entirely convinced.

Wuba (malaria) is also associated with an evil spirit or *Säytan* that lurks most often around rivers and streams, according to most people interviewed. During the malaria eradication campaign of the seventies, farmers learned that mosquitoes transmit malaria. But 30 years later, they do not appear to be entirely convinced and continue to believe that the aetiology of the disease is spiritual.

In the seventies, Gamst (1969: 151) recorded community processions to carry the spirit of *wuba* away. The event he describes occurred in the Belesa district, which is located opposite the Tsamla community on the other side of the Tekkezze River in Gonder Zone:

> When a community is afflicted with a specific spirit of disease, it may hold a procession called baseta masanat (seeing off of the disease) to carry away the pestilence. The procession is an effective mechanism to reduce anxiety from disease, allowing a community to act against the capricious and deadly spirits that cause sickness. I observed such a procession late in 1964 after an epidemic of malaria in the province of Begemder. The procession originated in Belesa, southeast of Gondar....The thirty people in the procession were collectively transporting the spirit of malaria that had caused the epidemic in Belesa.

4.6 - God and pests

Over the centuries, Orthodox Christianity in Ethiopia has evolved in a unique way (Ullendorf 1968, 1973). Incorporating a great number of pre-Christian beliefs and practices of the Old Testament[19], it matured into a unique version of judaised Christianity, found nowhere else in the Christian world (Ullendorf 1973). Ethiopian Orthodox Christians proudly claim that they have inherited from the Israelites the status of God's chosen people (Ibid).

[19] See Ullendorff 1968 for an in-depth study of the judaised aspects of Ethiopian Orthodox Christianity and Pankhurst 1992 for a historical analysis of theological exchanges and links between the Ethiopian Orthodox Church and the Jewish religion in Ethiopia.

Farmers in Wag pride themselves on their "real" Orthodox Christianity and share many Old Testament beliefs very strongly. In their view, and regarding pests, the first point to emphasise is that any infestation, regardless of its scale, intensity or character, is the result of God's will, because as Creator of all living creatures on earth, He has the power of life and death over everything. Asked whether Satan can send pests, most farmers reply that they have never heard of such a thing. Even if it were the case, they would still perceive it as an act of the Almighty since he is known to have created and to control Satan (as in the Book of Job for instance). When Satan or a devil strikes a human being, it is only because God has allowed it to happen:

ተባይ የሚልከው እግዝያብሔር ብቻ ነው
"It is only God who sends pests."

Referring to hyenas, foxes and leopards who are responsible for the deaths of many sheep and goats, particularly in the lowlands:

ጌታ የጠብቅ ነው
"It is God who looks (or does not look) after them."

Looking for reasons to explain the increased and recent prevalence of ticks:

የእግዚያብሔር ስራ ነው
"It is the work of God."

Secondly, the belief that God is closely scrutinising their actions and thoughts is central to their everyday lives. He punishes and rewards human beings for their sins and good deeds, both during their lives and after their deaths. The Heavens and Earth are in constant communication and events only take place through the will of God (Cassiers and Bessette 2002).

In the area under study, large scale infestations of migratory pests (locusts and army worms), which have resulted historically in great crop destruction, famines and large scale migrations of cattle and people, are a direct sign of the hand of God, punishing them for their sins. The following sayings and comments collected during the interviews speak for themselves:

In general:

እኛ ጥሩ ብንሆን ጌታ ጥሩ ሊሆን ነበር እኛ ስንከፋን ግን ግዘው ከፋ ነውን

"If we are good, God will be good to us; if however we commit sins, times will become bad."

ዛሬ ጣበይ በዛ ዛሬ ግዜኣችን ነው መስል ሃጢያት በዝቶ ነው ዛሬ ሰው ለሰው ፍቅር የለውም ትንሹ ትሊቁን አያከብረውም ኣሁን መሬት በገመድ ተለክታ ተሰራች

"Today, there are more pests. We live in times of sin. Today, people don't have love for one another, young people don't respect elders. Today we measure our land with a rope."

About army worms infestations:

ዴሪ እግዝያብሔር የማርህ ነው. እግዝያብሔር የሰደድውን ማን ያድናል ?

"Army worms? May the Lord make you well! Who can cure what God inflicts?"

ዴሪ ትባላለች በስማየ አደል የሞት ወድቅ ከመሬት ኣትፈላም ከስማየ ከዝናብ ጋር ነው የሞት ወድቅ የሉናል

"It is called *deri*, it is like death that falls on us; it is not born on the ground, it comes with rain like a falling death, they say."

ዴሪ ብስደደ የጌታ መላክት ነው አያድነውም

"Army worms are sent by God, there is no cure."

God's anger and capacity for mercy is hinted at in the following fatalistic beliefs related to livestock health and pest infestation. The reference is to God's control over the rains and climate, determining episodes of drought and the incidence of livestock pests (livestock lice and fleas) known to proliferate before the onset of the rainy season when livestock are at their weakest:

እግዝያብሔር ሲመቸው ጨሌ ሲበላ የሚረገፍለታል ፀሐየ ከሆነ የሞታል.

"If God allows it (it will rain and) the livestock will feed on the *chele*[20] grass and recover, if the sun persists they will die."

የእግዝያብሔር ምህረት ነው .

"(Their recovery) will occur by the Mercy of God".

Referring to a weevil infestation:

እግዝያብሕር ሲመር ነው.

"(We will be saved) if God forgives us."

Among the first Europeans to visit Abyssinia in the 16th century, Alvares noted the passivity of farmers confronted with a large-scale locust invasion:

> I saw men, women and children, seated horror-struck among these locusts, I asked them: why do you stay dying, why do you not kill these animals, and revenge yourselves for the damages which their parents did you, and at least the dead ones would do you no further harm? They answered that they did not have the heart to resist the plague which God gave them for their sins. The people were going away from this country… (Beckingham and Huntingford 1958: 132)

While the wrath of God is reportedly linked with the intervention of the Archangel Michael, farmers in Wag are more inclined to believe that it is the Archangel Gabriel who is sent by God to punish men for their sins:

መህረት ለሚከኤል ቁጣ ለገብሪኤል

"The mercy (is) with Michael, the wrath (is) with Gabriel."

Nor is the wrath of God limited to the sending of diseases and insect pests. Farmers living at higher altitudes observe that while they have relatively fewer insect pest infestations than at lower altitudes, they suffer the large scale attacks of other equally damaging pests, including rats, baboons and hyenas, which they also interpret as a sign of God's discontent.

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[20] Fresh green grass that grows after the onset of the rainy season.

Portuguese Jesuits intent on converting the highland population to Catholicism during the first decades of the 17th century seemed to have benefited from the initial famine episodes that inevitably followed large-scale locust invasions.

> ...just as a fat stomach does not generate a subtle mind so an empty stomach renders the mind very acute and their ears propitious...there was no one who did not accept the faith together with the food. (Pankhurst 1985:38).

At least some of the Jesuits interpreted these locust invasions as the sign that God was favourably disposed towards their proselytisation campaign. Thus for Lobo (1985: 56):

> God, who often makes calamities subservient to his will, permitted this very affliction, to be the cause of the conversion of many of the natives, who might have otherwise died in their errors.

It is quite likely, however, that they underestimated the so-called casuistry of the Ethiopian Orthodox priests, who chose to associate this sign of the wrath of God with the departure of too many Ethiopians from Orthodoxy:

> He [an Abyssinian] confessed with the utmost frankness and ingenuity that the priests and religious, had given dreadful accounts both of us, and of the religion we preached, that the unhappy people were taught by them, that the curse of God attended us wheresoever we went, that we were always followed by the grasshoppers, that pest of Abyssinia, which carried famine and destruction over all the country: that he seeing no grasshoppers following us, when we passed by their village, began to doubt the reality of what the priests had so confidently asserted. (Pankhurst 1985: 60).

The precise timing and momentum of the rebellion that ultimately led to the expulsion of the Jesuits are lost in history. However, we know that the mountainous areas of Wag and Lasta served as rallying points for all opponents of the new faith (Pankhurst 1984); here we find once again the areas of Wag and Lasta portrayed as champions of the Ethiopian Orthodoxy. The extent to which the "wrath of God" and its interpretation played a role in cementing this rebellion is unknown; it is realistic to assume that it was already a deep-seated belief in the Highlands (Alvares had reported it more than 60 years before). Moreover, it is quite likely that the Jesuits and their impatient manoeuvring (particularly of Mendes (Ullendorf 1973)) provided an ideal scapegoat both for the Orthodox clergy and for farmers more than willing to transform themselves into soldiers if it gave them the opportunity to amend for their past sins.

Nowadays, common reasons put forward by farmers in the study area for explaining God's wrath are the non-observance of the various fasts during the year and the non-observance of religious holidays. Cassiers and Bessette (2002: 556) report similar beliefs from their interviews with Orthodox Christian informants in Addis Abeba. Other farmers in Wag describe how the general lack of love and consideration for one another finds its most common expression in the haggling and tense negotiations, with which food aid distributions and issues are regularly associated. This state of affairs is summarised by the phrase: *Tank'ol bäza*, literally: "There is too much malice (or foul-play)"). In imperial times, people also linked the moral qualities and sense of justice of their Emperor (believed to be appointed by God) with God's anger. If a monarch was found lacking in both, it meant that famine times or other catastrophes were to be expected. (Ibid: 26).

More recently, a few farmers in Shimela and Yekatit Dewol have started explaining the recent availability and use of chemical pesticides (and the resulting decrease in large crop pest infestations) as a sign that the current era is not as sinful as other farmers claim it to be.

In times of hardship and trial, Ethiopian Orthodox Christians are advised to pray, fast and repent for their sins (Cassiers and Bessette 2002). Perhaps the words of the Emperor Menelik spoken to his people in the midst of the 1882-1892 famine are the best illustration of this deep-rooted aspect of the Abyssinian life:

> When the cattle disease began I made a decree ordering prayer to God; but you, O people, did not take my words seriously and gave up praying. The cattle are all dead and when you worked the land with the hoe, locusts and caterpillars ate up the crop. All this happened because we did not pray enough...When the people of Nineveh prayed for three days the fire stopped. (In Pankhurst 1985: 99)

4.7- The evil eye and pests

Yäsäw ayn, literally "the eye of the person" or evil eye, is a belief widespread in Wag Hamra. Beautiful people, animals or crops wither away after being the object of envious stares from the person who possesses the evil eye. Farmers assimilate the power of the evil eye to a piercing effect (*Yäyn wog*, literally "the piercing power of the eye)) and believe that this special power can split large stones (see Donaldson 1992 for the mention of a similar belief in Iran).

They also make a distinction between a simple person who has the evil eye and a person with *buda* powers. The latter is more powerful than the former since he is said to possess other evil powers, such as the ability to transform himself at will into a hyena and the ability to kill someone slowly by breaking a twig of a certain plant (Reminick (1973: 35) mentions the twisting of a root). Without always formulating it clearly, farmers seem to make another distinction: the *buda* is always portrayed as more aggressive and frightening than a simple person with the evil eye. Other authors reporting from different areas in Ethiopia have contrasted the involuntary character of the simple evil eye with the much more purposive and aggressive nature of a *buda* attack (Ullendorf 1973). Such variations in evil eye beliefs have been noted in other cultures outside of Ethiopia (Maloney 1976, Dundes 1992). Reminick (1973, 1974), reporting specifically from the Menz area, lumps together the simple evil eye person and the *buda*, draws a line between the intentional and non intentional *buda* and concludes that the evil eye phenomenon is a reflection of a status division and opposition between Amhara farmers with land and non-Amhara landless craftsmen (Reminick 1973). It is again important to remember that Menz is not representative of the whole of Amhara. What Reminick ascertains is certainly not the case in Wag, where farmers recognise that a *buda* person is more likely to be found (though not exclusively) amongst craftsmen. Besides, many of these craftsmen (mainly blacksmiths) operating in the area under study are not landless. In addition, farmers in Wag do not link the evil eye and *buda* powers with a particular ethnic group. So called Amhara farmers from the Meskelo, Bella and Shimela communities believe that anyone can be evil-eyed, whether Amhara, Agaw, Christian or Falasha, even if in the past Falashas were more commonly associated with this phenomenon than others. More than 10 years after their collective departure to Israel, the remaining farmers still protect themselves against the *buda* and the simple evil-eyed people.

Asked whether the evil eye can cause pest infestation in children and young animals, farmers were at a loss to answer. They remarked that they had never observed such a phenomenon, but that it was not entirely impossible since a child or calf struck by the evil eye would gradually become weak and more susceptible to pest infestation, thereby suggesting an indirect relationship between the evil eye and pest infestation. The direct causal relationship between the evil eye and certain lice infestations on children put forward by Reminick (1974) could not therefore be confirmed within the context of Wag. Animals particularly at risk are calves, lambs and kids born with a uniform white coat. To deflect the attention of the evil eye bearer, the animals are smeared with charcoal. Beautiful children in general at any time of the year, and whole families in the lowlands during the celebration of the finding of the True Cross, smear themselves with charcoal to repel the evil eye (the former being smeared with any charcoal while the latter use the charcoal of the *dämära*[20]). This type of protection against the evil eye has been reported in other cultures outside of Ethiopia (Woodburne 1992, Spooner 1976).

However, the most salient aspect of the evil eye that emerged from interviews with farmers was the belief that it could do much harm to crops. In the vast store of literature and articles dedicated to the evil eye, reported cases evoke mainly the harm it can potentially cause to people and animals. There are very few references to its destructive impact on vegetation. It can blight trees (McCartney 1992) or make them dry up (Murgoci 1992), cause fruit to fall, to become wormy or to be injured by hail (Donaldson 1992) or cause a fruit tree to suddenly wither and die (Dundes 1992). Reports of crops attacked by the evil eye are very scarce. There is a loosely-defined belief in Western Europe that excessive verbal praising can cause crops to spoil (Jones 1992, McCartney 1992). A better example of the visual power of the evil eye being associated with crops is reported from southern India (Woodburne 1992). The Talmud states that:

> Man should not stand in the field of his neighbour when it is in full bloom for fear of the evil eye. (Brav 1992: 49)

Only Gamst (1969: 54) mentions a similar type of belief for Ethiopia in his narrative of Qemant traditional beliefs and practices:

> To protect crops [from the evil eye], skulls of cattle on poles, or several poles made from limbs or small trees from which the bark has been peeled, are placed upright in the fields. No reason could be found for these actions except that they were 'known to be effective.

[20] The *dämära* is a bundle of sticks burnt during the celebration of the finding of the True Cross. It is used in Wag to purify the inside of houses for the whole year. The way and direction in which it falls after burning are interpreted as omens for the forthcoming year.

Farmers in Wag follow exactly the same custom of cutting large branches of large trees or the trunk of small trees, of peeling the bark off and of placing them in the middle of the fields they wish to protect from the evil eye. Having observed the same practise from the highlands of Meskelo all the way down to the lowlands of Tsamla, and having questioned several farmers in the five communities, I reached the following conclusions:

- A majority of farmers at all altitudes believe that these pieces of wood are meant to protect the fields from the attacks of the evil eye. The choice of wood is conditioned by the colour of the peeled wood, which should be white. Based on the same colour principle as the attacks of the evil eye on lambs and kids, the evil eye bearer, passing by a field, is attracted to the whiteness of the wood and concentrates the power of his stare on it, causing no harm to the crops. Variants of this "white defence" include the positioning of white mule or donkey skulls and the smearing of white ashes on rocks in the middle of the field to deflect the evil eye stare from the crops (see Photograph 5.1).

- Farmers select specific tree species for this purpose. Based on availability, this choice varies with altitude: *bïsana* (Croton macrostachius) and *grar* (Acacia spp.) in higher altitudes, *kulkwal* (Euphorbia ampliphylla) and *bïsana* in mid altitudes and *kulkwal*, *ankwa* (Commyphora spp.) and *t'salwa* (Mimosoideae) in the lower altitudes. In addition, some farmers specify that the wood should be harvested from three different places in a different *gott* or village than the one for which it is intended (see Photographs 4.1, 4.2).

- Evil eye protection is particularly necessary when a farmer is opening a new (and therefore fertile) field, when the field is considered large by the standards of the community or when the crop being cultivated is precious, as is usually the case with *teff*. Evil eye poles were seen planted in fields of wheat, *teff*, faba beans and chickpeas (the list is certainly not exhaustive though).

- Some farmers in the lowlands believe that pieces of wood planted in a field are only used to attract termites on types of soil more susceptible to termite attacks. The termites converge on the wood, colonise it and inflict relatively little harm on the surrounding crop. When the piece of wood is completely infested, the farmer burns it or throws it away with all the termites safely trapped inside. If necessary, another piece is brought in. The most commonly used tree species mentioned by farmers are the same *t'salwa, ankwa* and *kulkwal*, otherwise used by other farmers to deflect the destructive stare of the evil eye. It appears that the type of wood is chosen for its lightness, softness and vulnerability to termites. To confirm this hypothesis, a simple pair-wise ranking exercise was carried out to compare the relative susceptibility of 10 different wood species to termite attack. *It was found that to repel the evil eye in their fields farmers choose deliberately the tree species (kulkwal, ankwa and t'salwa) that rank last in terms of resistance to termite attack.*

Having observed this duality of purpose in the lowlands, I questioned farmers about the possible existence of a causal link between the evil eye and termite infestations. The vast majority believed that the two phenomena were largely unrelated. Only in one instance did a young farmer from Tsamla mention the fact that termite attacks were a direct consequence of the evil eye. Rather, a significant proportion of farmers living in the lower altitudes of Tsamla, and to a lesser extent Yekatit Dewol and Shimela, believe that the pieces of wood can simply be used for both purposes. In contrast, farmers from the higher altitudes do not believe or even know that such pieces of wood can be used to attract termites. One of the best proofs of this differential knowledge is the way in which the pieces of wood are positioned in the field: farmers from lower altitudes will place the wood in the middle of the field while farmers living at higher altitudes will be less choosy and place it anywhere, sometimes even on the edges of the field or in the middle of small stone dikes where, not touching the ground, it is very unlikely that they will be noticed by termites.

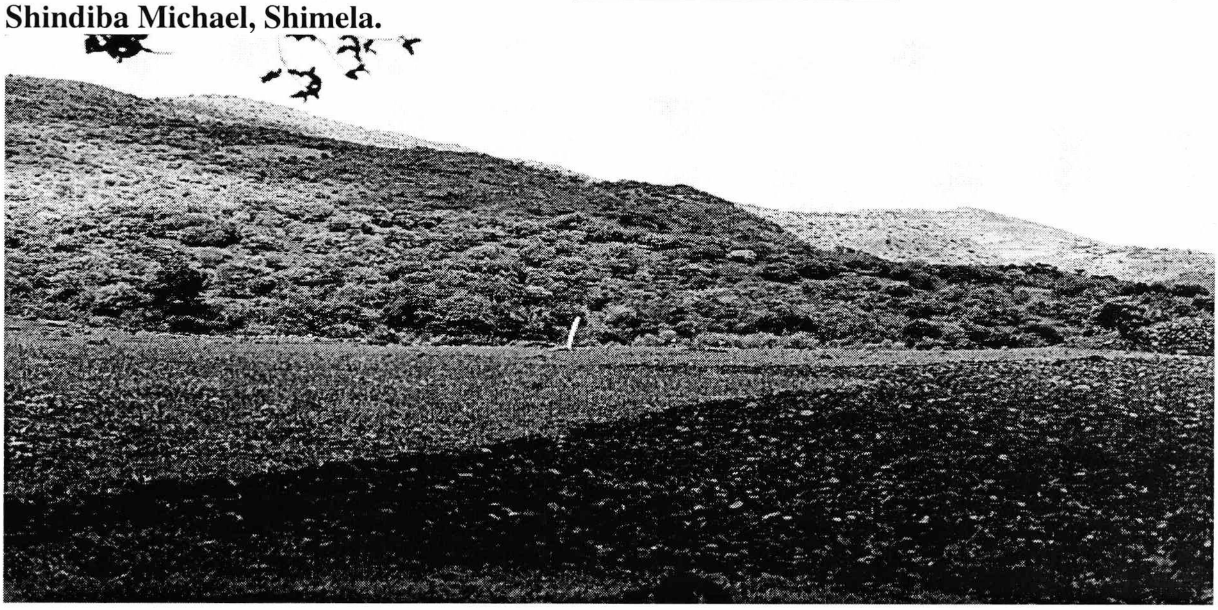
In the absence of a clear causal relationship between the evil eye and termite infestation, this duality of purpose observed in the lower altitude areas of the study area, where termites are more prevalent than in the higher altitude areas, suggests the existence of a *continuum of plant use* (see chapter 7 for more details on the concept of continuum of plant use). It is suggested that:

- Either farmers first used white peeled trees to deflect the impact of the evil eye and, having observed the positive effect that certain types of woods had on termites, restricted their choice to white pieces of wood easily attacked by termites.

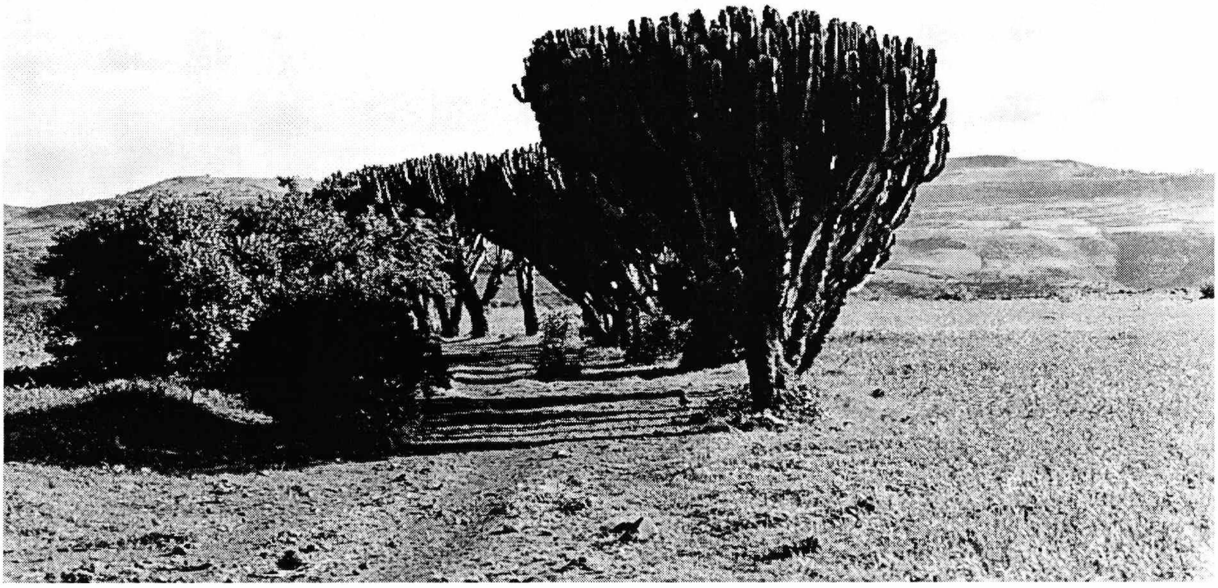
- Or farmers first used specific woods to attract termites at certain places in the field and further adapted this practice by choosing only white woods when the need to protect their crops from the evil eye arose.

Photographs 4.1: Evil eye / termite stick (Croton Macrostachyus) with skull in a field of teff, Shindiba Michael, Shimela.

Photograph 4.2: Evil eye / termite stick (Euphorbia ampliphylla) in a field of wheat, Shindiba Michael, Shimela.



Photograph 4.3: Old evil eye hedge (<u>Euphorbia ampliphylla</u>), Shimela Maryam.



As to the origin of this form of traditional knowledge, one is only left to wonder. The near absence of literature on the subject makes it even more difficult to pick up a trail. Woodburne (1992) reports a similar practice from people in southern India, where wooden poles wrapped at the top with rags were planted in the fields to deflect the impact of the evil eye on the crops. However, based on Gamst's (1969) testimony, it would be tempting to suggest that it is linked somehow to the presence or influence in former times of strongly judaised populations. The Qemant, where Gamst (1969) undertook his study, have been categorised as a "Hebraic – pagan society". Their beliefs and practices bear strong similarity with those of the Falashas. Examples or counterexamples of such evil eye beliefs and practices concerning crops in former Falasha settlements in Gonder Zone would certainly shed additional light on the subject.

Another, less common, way to deal with the evil eye consisted in planting hedges of *k'ulkwal* around the fields (see Photograph 4.3). This was believed to be an effective remedy because of the toxicity of the tree's sap, known to cause blindness.

4.8 - *Däbtäras* and pest infestations

Farmers interviewed don't think that *däbtäras* can send pests to someone or to a particular place by casting spells but they don't rule out the possibility if the *däbtära* is very powerful. After all, some people believe that *däbtäras* can cause hail to damage targeted fields.

Much more widely accepted is the belief that *däbtäras* can inflict scabies on people from a distance. The symptoms apparently are not different from those of non-purposive scabies and it is only the initial straightforward treatment with herbal medicine and its failure that will reveal the existence of a spell.

4.9 - Synchronic variation in ethnoentomological knowledge of pests

In general, the semi-structured interviewing with farmers failed to reveal significant variations of insect pest knowledge among farmers. The influence of gender, age, occupation and altitude was reviewed to identify the possible sources of variation.

No great differences in knowledge due to gender were recorded. Despite the strict gender specialisation of tasks, women are familiar with the insect pests attacking livestock and with crop insect pests. This is largely due to the fact that animals are brought back to the household every night and that it is sometimes the responsibility of women to look after young animals, usually more susceptible to livestock lice and flea infestations. In the absence of their husbands, and if children are still too young, women assume the ultimate responsibility of looking after the livestock. Regarding crops, women take an active part in weeding, harvesting and sometimes threshing and have ample opportunities to become acquainted with the main crop insect pests.

Age does not appear to be as great a source of variation as in the case of plants (see Chapter 5). Although no systematic and rigorous interviewing of young children was carried out on the subject, it emerged clearly that their learning curve for identifying insect pests seemed very steep. Informal discussions with young children suggested that, at the very latest, most of them are able to recognise and differentiate unambiguously between all livestock, household and the most common crop pests (termites, grasshoppers, Wollo bush cricket, ants) by the age of 10. Knowledge gaps are restricted to migratory pests (locusts and army worms) that have not been seen in the area for almost 20 years and the few household pests, which are found outside of their villages at extreme or specific altitudes. By the age of 15, most of them will have had the opportunity to accompany their father or parents several times to neighbouring communities and to fill these knowledge gaps.

Traditional healers and *däbtäras* living in the area under study are farmers. As such their knowledge does not differ significantly from others. Their knowledge of insect pests may marginally exceed that of simple farmers if they have travelled to distant areas and have encountered pests not present in their own communities. Some, having travelled to the lowlands of Ziqualla *Woräda* mentioned the existence of a household pest called *damotra* (unidentified), which causes very painful bites. A small incident in the life story of a *däbtära* noted by Mercier (1988: 222) is quite revealing in this respect as it relates to the un-encountered jigger flea:

> Et il me montra ses plantes de pied et ses orteils gonflés, complètement mangés par les chiques. Nous ne connaissions pas cette vermine jusqu'alors. Il n'y en avait pas dans le pays ou nous avions passé l'été[21] .

As mentioned previously, a few insect pests may be unknown to certain farmers because they are prevalent in areas and at altitudes that are outside the regular travelling areas of farmers. These include the jigger flea found only on certain pockets and the rare ear-tick, prevalent only at low altitudes where farmers seldom travel. The most notable phenomenon related to altitude is the way in which a few unambiguously identified pests have different names towards the lowlands, most probably of Agaw origin (Table 4.2)

Table 4.2: Comparison of Amharic and Agawigna names for selected pest

Scientific name	English description	General name (Amharic)	Local name (Agawigna)
Componotus compressus	Large black teff eating ant	*K'inč'ara*	*T'iska, djergid*
Echidnophaga gallinacea	Chicken flea	*Yädoro qunič'a*	*Bätäka*

[21] Translation: "And he showed me his swollen soles and toes, infested with jigger fleas. Until then, we were not familiar with this pest. There weren't any in the country where we had spent the summer."

CHAPTER 5

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ETHNOBOTANY OF BOTANICAL PEST MANAGEMENT

5.1 - Historical overview and literature review

The use of plants and plant extracts to control/manage insects is a very ancient human activity. The first insecticide compounds used by humans were from plants, the bioactivity of which has been known from the earliest recorded times. For instance, Dioscorides (AD 40-90) mentioned the usefulness of opium, aconite and other plants as medicines and occasionally as insecticides (McIndoo 1945). As early as the 5th century BC, seeds were treated with insecticide plant extracts to protect germinating plants from insects (Smith and Secoy 1975). Crossing to another continent, we find that the ancient and classical Indian texts of plant science or "Vrksayurveda" were also recommending the use of botanicals in the management of pests and diseases (Vijayalakshmi *et al* 1999, Balasubramanian *et al* 2000, Balasubramanian *et al* 2001) in various forms (pastes, irrigation of crops with herbal solutions and fumigation: Balasubramanian *et al* 2000).

At the beginning of the 20th century, the United States Department of Agriculture undertook a worldwide investigation of plants with insecticide activities (Klocke 1989). This effort culminated in the identification and selection for commercial development of two botanicals with strong insecticide activity, Lonchocarpus sp. and Derris sp., both used as fish poisons in Brasil and Southeast Asia respectively (Higbee 1947). A few decades later, Pyrethrum was also selected for the potency of its insecticide properties. However, the development of the chemical pesticide industry led to the rapid decline of their importation and use in the western world after the Second World War. Plant screening continued unabated and by the mid-eighties, more than 2000 species of plants were known to have some form of insecticide activity (Ahmed and Grainge 1986). In the meantime, plants were still in local use throughout the world to kill or repel insects (Klocke 1989).

Over the past decades, the attention paid to the recording and documentation of indigenous, ethnobotanical and ethnoecological knowledge of botanical pest management has not faltered. A quick review of the literature by continent yields the following information:

Smith and Secoy (1981a) provide us with a rapid overview of the plants that were used in Europe to control agricultural pest prior to 1850. Guarrera's (1992) contribution is interesting, in that it reveals the current persistence of traditional knowledge of botanical plants used in Central Italy to control pest of plants, animals and humans and hints at a broader, coherent and obviously disappearing body of traditional knowledge of botanical pest control around the Mediterranean Sea.

Local knowledge of botanical insecticides has also been recorded in North America (Smith and Secoy 1981b), Mexico (Romero *et al* 1988) and the Caribbean (Roeth 1997, Lans and Brown 1998). In South America, two poles of knowledge seem to appear. First the traditional use of *tarwi* (Lupinus mutabilis), as both a crop and a source of livestock ecto-parasiticide, is widespread throughout the Andes (Bazalar *et al* 1992, Jimenez *et al* 1985, Tillman 1983). Other botanicals are also reportedly still used by farmers (Caballero 1984). Several scientists and development practitioners have made attempts with farmers to validate the efficacy of *tarwi* as an ecto-parasiticide of livestock (McCorkle and Bazalar 1996). The other (reported) centre of knowledge is found in the Amazon forest, with reports of knowledge originating from Venezuela (Pompa 1984) and Brazil (Posey 1986, Kerr and Posey 1984).

Asia and South East Asia figure prominently in the literature with traditional knowledge of botanical pest management being reported from Mongolia (Meserve 1996), China (Yang and Tang 1988), Thailand (Chejew 1988) and the Philippines (Conklin 1967: 16, Dayrit 1990, Padua 1991 and Vega 1994). But the majority of reports undoubtedly originate from Sri Lanka and India (Ahmed and Grainge 1986, Baskaran et Narayanasamy 1995, Kemparaja *et al* 1998, Matzigkeit 1996, Pal and Jain 1998, Patel *et al* 1998, Peries 1989, Rath 1994, Vijayalakshmi *et al* 1997a,b, Rekha *et al* 1998, Vijayalakshmi *et al* 1999, Balusabramanian *et al* 2000, 2001). Even though neem (Azadiracta indica) is traditionally a key plant species for pest control, the knowledge of botanical pest control does not revolve exclusively around the use of neem but involves the use of many different plants. An explanation of the prominence of the traditional use of botanicals as sources of pesticides in India and Sri Lanka may be the survival of the ancient science and techniques of Indian plant science or "Vrsksayurveda" (Vijayalakshmi *et al* 1999, Balusabramanian *et al* 2001) and animal science or "Mrgayurveda". In some parts of India, farmers resort to practices of botanical pest control similar to those described in the ancient texts (Ibid). It is worth noting that the use of botanicals to control insect pests of field crops is nowhere as widely reported as in India.

The last great centre of (reported) traditional knowledge of botanical pest control is the African continent. Traces of knowledge have been recorded in Southern and Central Africa, namely from South Africa (Bryant 1909, Watt and Bryer-Brandwijk 1962), the Zambia (Berger and Banda 1995), Rwanda (Van Puyvelde 1994), Gabon (Walker and Sillans 1961), the former Belgian Congo (Staner and Boutique 1938) and from Malawi (Golob 1999, Golob *et al* 1982, Kambewa *et al* 1999). Knowledge is apparently abundant in West Africa also with reports originating from Cameroon, Nigeria, Ghana, Guinea-Bissau, Senegal and the African Sahel in general for insect pests affecting livestock, humans and stored crops (Palsson and Jaenson 1999, Akinboye 1997, Dalziel 1937, Bayemi 1998, Belmain *et al* 2001, Golob 1999, Law 1980, Niber 1994, Thiam and Moumouni 1994, Toigbe 1978, Toyang *et al* 1995). East Africa stands up easily to comparison with reports of use and knowledge of botanicals as insecticides found in Egypt (Bauman 1960), Tanzania (Bohlen 1978). Accounts of use abound in Kenya (Adoyo *et al* 1997, Blomley 1994, Heffernan *et al* 1996, Kariuki 1992, Morgan 1981, Namada 1997).

In Ethiopia, plants and animal parts used as ear pest expellants, plant insecticides and remedies against scabies for humans and livestock are described in the medico-religious texts translated by Abebe and Ayehu (1993: 129-131; 190; 372) that are believed to have been originally written several centuries ago. Secondly, the mention of insecticidal plants recurs in the literature and for different geographical locations in the northern highlands. Extracts of certain plants are mixed with writing ink to repel flies (Griaule 1928: 68). In the Amhara province of Godjam, a particular type of caterpillar, also used for divination, was thought to be the enemy of the Virgin Mary. To prevent it from entering their houses, farmers suspended the branch and leaves of a certain tree above their door (Griaule 1935). Medicinal plants are used to treat fleas and ticks (Cacciapuoti 1941). Aromatic grasses are used in western Shoa to keep houses and churches free from insects. They are often found around houses (Huffnagel 1961). The well-known Ethiopianist Stefan Strelcyn (1973) interviewed more than twenty young Ethiopian students about the plants and related uses with which they were familiar. Several students born and raised in different geographical areas of the northern highlands reported the use of plants to control, fleas, lice and ticks in humans and livestock as well as bugs (Strelcyn 1973). The following quotation noted by Strelcyn (1973: 187-188) is even more remarkable as it is one of the extremely rare mentions of household plant remedies being used to treat crop pests:

> Ses feuilles peuvent être d'une grande utilité pour le planteur. On coupe ses feuilles et on les laisse fermenter pendant plusieurs jours. On en asperge les plantes atteintes d'une maladie. Cela a le pouvoir de détruire les insectes qui se trouvent sur la plante...(Cela) a le pouvoir de défendre les plantes contre plusieurs insectes, ennemis du paysan et de les détruire[22]. (Etudiant du Begemder)

In his compendium of botanicals used in traditional Ethiopian medicine, Getahun (1976) mentions several plants known by traditional healers to have insecticide properties, although he does not specify for which type of pest they are used. Studies undertaken in the Tigray Region (North of Wag Hamra) have unearthed localised knowledge of botanicals used to control insects pests and parasites affecting humans, livestock and stored crops (Wilson and Gebre-Maryam 1979, Vetter 1997).

Overall, a majority of the references cited above can be classified as 'economic botany', whether their focus be the molecular analysis of plant extracts, the laboratory screening and testing of plants extracts for certain types of physiological activity (see the bibliography of Golob 1999 for a glimpse of the volume of ethnopharmacological literature on the subject) or the culturally de-contextualised listings of plant recipes for pest control (see Stoll 2000 and Matzigkeit 1990 for archetypes of such compilations in global pest control and livestock pest control respectively). This trend tends to reflect the current prominence of plant-based approaches over people or knowledge-based approaches in the study of traditional knowledge of botanical pest management. However, for a very noteworthy exception to this trend see the reports of the work carried out at the Centre for Indigenous Knowledge Systems (CIKS) in Bangalore, India, focused on the revitalisation of ancient Indian plant health science or "Vrksayurveda" and its potential for modern and sustainable pest management. (Balasubramanian *et al* 2000, 2001, Vijayalakshmi *et al* 1997a, b).

[22] Translation: " Its leaves can be of great use to the farmer. They are cut and left to ferment for several days. You then spray the diseased plants with the mixture. It can kill the insects that infest the plant. It can protect plants against several insects considered as pests by farmers and kill them (student from Begemder)."

While the last decades have witnessed a shift in ethnobiological debates from cognitive aspects of plant classification towards processual approaches and studies of knowledge loss (Martin 2000, Zent 2001, Heckler 2002), the study of pest management and the ethnobotany of plant based remedies for pest control has largely retained an a-temporal and a-spatial dimension, far from considerations of intra-cultural variability and knowledge dynamics.

The approaches and data presented in the following paragraphs and chapters, then, are an explicit attempt to restore the balance between cultural and economic ethnobotany and between plant and knowledge focused approaches in the study of botanical pest management.

5.2 - Cultural perceptions of plants in Wag Hamra

5.2.1 - Some comments on the nomenclature of plants in the area under study

Much has been said, and competently, about the main principles which govern the identification and nomenclature of plants in northern Ethiopia (Abate *et al* 1976, Strelcyn 1973, Lemordant 1971, 1984, Mercier 1976b, 1979b). Mercier made significant contributions to the subject by carrying out a comparative analysis of the plant knowledge held by *däbtäras* or magico-religious healers while the other authors have made equally worthy contributions by concentrating their efforts on the study of popular plant knowledge and nomenclature.

Plant names, in particular, have received a great deal of attention. On popular names, Lemordant (1984) argues that the main criteria governing the attribution of names are morphology and use while Mercier (1976b, 1979b) outlines clearly how not only morphology (including size), animal metaphors and use but also colour, ecology and altitude referents are used by *däbtäras*. The findings of my research in Wag, focussing on plants used for pest management, are completely in line with these ethnobotanical studies. Farmers refer to distinctions of altitude (for example: *yäkolla talo, yädäga talo,* Rhus spp.) to differentiate between species of the same genus. The use of two altitude referents only for plant names (*kolla* and *däga*) is an indirect confirmation of the emic perceptions of altitude outlined in Chapter 3. As such, *woyna-däga* is not used as an altitude referent in the area under study.

More intriguing is the distinction that farmers make between two apparently very similar looking weeds in their fields. Both are referred to as *ïnkïrdad.* The first weed (unambiguously identified as Lolium temulentum) is described as growing exclusively in fields of wheat. It is harvested and threshed together with the wheat. Despite careful sifting, a few grains end up being sown the next year with the wheat. For this reason, farmers sometime call it *yäsinde ïnkïrdad* (literally the *ïnkïrdad* of the wheat). However, farmers also recognise another type of *ïnkïrdad* that grows exclusively in barley fields and which they naturally call *yägäbs ïnkïrdad* (literally the *ïnkïrdad* of the barley). Farmers are adamant that the two species are distinct even if they are very similar looking in the field. Only the "wheat" species and grains of the "barley" species could be observed *in situ.* Grains of the "barley" species are indeed much thinner and longer than those of the wheat species and it is a well-known fact that only the grains of the wheat species are used to add "flavour" to local drinks. However, in the absence of formal identification of the "barley" species, it is impossible to conclude whether the two plants are separate species of the same Lolium genus or two varieties of the same species that have co-evolved separately as weeds with their respective host.

Colour is also commonly used to differentiate between closely related species. Examples in the area under study include the Acacia and the Commiphora genera (*grar* and *ankwa*) as well as an unidentified genus (*ts'alwa*) from the Mimosoidae family, where the colour of the bark is one of the criteria used to distinguish between closely related species. Colour also helps farmers to distinguish between several varieties of a given species: "dark" and "red" for both fenugreek and datura, referring to the colour of the seeds.

Size, morphology, animal metaphor and the use to which a plant is commonly intended are common forms of referents in Wag plant names. To add to the existing gallery of animal metaphors (Strelcyn 1968, 1973, Lemordant 1971, Mercier 1976b, 1979b), it is worth mentioning *yädorogäday* (Stereospermum spp.) and *towant'äla* (Commicarpus plumbagineus). The former means literally "that kills chicken", an allusion to the toxicity of the smoke and ash of this tree for poultry while the latter is of direct relevance to this study on several counts: an Amharic speaker not familiar with Wag Hamra may be tricked into believing that it means literally "an umbrella for bedbugs". The trick here is that the word is an old loanword from the Agawigna language, now commonly accepted as part of the Amharic language in Wag. In Agawigna, *towant'äla* literally means "the remedy against bedbugs". Thus, we have a plant name that not only makes a semantic link between the field of pest management and botany but also provides us with a linguistic indicator or trace of larger forces of acculturation at play between the Amhara and Agaw cultures. Despite a careful screening of the list of plants named in the five communities under study, this plant was the only one found with such characteristics. Another species with strong semantic connotations relevant to this study is *yäkolla talo* (Rhus natalensis), often laid on the ground below the harvested heaps to protect the crop from termites until the threshing is complete. Farmers in the area under study refer to it as *talo* or *yäkolla talo* but the same plant is referred to as *mïst' eybälash* (lit. "The termite does not eat it") in neighbouring Gonder (Edwards 1976).

The various names attributed to species of the Satureja genus provide another possible trace of the confrontation/interaction between the Agaw and Amhara cultures. In highland Meskelo and on the southern side of the central ridge in Shimela, two areas by now well "Amharised", this genus is usually referred to as *yäras kätäl* (literally "the plant for the head"), an allusion to the use of its mildly scented leaves by women. Crushed leaves are mixed with ghee and pasted on the head for hair beauty, particularly during important annual celebrations (Easter, Epagominal days, New year, Epiphany).

For reasons not entirely clear, the same plants are also sometimes dubbed as *yagaw kätäl* (literally "the plant of the Agaw"). Two possible hypotheses can be put forward to explain this duality in naming and the strong cultural reference. It could be first argued that for a number of geographical and historical reasons outlined in previous paragraphs, Wag is one of the last Agaw areas to undergo a process of "Amharisation" in Ethiopia and that the cultural and ethnobotanical interaction between both cultures is recent. Used exclusively by Agaw people, the use of these plants would have been "discovered" as Amharisation proceeded. I am not convinced by this even if it could be argued that Agaw people have a superior knowledge of plant use for hair beauty and treatment since even Agaw men use scented ghee for their hair (though with a different preparation).

Several facts do not support this hypothesis. In particular, nowadays, Amhara and Agaw women alike use the same plants and techniques for hair treatment. Travellers passing through Ethiopia observed the same practice among women (most likely Amhara) in the highlands several centuries ago. Prustky's (1991: 180) comments, although loaded with unnecessary moral judgement, are quite explicit in this respect:

> In the vanity of their hearts they [abeishas] anoint themselves almost daily, especially the women, with mutton fat or oil, or some other unguent, and rub and massage the skin until they shine like mirrors...The women perfume themselves with different sweet smelling, and indeed fetid herbs, and the more they smell, or stink, of them, the more acceptable they are to their husbands.

There is therefore nothing really to suggest that names of plants of the Satureja genus are related to an exclusive Agaw cultural trait. Nor is there any reason to believe that this duality is the result of any geographical endemism of the said genus in the Wag Hamra area. Species of Satureja are commonly found throughout the highlands of Ethiopia.

A more realistic hypothesis would be that plants of the Satureja genus have become correlated with the Agaw culture because of their use in *zar* ceremonies and the frequent association made between populations of Agaw origin and *zar* celebrations. The plant was not mentioned explicitly as being used in such ceremonies in the area under study but other authors have noted its association with *zar* spirits (Mercier 1979b: 158). On the other hand, *dwa*[1] (Kleinia spp.), another plant very commonly associated with the *zar* in the five communities and in Wag Hamra as a whole, was never referred to as *yagaw kätäl.*

Dwa in itself is a complex semantic referent. It points first to the Muslim world as it designates a ritual prayer performed by spiritual leaders of Islam (sheikhs). At the same time, one is left to ponder on the implications of using a plant name with such strong Muslim undertones in what is otherwise known as a fundamentalist Christian Orthodox area, considering that in Wag the same plant is also nearly synonymous with *zar* ceremonies. There is almost the suggestion that *zar* belief and tradition are exclusively Muslim. With such a powerful suggestive name and from a devout Orthodox Christian and Amhara perspective, the plant would seem to epitomise the cultural and religious rift that separates the true Amhara from the rest of the world (Muslim, pagans, Agaws, etc). If indeed there were a hidden suggestion, it would be further reinforced by the fact that *zar* ceremonies also involve the chewing and spiting of *č'at* (Catha edulis) (Leiris 1996), an activity that devout Orthodox Christian people would traditionally associate with followers

[1] The plant is in great demand in Wag. A bundle of a hundred sticks brought to the market will usually be sold by the unit within minutes.

of Islam. However, the reports of Leiris (1996) and more recently of Mercier (1988) and Cassiers and Bessette (2001) have clearly illustrated the fact that the *zar* belief complex is largely a-religious and that both Christians and Muslims orchestrate and take part in *zar* ceremonies. Besides, the current fast expansion of *č'at* plantations in Wag and the concurrent sharp rise in consumption in many parts of the Zone beg serious questions regarding the specificity of the association of *č'at* chewing with the Muslim world.

When approaching the predominantly Agaw areas of Zuqualla in the community of Yekatit Dewol, it becomes apparent that certain plants have both an Amharic and an Agawigna name: *č'ärät* (Agave spp.) in Amharic becomes *biska* in Agawigna, *astänagïrt* (Datura stramonium) is *bebsa* in Agawigna, etc (see annex 5.1 for details). In fact, a multi-layered duality of naming is observed on the Agave genus. On a first level and to differentiate between the local (Agave sisalana) and the exotic or newly introduced species of Agave (Agave americana), farmers have respectively added *yäfäränji* ("non-Ethiopian") or *yabäša* ("Ethiopian" in general with a slight Amhara-Tigray emphasis) to the Amharic name *č'ärät* and to the Agawigna name *biska*. On a second level, *yabäša č'ärät* sometimes gives way to *yagaw č'ärät* (literally the Agaw sisal), whereby the ethnic Agaw factor is heralded as a symbol of what is local or "Ethiopian". This case is yet another ethnobotanical hint or marker of wider acculturation processes at play in the area under study.

The confusion between *lit* and *tult* (Mercier 1979b: 163) was partially observed in the five communities under study suggesting a micro-local rather than a regional dimension to the phenomenon. Mercier has shown that the Amharic names for a Rumex and a Malva species are interchangeable depending on the region where they are found (Gondar or Shoa). Evidence from Wag has revealed that:

- In Meskelo (highland community): *tult* corresponds to the Rumex species and *lit* to the Malva species.
- In Shimela (midland community): *tult* and *lit* are used indiscriminately for the Malva and the Rumex species.
- In Tsamla (lowland community): The Rumex species is unknown and *tult* and *lit* are used indiscriminately for the Malva species.

In the area under study, it is also important to report the use of certain generic terms to name specific locally perceived categories of plants. Therefore, plants well known for their ability to treat burn wounds (specifically *mušäršära* (unidentified species) and *kutintina / yäjibč'ama* (Verbascum sinaiticum)) are likely to be called either by their name or by a generic name *ïsatabïrd* which literally means "that cools the fire". Similarly, bulbous plants with known therapeutic properties are sometimes simply alluded to as *amoč'*. A classic example is *yäjibšïnkurt / yäjibamoč' / amoč'* (Crinum spp.). *Amoč'* is not entirely synonymous with *šïnkurt* or onion and could almost be translated as "a bulb remedy". In this case, *yäjib amoč'* is a type of *amoč'*. A third example is *bukbuka*, a generic term used to designate any rotten mouldy wood as well as specific tree species, whose rotten mouldy wood is much sought after for household fumigation purposes. *Wäyra* (Olea africana var. europea) and *hïkïma* (Terminalia browni) are common *bukbuka* in Wag.

This type of nomenclature is a form of coding. If a farmer mentions *ïsatabïrd* or *amoč'*, he is the only one to know the plant he is referring to. The vagueness and uncertainty that it introduces and its implications for knowledge transmission are reminiscent of knowledge coding phenomena already described concerning the knowledge nebulae of *däbtäras* (Mercier 1979b, 1988). In our case, the very important and interesting fact to note is that *ïsatabïrd* and *amoč'* were brought forward as plant names by dozens of simple farmers, not the least inclined towards the secretive and esoteric practices of the *däbtäras*.

5.2.2 - Some salient features of cultural botany in Wag

5.2.2.1 - Plants and wisdom

In the rural society of Wag as in most parts of northern Ethiopia (see Levine 1965 for a description of a similar trend in Shoa), age is one of the dominant criteria for establishing a hierarchy between people in everyday life. A young person is always expected to obey and serve his elders. At the same time, it is commonly accepted that men are likely to undergo significant changes as they pass through various phases in their life. From the Menz area in Shoa, Levine (1965: 79) reports that:

> Children are considered inferior because they are governed by ignorance and passion...By about six years he has passed the first "age of reason", but he is wise enough only to stay away from fire...As the child grows older he is supposed to be dominated in turn by each of the four elements. The adolescent is likened to air: flighty, never settled. The young man is like fire: hot in picking quarrels as he is hot

> chasing after women, and altogether not worth very much. Only as a man approaches forty does he begin to gain respectability. He becomes cool, like water...This is the advent of the real age of reason, when a person arrives at an understanding of what is right and wrong in life. Most esteemed of all is the elder, the man of sixty or seventy...He is sober and wise...

Ignoring the idealistic tone of this description, the comparison with the four elements and the omission of the existence (acknowledged by most farmers in Wag) of an age of senility that comes with great age, these various phases described by Levine are quite accurate, or at least bear a strong resemblance to what is in turn tolerated and expected of men in rural societies of Wag. In particular, the sense of slow maturation and the taming of vital energies that comes with the gradual acquisition of experience are concepts, with which the patient and enduring farmers of Wag seem quite familiar. To describe these human phenomena, farmers are keen to use metaphors from the plant kingdom. A young child who has not reached the first age of reason is likened to a plant that has not born any fruit (*fre yällem*). At the other end of the age spectrum, some very old men are keen to emphasise their relationship to (large) trees because of their (implicit) old age: *Yne balinjäraoch nachaw*, literally: "They are my (age) companions".

Furthermore, the esteemed and wise elder is often compared to the *wäyra* tree (Olea europea var. africana) by his younger neighbours and relatives. The choice is by no means fortuitous as the *wäyra* tree is one of the biggest in the Abyssinian environment. Its wood is considered noble and is much sought after for its hardness (ideal for large construction pillars and for making tools particularly for ploughing) and its resistance to termites (ideal for building grain stores). The price to pay for such wood is of course patience. It is one of the slowest growing species in the highlands. In contrast, it is not uncommon to hear older men rebuff younger, "less matured" men during discussions and arguments with veiled insults such as *dädäho* (Euclea shimperi) or *talo* (Rhus retinhorrea), two species notorious for their short size and light wood (ideal for baking), their very fast growth and ability to sprout almost anywhere like weeds (two characteristics which make them a nuisance to farmers during the first soil preparation).

5.2.2.2 - Plants and gender

Discussions with men and women about plants reveal different associations with the plant world. The Wag farmer tends to associate himself immediately with large trees found in the wilderness. They evoke the sense of strength and wisdom mentioned previously but are also important to him directly as sources of construction materials and working tools because of the quality and shape of the woods involved. They also speak to him of distant fields, places and official meeting grounds, where men discuss important community matters (food aid, court cases, development activities, etc).

By comparison, women are more comfortable discussing species more commonly found around the household (backyards) or in gardens alongside the river. This is a sphere of plant knowledge that men are keen to discard publicly as unmanly, the plants concerned being usually small, inconspicuous, sometimes aromatic and often annual. This rather simple and almost Manichean gender dichotomy sets the background for the following and much more detailed synchronic gender analysis of botanical pest management knowledge and use presented in section 5.4.

5.2.2.3 - Plants and the spiritual world

To this day, a number of pre-Christian beliefs persist in Wag Hamra. In particular, it is still widely believed that spirits called *qolle* in many parts of the northern highlands (Messing 1957, Young 1970, Mercier 1979c) have their residence in specific places, particularly in large trees and alongside rivers and streams. Women are always advised not to travel alone to the river to fetch water. In Wag, preferred tree species for these spiritual entities include all the large tree species such as *wäyra* (Olea europea var africana), *dokma* (Syzygium spp.) and *warka* (Ficus vasta). In addition, the Orthodox Christian tradition in Wag (as in other parts of Ethiopia) has tended over time to blend and to merge all the spiritual forces perceived as negative by the Church (*qolle, zar, aganänt* (fallen angels *sensu stricto*)) under the generic *aganänt* or devil (*sensu lato*) and ultimately under the generic *Säytan* or Satan (fallen archangel Satanael). Devils in Wag, then, are also said to favour certain places such as rubbish and ash dumps near the village (also mentioned by Griaule 1928) and small or medium plant species (*bahïr kulkwal* (Opuntia ficus-indica), *k'ulkwal* (Euphorbia ampliphylla) and *gulho* (Ricinus communis). During the course of the study, this point was brought back home very strongly when a farmer in Meskelo decided to uproot all the Castor oil trees in his backyard after his mother fell ill and was declared insane, or in local terms, possessed by a devil.

Moreover, according to strict Ethiopian Christian Orthodoxy, knowledge of plants for purposes other than daily life activities (food, drink, construction, tools, etc) is not encouraged. The layman farmer, follower of the Church, should not concern himself with the acquisition of botanical medical knowledge as the power of faith (including the use of Holy water) is deemed superior to any other form of medical treatment.

In addition, the simple farmer does not want to be associated with the *däbtära* or magico-religious healer, who is familiar with the esoteric and worse still, is rumoured to draw satanic contracts with *aganänt* (*sensu lato*) in return for increased esoteric knowledge. Since *däbtäras* are famous for their extended knowledge of plants and their combined use with occult prayers and practices (see Griaule 1930, Strelcyn 1968, Mercier 1988 for very detailed information on the subject), no farmer wants to be seen as taking an initiative to increase his botanical knowledge for fear of being also suspected of being acquainted with the esoteric. Accordingly, a farmer may be reluctant to acknowledge his familiarity with some of the "favourite" plants of the *däbtära*, even if these plants are conspicuous, ubiquitous and impossible to ignore. In the case of our study, examples of such "dreaded" plants that made farmers uncomfortable during interviews included the parasite *täkät'säla* (Tapinanthus spp, the plant *par excellence* of the däbtära), *astänagirt* (Datura stramonium), a very common backyard plant, and to a lesser extent *yämder ïmbuay* (Cucumis ficifolius), *yäset kïst* (Asparagus spp) and *bäläs* (Ficus palmata), usually found near streams. Although the Tapinanthus genus and other very similar looking parasites of the Loranthaceae family are very common at all altitudes in the area under study, only two men out of three and a little over half of the women interviewed during the quantitative survey reported that they knew this type of plant. Concurrently, about one adult in 10 interviewed claimed that he did not know the Datura species, even if conspicuous specimens were often seen in the backyard of the person being interviewed.

Timbaho (Nicotiana spp. including Nicotiana glauca and Nicotiana tabacum) is considered as devilish in Wag as in many predominantly Christian areas of the Highlands, not because of its potential use by *däbtäras* but because of its troubled link with Christian history. Following the crucifixion of Jesus Christ, all plants surrounding the Cross are said to have withered and died, with the notable exception of *timbaho*...This explains largely why farmers in Wag consider cigarette smokers with a mixture of caution and suspicion.

In extreme cases, and on at least two occasions, farmers (a priest and a church student) interviewed during the survey became angry at the suggestion implied by the interview that they might know a few plants and subsequently refused to identify any plant at all (even the most benign ones).

The case of the *zar* plants is less straightforward. Although *zar* ceremonies are proscribed by the Orthodox Church as idolatry, Christian farmers are much less reluctant to name plants commonly used during *zar* ceremonies. Unprompted, farmers (including more than 20 children and adolescents) named *zar* plants more than 80 times during the course of the quantitative survey (Mainly *dwa* (Kleinia spp), *adäs* (Myrtus salicifolia), *wïgïrt* (Silene macroselen), *koso* (Hagenia abyssinica) and *wäyra* (Olea europea var africana). This is clearly more than anecdotal evidence and suggests a rather sustained degree of exposure of the people interviewed to *zar* ceremonies.

Simultaneously, *dwa* is often talked about as being a favourite plant of the Devil, and not only because of its use in *zar* ceremonies. People have observed that the plant only grows on near vertical cliffs, usually on the upper half of the cliff where fragments of soil are still loosely held by rocks within seemingly close reach of the person trying to harvest the plant. It is this tantalising closeness that has caused and continues to cause the death of many young boys and adolescents in Wag, intent on harvesting the plant. Moreover, old people have also noted that the plant becomes very abundant during and after serious episodes of drought.

5.3 - Botanical pest management in Wag Hamra: a large, diversified and complex field of ethnobotany

5.3.1 - Plants and remedies

5.3.1.1 - Overview

As mentioned in the introduction, the study was launched with the objective of revealing and consolidating a field of knowledge that has only been hinted at in the Ethiopian ethnomedical literature. However, there were few indications and clues as to the volume and extent of knowledge that the study would unearth. To give a measure of the significance of the overall findings, it is perhaps fitting to present in turn the findings of each research phase. After the qualitative phase (semi-structured interviews with 60+

knowledgeable informants), more than 150 remedies had been identified, involving the use of more than 50 distinct plant species. As mentioned above, these remedies formed the basis of the second part of the structured survey questionnaire (see Chapter 2). At the end of the quantitative survey, the knowledge by farmers of a total of nearly 440 remedies involving the use of more than 100 distinct plant species was reported in five communities alone. This is very significant as it implies that almost an additional 300 remedies and 50 plant species were reported, *unprompted*, during the quantitative survey. It gives an idea of the volume and diversity of this type of ethnobotanical knowledge among farmers in Wag. Nearly 250 of these remedies or "fragments" of knowledge have some degree of consensual depth, owing to the fact that they have been mentioned on separate occasions by at least two different people, which leaves about 190 remedies that have been cited by one person only. Of the latter, 12 are remedies identified during the qualitative phase which have remained unconfirmed during the quantitative survey. The absence of consensual depth for these remedies suggests that potentially they are the expression of local idiosyncratic forces of innovation, at least within the five communities under study. This leaves 178 remedies mentioned only once and during the quantitative survey. A majority of these have already been screened during the field interviewing to filter out possible mistakes by clarifying unusual answers with respondents. Residual mistakes may still be present in the list but they should be few in numbers. This means basically that the 178 "one off" remedies are either traces of an additional body of consensual knowledge or are the expression of idiosyncrasies. To know this, we would need to run a new structured questionnaire survey to find out. While this is impossible to do, we can use the findings of the qualitative research phase to obtain an estimate of the level of idiosyncrasies. Of the initial 152 remedies of the qualitative phase, 96 were reported, *unprompted*, in the first part of the structured questionnaire (84 remedies were reported by people as having been used and another 12 remedies as possible remedies). Therefore, if we apply the same conservative ratio (96/152 or approximately two thirds as opposed to the more liberal ratio 140/152 or nine tenths) to the 178 "one off" remedies obtained during the quantitative survey, we reach the conclusion that more than 350 remedies identified during the whole research have some degree of consensual depth. This again points to the significance of this type of plant knowledge in Wag. In order to further appreciate this wealth of knowledge of botanical pest management, it is important to focus on the different modes of use and strategies involving plants that farmers resort to.

5.3.1.2 - Modes of plant use: another indicator of knowledge wealth

a) Direct application of plant parts/extracts.

This mode of use is the most common and can be further divided according to the different ways in which the direct application of the plant part/extract is made:

Rubbing: plant parts, often freshly cut leaves, are rubbed against a surface and have a repellent effect on pests. This technique is used for example inside grain stores against weevils. Prior to filling a newly built store with the product of the new harvest, the inside of the store is rubbed with the weevil repellent plant.

Washing: plant parts are minced or hashed, mixed with a liquid (not necessary if the plant part is sap) and the solution/paste is used to scrub a surface. This technique is used for example to wash clothes and kill body lice or to kill head lice (for men) or on the coats of young animals to kill/repel lice and fleas.

Smearing: plant parts are minced or hashed and mixed with a liquid or a substance (like ghee for example) to form a semi-solid paste that is used to smear and cover the surface. This technique is used for head lice treatment (for women), to kill ticks on cattle, to repel flies on wounds and to deal with jigger fleas. When the plant sap is already quite oily, as in the case for of Aloe spp. and Commiphora spp., the addition of ghee is not necessary and the sap is directly applied (on the head, the wound or the tick). A well-known example of the use of sap as paste is the direct application of Aloe sap on wounds to repel flies. In the case of the jigger flea, the modus operandi is slightly different. The plant paste is not used to extract the pest itself (this is most commonly done with a needle) but to smear the wound that this operation creates. According to farmers, the "jigger flea" wounds do not heal properly and become infected if left untreated. It is believed that the insect secretions and residues present in the cavity burrowed by the insect inside the flesh are responsible for this. When the sap of the plant remedies used is known to be caustic (as in the case of Calotropis procera for instance), the leaves are first toasted and then only minced and hashed. This process reduces the burning/stinging effect on the wound.

Inserting: when pests are not directly accessible, as is sometimes the case with ear ticks, juice is extracted from the plant and inserted into the ear to expel the pest. Another original example of this technique is the introduction of diluted Aloe sap into the main entrances of ant nests (*k'inč'ara*: *teff* eating ant). Farmers do not know whether this technique kills or repels the ants but notice that it is effective.

Spraying: juice is extracted from the plant, diluted with water (sometimes cattle urine) and sprayed with a flywhisk. This technique is mainly used inside the household to repel/kill bedbugs and fleas.

Mixing: plant parts are cut from the plant and applied without any form of processing. This technique is commonly used to repel weevils inside grain stores. Leaves are directly mixed with the grain. This technique can be used in addition to the rubbing of the insides of the store described above. In certain areas where the risk of weevil infestation is high and when certain crops are more susceptible to weevil infestation (beans, sorghum) than others, farmers mix the leaves with the crop on the threshing ground, immediately after harvesting. The weevil repellent is then "threshed" together with the grain, ensuring that the crop is protected even before it reaches the grain store.

Plasters: ashes and fresh cattle dung are often mixed into the equivalent of a plaster and smeared over the walls of the household (and sometimes also on the insides of grain stores). This technique is purely preventive and is believed to reduce bedbug, flea and ground maggot (and weevil) infestations for several weeks or even months.

b) Smoking

This technique is also widespread in Wag Hamra. Plant parts are lit and used as fumigants to repel/kill pests, particularly household pests. It is known to be used against flies, the three types of fleas identified in the area under study (parasites on humans, cattle and poultry), bedbugs and for the smoking of grain store as an additional weevil repellent technique. Refinements to the technique include the use of wet branches to increase the potency of the fumigation and the use of specific rotten mouldy woods (*bukbuka*). Traditionally, this technique is considered dangerous and requires a careful and precise handling and monitoring. Sufficient plant material must be accumulated and burned slowly in such a way that the fumigation will last at least an hour while the house remains closed. Reported cases of a roof catching fire during the process because of improper burning are not rare.

c) Laying plants on the ground

This is undoubtedly one of the very inventive techniques used by farmers in Wag and probably elsewhere in northern Ethiopia. Freshly cut plants are laid on the ground where they can serve different purposes:

Repellence: some plants laid on the ground have a repellent effect on pests. This technique is particularly used inside the household at night to repel fleas from the mattresses and couches. Applications of this technique have also been conceived in the agricultural field. Freshly cut crop stalks are not laid directly on the ground for fear of termite attacks, particularly with *teff* harvests. Instead, leafy branches are first laid to form a carpet on the ground. Farmers believe that this technique has a double effect: some plants will have a mild repellent effect sufficient to keep termites at bay until a few days later when the threshing begins. In addition, they have observed that compacted branches and leaves of certain species form a physically impregnable barrier against termites (from below that is), whereas other species do not. *Dädäho* (Eucla shimperi), *talo* (Rhus spp.) and *kitkita* (Dodonea angustifolia) are plants that combine both qualities. In comparison, *ïmbwač'o* (Rumex nervosus) has a very mild repellent effect but forms a very poor physical barrier.

Glue trap: some plants are laid on the ground to trap household pests (bedbugs, fleas and ground maggots) with their gluey sap. This is done by cutting large bunches and by pressing them on the ground or against the walls, which causes the sticky sap to exude from the plants. The lightweight insects, upon touching the plants, are paralysed. When the house owner considers that enough insects have been trapped, the plants are removed and a fresh bunch is brought in. *Qunisa* (unidentified species) and *towant'äla* (Commicarpus plumbagineus) are classic examples of plants used with this technique. As mentioned above, *towant'äla* works best on bedbugs, hence its application on walls since bedbugs nest in roofs, but is also used occasionally against fleas and ground maggots. *Qunisa* is laid on the ground primarily for the purpose of trapping fleas. One of the disadvantages of the technique is that both plants are seasonal and that within the growth season, the sap reaches its maximum stickiness at a specific time. In addition, the technique is quite labour intensive. The plants dry up quickly and must be renewed frequently.

Deceit: this equally original technique consists in apparently tricking ground maggots in believing that they are biting human arms. Long branches are specifically chosen for their softness and smoothness (for example Jasminum abyssinicum or Euphorbia tirucalli) and laid on the ground or below couches. The ground maggot bites the plant believing it is human and poisons itself.

d) Attractants

This technique of using plant attractants appears to be specifically geared towards the management of agricultural pests. I have already mentioned in Chapter 4 the use of specific soft and termite sensitive woods to attract termites (which has the result of deflecting their attention from the surrounding crop).

Another strategy conceived for *teff*-eating ants consists in dropping *teff* or barley threshing residues on the main ant paths. The ants take the residues for food and carry it back to their nests. By the time they have finished, the planted *teff* has germinated and is much less sensitive to their attacks.

e) Plants used for their morphological characteristics

A few plants are chosen specifically to combat pests because of a unique morphological feature. The horsetail-like appearance of the annual plant *dog* (Ferula communis) and its subtle aromatic fragrance make it an effective flywhisk at the beginning of the rainy season.

Thorns of the unpleasant *käntafa* plant (Pterolobium stellatum) are sometimes used to burst and kill ticks inside the year because of their unique curved and quite ear-fitting shape. Also, thorns of the small *yayt šoh* bush (unidentified species) are thin and sharp enough to easily burst and kill cattle ticks.

5.3.1.3 - Combinations of plant and animal remedies

There are numerous remedies in which farmers deliberately mix a plant part or extract with animal by-products such as ghee, urine or dung. Ghee is commonly used in combination with plants for head lice, jigger fleas and cattle ticks. Paul Mérab (1912: 89), private physician of the Emperor Menelik, had already noted the virtues of the use of ghee by the Abyssinian people:

> Contre [ces hôtes gênants] de la tête, ils ont un remède qui est pour le moins aussi abyssin que le kosso : c'est le beurre, qui comme l'huile, tue très bien les parasites en obstruant leurs orifices de respiration trachéale...Ainsi donc, ce fameux beurre qui fait l'horreur des Européens préserve les indigènes des microbes autant que des macrobes[23]. (Ibid p.107).

However, in the area under study, the issue of the relative virtues of ghee and botanicals to deal with the above mentioned pests gives rise at times to endless and inconclusive debates among farmers in Wag. During the qualitative interviews, some women have argued for example that ghee alone is an effective remedy against head lice while others claim that only plant shampoos can properly repel the insects. The quantitative results of the survey indicate that the use of ghee alone to treat head lice is much more common than the combined use of ghee and plant extracts or than the sole use of plant extracts. On the other hand, the combination of ghee and a plant extract is considered necessary in the case of cattle tick treatments, since ghee alone does not repel or kill ticks.

Cattle urine is sometimes used as an adjuvant to "spray" botanicals either on household pests, mainly bedbugs, or on livestock pests (lice and fleas). It is again tempting to believe that the combination of both products is more effective than the individual components of the remedy. In this case, it would not be entirely unrealistic to suggest that ammonia based substances held in urine contribute to softening the cuticle of the insects, thereby decreasing their natural defences to plant extracts.

Finally, ashes are often mixed with cow dung to make insect repellent plaster, applied on the surfaces of walls, couches and grain stores.

5.3.1.4 - "Generic" versus specific plant remedies

Farmers make a distinction between specific and less specific plant remedies as if to draw a line between the equivalent of generic and specific plant remedies for pest management. In this sense, "generic" botanical remedies are mainly used to repel household pests. For instance, the smoke of any wood or plant species can be used to repel flies and other troublesome flying insects but some plant smokes are known to be much more effective than others: *wäyra* (Olea africana var europea), *wïgïrt* (Silene macroselen), *hïkïma*

[23] Translation: "To deal with these troublesome head pests, they have a remedy that is as Abyssinian as kosso can be: ghee, like oil, kills the parasites by obstructing their tracheal breathing orifices...So, then, this same ghee that disgusts Europeans protects indigenous people against both microbes and macrobes."

(Terminalia browni), etc. Against weevils, the ashes of any normal wood burnt inside the household can be used inside the grain store. However, farmers of the lowlands are aware of the superior repellent qualities of the ashes of certain woody species and use them accordingly. On the other hand, and almost by negative contrast, all farmers know that the smoke and ashes of certain tree species are toxic, either to animals or to human beings (see Chapter 7).

In the case of field termites also, any leafy branch can be laid on the ground below the harvested heap to form a barrier against termites before threshing, but certain plant species are known to have a better repellent effect than others, and will be sometimes selected accordingly. The choice of generic versus specific plant species appears to be largely driven by contextual considerations, such as the comparative availability of generic and specific plant remedies in the immediate neighbourhood, and the perceived intensity of the pest infestation. Predictably, generic remedies are more likely to be used when pest infestation or the risk of pest infestation is low and when specific plant remedies are not available within the immediate vicinity of the household (or field).

5.3.2 - Plant remedies within the broader context of pest management

Of the almost 7500 remedy quotes made by the 349 respondents during the first part of the structured questionnaire, it is worth noting that botanical, chemical and mechanical remedies form the bulk of all the remedies mentioned unprompted (more than 80%). Specific and generic plant remedies total nearly 2500 quotes followed by mechanical/physical remedies (more than 2100 quotes) and chemical and synthetic products (nearly 2000 quotes). The remainder is made up of animal product remedies, inorganic product remedies and "religious" remedies. The diachronic interaction between the introduction and use of chemical/synthetic remedies and the evolution of the use and knowledge of plant remedies for pest management is analysed in Chapter 6. The issue of the relationship between the use of mechanical/physical remedies and the use of plant remedies is also a complex and diversified one. First of all, there is a range of "preventive" remedies that do not compete but rather complement the use of plant remedies. They include the cleaning of the house for household pests, the fast harvesting and threshing of crops to avoid respectively the most "voracious" phase in the life cycle of grasshoppers and termite infestations. Other cases are examples of plain common sense. If given the choice, a farmer will build his grain store or lay his harvested heaps on large stony areas rather than on the soil as a first protective measure against termites.

A second group of physical remedies includes measures taken when pest infestation levels are too high or too advanced for any botanical remedy to be effective: changing house or sleeping outside when flea/bedbug bites become unbearable, emptying stores and exposing the grain to fire or to the sun to expel weevils that have become too numerous.

There is finally a third category of remedies that compete directly with plant remedies. If given the choice, farmers will choose a physical remedy because it is not time consuming and easy to use: covering a wound with paper, plastic or a piece of cloth rather than looking for the fly-repellent sap of a plant, shaving the hair off (for men) rather than looking for a plant, making a shampoo against head lice and washing it off, picking, killing, destroying, bursting fleas, bedbugs, lice and ticks by hand rather than spending a lot of time in searching, preparing and applying the plant remedy. It would appear that the occasional use of plant remedies in such cases is highly contextual and determined by the combination of chance events and the simultaneous availability of specific plant remedies. In some cases, it is more than likely that gender and age influence the choice of remedy. Head lice are a good example in this respect. In general, men are less likely to use any product (botanical or animal) than women. They resort in a majority of cases to simple hair cutting or complete head shaving to deal with head lice infestations. Children are also more likely to use products than adults. Young shepherds in particular appear to be more inclined towards the use of botanical shampoos than grown-up men.

While this competition factor explains why plant remedies are so rarely used for ticks affecting humans, it fails to highlight the reasons why plant extracts and manual measures are equally used to deal with livestock ticks. The difference then is that cattle in general have a much larger body surface potentially exposed and that the udders of cows in particular are sensitive to tick infestations. Farmers know that tick wounds on the udders can cause infections and thereby alter the quality and quantity and milk produced, hence their choice of plant products often in combination with ghee rather than the simple pulling out, cutting or bursting of the tick that would leave the tick wound untreated. It seems that the remedy is chosen specifically for its dual properties of repelling/killing the tick (which drops off) and of healing the tick wound (see Chapter 7 on continuum of plant use for a further discussion on the subject).

The information presented so far is equivalent to the knowledge that an omniscient hearer – speaker would have accumulated and synthesised. To decipher and highlight the less visible mechanisms that govern the distribution of plant use and knowledge in space, simple statistical tests were run on the data collected.

5.4 - Synchronic analysis of the use of plant remedies and of plant remedy knowledge

All the botanical information related to pest management collected during the quantitative survey is summarised in its simplist form in Table 5.1, which shows the percentage of people who report respectively the use of plant remedies (USE), the knowledge (unprompted) of plant remedies (RAW K) and the knowledge (prompted) of plant remedies (TOTAL K) for each type of pest. RAW K includes USE (all the plants reported as having been used by the informants) and all the possible remedies (not used) cited by farmers in the first section of the structured questionnaire. TOTAL K includes RAW K and all the additional remedies recognised by farmers as valid when prompted in the second part of the structured questionnaire.

Table 5.1: Proportion of people interviewed reporting the use and knowledge (prompted and unprompted) of botanical remedies for pest management.

Pest type	USE (%)	RAW K (%)	TOTAL K (%)
FLY	20	22	49
WOUND FLY	41	46	85
GROUND MAGGOT	26	37	60
JIGGER FLEA	5	10	27
EAR TICK	10	19	27
BEDBUG	9	13	50
EAR PEST	3	8	38
SCABIES	8	11	43
BODY LICE	38	40	44
MOSQUITO	1	1	19
HEAD LICE	5	7	70
FLEA	12	19	46
TICK	1	1	2

LIVESTOCK LICE	24	37	56
LIVESTOCK FLEA	23	30	53
CHICKEN FLEA	26	37	56
CATTLE TICK	5	10	34
MANGE MITES	2	4	20
WEEVIL	4	6	22
TEFF EATING ANT	8	12	12
GRASSHOPPER	1	1	1
FIELD TERMITE	3	4	25
HARVEST TERMITE	27	57	81

A summary analysis of the household values suggests the existence of four categories of remedy:

a) Remedies that are used and known in a majority of households (remedies against flies in the air and on wounds, ground maggots, body lice, livestock lice and fleas, chicken fleas and termites). The use of botanical remedies against these pests is reported in more than half of the households. Such high figures and therefore low inter-household variation suggest a fairly even distribution of the knowledge among the population, regardless of altitude. Knowledge of such remedies is clearly public knowledge.

b) Remedies that are used in a minority of households but known in a majority of households (remedies against bedbugs, scabies, head lice, fleas, cattle ticks). The use of botanicals against these pests is reported in less than a third of the households but more than two thirds of the households know the existence of such remedies. This also suggests a fairly even distribution of the knowledge among the population but also points out to other exogenous factors to explain the lower use figures.

c) Remedies that are used and known in a minority of households (remedies against jigger fleas, ear ticks, ear pests, mange mites, weevils, field termites). A range of factors is suggested to explain this high level of inter-household variability: age, gender, pest incidence and distribution, altitude, knowledge specialisation in the population that would affect the "public" nature of the knowledge.

d) Remedies that are used and known in an extreme minority of cases (remedies against human ticks and grasshoppers). The case of the paucity of remedies for human ticks has already been clarified above. Regarding grasshoppers, the case is interesting since it is proof that word of the recent work undertaken by the Ministry of Agriculture in partnership with farmers on the trial of botanical pesticides to combat major crop pests (including grasshoppers) is travelling in Wag Hamra. However, the closest communities where the trials are taking place are only 20 km away from the study area and the information should therefore be treated with caution. It is both encouraging to hear that the new knowledge is implicitly replicating itself and disappointing to hear that only two men out of the 93 interviewed are aware of the trials which have been ongoing for the last two agricultural seasons.

Table 5.2: Proportion of households reporting the use and knowledge (prompted and unprompted) of botanical remedies for pest management.

Pest type	USE (%)	RAW K (%)	TOTAL K (%)
FLY	52	55	86
FLY ON WOUND	82	83	100
GROUND MAGGOT	53	70	92
JIGGER FLEA	15	26	58
EAR TICK	25	39	46
BED BUG	28	35	89
EAR PEST	9	25	68
SCABIES	25	31	77
BODY LICE	74	76	79
MOSQUITO	2	3	47
HEAD LICE	16	21	97
FLEA	34	43	75
TICK	0	0	5
LIVESTOCK LICE	63	76	92
LIVESTOCK FLEA	63	74	93
CHICKEN FLEA	67	79	93
CATTLE TICK	17	27	71
MANGE MITES	5	11	44
WEEVIL	11	15	40
TEFF EATING ANT	22	32	32
GRASSHOPPER	1	1	2
FIELD TERMITE	8	10	54
HARVEST TERMITE	73	87	98

A comparison between the trends outlined above and the same summary analysis undertaken this time with compiled figures of individual use and knowledge (Table 5.2) suggests the existence of high degrees of intra-household variability. As an example, the use of plant remedies against livestock lice and fleas is reported by only a quarter of the respondents but by nearly two thirds of the households. This implies that not all members of the household use the same plant remedies or have the same knowledge of them.

5.4.1 - Gender

5.4.1.1 - Plant knowledge and gender

The total number of plant species recognised and identified by respondents during the survey was divided into five sub-categories: very low, low, intermediate, high, and very high. X^2 calculated for the gender variable, irrespective of age, gave a value of 19.48. For four degrees of freedom, this result is significant at the 5% level. We can reject the null hypothesis and confidently assert that knowledge of plants otherwise used for pest control is related to gender in Wag Hamra (see the critical X^2 values presented in Annex 5.2). Student t values were calculated for the whole sample population, for adult men and for children (Table 5.3). In the three cases, the t values are significant at the 5% level. Male members of the population in general, adult men and boys know and identify more plants than respectively female members of the population in general, adult women and girls.

To refine this result, the plants were sorted into the binary categories "near the household"/ "far from the household" and "cultivated"/"non-cultivated". T tests run on these various categories were again conclusive (Table 5.3). Male members of the population in general, adult men and boys know more non-cultivated plants and plants growing far from the household than respectively female members of the population in general, adult women and girls. In contrast, there is no significant difference in knowledge between male and female members of the population regarding plants growing in the immediate vicinity of the household (all t values inferior to the critical t value at the 5 % level see Annex 5.2). These findings are hardly surprising. Boys take on shepherding tasks and leave the house at a very early age, whereas young girls will spend the greatest part of their youth in the immediate vicinity of the household under strict supervision. This early gender differentiation in life style and the greater opportunities that it offers to boys for exploring their natural environment and distant surroundings explains why they know both plants growing in the vicinity and far from the household whereas the plant knowledge of girls is restricted to their immediate surroundings. Married women may find more opportunities to travel away from the household during adulthood, learn to know new plant species and partially compensate for their childhood knowledge gap, but during the same time, young adult men will embark on regular and distant treks for a variety of purposes, thereby increasing their exposure to and knowledge of plant species not normally found at their altitude of normal residence, hence the sustained gender gap in plant knowledge observed during adulthood.

Table 5.3: Summary of Student T tests on gender and plant knowledge

Types of plant knowledge	GLOBAL T values	ADULT T values	CHILD T values
Overall Knowledge	3.37	4.90	2.57
Total 'NEAR' Knowledge	0.38	1.30	0.36
Total 'FAR' Knowledge	3.88	5.20	2.98
Total 'CULTIVATED' Knowledge	1.04	3.20	0.29
Total 'NON CULTIVATED' Knowledge	4.02	5.08	3.37

Degrees of freedom: > 100

5.4.1.2 - Gender and USE

X^2 and t values calculated to test the existence of a relationship between gender and the use of plant remedies for pest management were found to be significant in several cases at the 5% level (Table 5.4 and 5.5):

Flies: we can accept the null hypothesis (Annex 5.2). Gender does not affect the use of plants used in smoke treatments to repel flies inside the household. Although the running of the fire and the coffee ceremony during which plants are smoked are the primary responsibility of women, there are numerous instances when men themselves feed the fire with regular wood (generic smoke repellent) or choose to burn specific types of wood. It is also quite likely that the practise of repelling flies is not considered and reported as gender specific because it potentially involves the participation of men and women. Men are more likely to harvest a particular plant species in the wild and women are more likely to buy more favoured fly repellents from the market. Men sometimes instruct women to do something about the fly situation in the house, without doing anything about it themselves.

In the end, if one piece of wood was actually used as a fly repellent, both husband and wife may report its use separately. The use of plants to repel flies in the household is an example of what could be described alternatively as a joint or loosely defined activity and responsibility.

Fly repellent on wounds: there is a clear relationship between gender and the use of fly repellents on wounds. Boys and adult men use more plant remedies for that purpose than adult women and girls but the difference is only significant at the 5% level for children. Boys tend to use fly repellents twice as often as girls. The difference in use is almost significant for adults (t value of 1.9 for adults compared to the critical value of 1.96). The explanation for the observed gender gap here is more straightforward. Boys and men are more likely to get small wounds given the higher risk involved in their day-to-day activities (shepherding, ploughing, construction, etc).

Ground maggots, bedbugs and fleas: the use of plant remedies for these household pests all provide another illustration of what a joint or loose activity/responsibility inside the household can be. Both men and women can decide unilaterally that floor plants or smoking are necessary or women can inform men that the house is infested and that something needs to be done. In short, there is no relationship between gender and the use of plants to combat ground maggots, bedbugs and fleas once the infestation is declared. The only specificity that exists is in the use of preventive plasters made of ashes and cow dung. Women always perform this activity.

Jigger flea and scabies: There is no significant relationship between gender and the use of plants to offset the attacks of these pests. This is expected in the case of body pests that make no distinction between men and women.

Ear tick: Both the X^2 and t values are significant at the 5% level and indicate that the use of plants to expel ticks from the ear is predominantly a male activity. The possible reasons for this gender specificity are unclear. The only plausible explanation is that boys/men are more likely to be afflicted by the pest because of their frequent wanderings in the wilderness.

Body lice: the results of the statistical tests are interesting. They suggest that adult men are more likely than women to use natural soap plants to deal with this pest (Table 5.5). It shows first that the washing of clothes in one way or another is not predominantly a female activity. Second, it suggests indirectly a different approach to body pests between men and women. It is very likely that women would not wait for lice infestation to reach unbearable levels before acting, not necessarily through the use of natural soaps (hand picking, exposure to the sun, changing of clothes etc). On the other hand, men, busy with physical activities and not really concerned with small pests, would wait for much longer before deciding to do something about it, usually in a decisive manner with the use of natural anti-lice soaps.

Head lice: the results show a significant bias of plant use towards female members of the population for this pest. The phenomenon is particularly pronounced for children. These findings are in line with the explanations given above regarding the use by women of aromatic plants for hair beauty.

Livestock lice and fleas: The results clearly indicate that this is mainly a male activity and that starting from childhood young shepherds are more likely to use plant remedies against these pests than girls. The other point to bear in mind is that the activity is not exclusively male. Women and girls sometimes find themselves in situations where they have to apply the remedy, for instance when the husband is away or when a young girl becomes shepherd by default if there are no young boys in a family. Young kids and calves are frequently left to the care of the women in the vicinity of the household during daytime until they are strong enough to accompany the herds. Moreover, in the lowlands, to maximise the quantity of milk for human consumption, calves are deliberately kept separate from the cows during daytime until the next birth. Depending on the circumstances and the various responsibility arrangements between men and women, women may treat the animals themselves or simply report the matter to their husbands.

Chicken fleas: despite the belief that the smoking of the house against fleas is dangerous and best performed by men, the results show a strong bias in favour of women. Poultry rearing is one of the few activities where women assume complete and unchallenged responsibility and decision making in the household. This obviously also applies to chicken health and the decision to ward off chicken lice with smoke treatments.

Cattle ticks: We can accept the null hypothesis in this case. There is no link between gender and the use of plants to treat ticks on animals. This is an important finding as it suggests that both men and women apply plant remedies against cattle ticks. This is largely due to the fact that women are often responsible for milking the cows and are therefore more likely to spot the ticks on the udders. This activity is possibly a case of loosely defined or joint responsibility between men and women.

Weevils: repelling weevils seems to be another case of joint or loosely defined responsibility within the household. This result is a little surprising since one would have assumed that all activities related to food around the household were the responsibility of women. In fact, it is important to make a distinction between two types of grain stores. The main grain store or *gotära* where the threshed harvest is poured is the joint responsibility of men and women. Weevil repellents are rubbed on the insides of the store or mixed with the grain immediately after the harvest and there is no gender specificity since both men and women perform this activity together. It is the responsibility of women to inspect the grain regularly and to report cases of infestation if necessary, but by then the use of plant weevil repellents is no longer relevant.

There is, however, another type of store called the *gota* that is always located inside the household. It is used to store the grain to be prepared and eaten during a few days or a week or two. This smaller store is invariably built inside the household and is under the strict and sole supervision of women.

Ants and termites: The protection of crops in the field and before threshing is clearly a male activity. As in the case of livestock, men assume ultimate responsibility for the "well being" and protection of crops.

In short, the results point to an overall predominance of men in the use of plant remedies for pest management. It appears that marked and statistically significant cases of gender predominance in plant use are the consequence of existing and strong gender divisions of labour within the household. Men are primarily responsible for livestock and crop production activities while it is agreed in most households that poultry production is the exclusive responsibility of women. Pest management activities and the use of plants that they entail are simply one aspect of these production activities.

Table 5.4: Summary of X^2 tests on gender and USE (degrees of freedom: 1)

Type of pest	GLOBAL X^2 values	ADULT X^2 values	CHILD X^2 values
FLY	0.62	0.25	0.86
FLY ON WOUND	9.85	4.32	7.49
GROUND MAGGOT	1.13	2.71	0.00
JIGGER FLEA	2.08	*	*
EAR TICK	7.40	5.07	*
BED BUG	0.72	2.68	*
EAR PEST	*	*	*
SCABIES	0.92	2.10	*
BODY LICE	1.14	5.65	0.57
MOSQUITO	*	*	*
HEAD LICE	5.08	*	*
FLEA	1.67	2.02	*
TICK	*	*	*
LIVESTOCK LICE	27.78	24.73	7.51
LIVESTOCK FLEA	26.43	26.07	6.00
CHICKEN FLEA	15.76	18.54	0.06
CATTLE TICK	0.20	0.03	*
MANGE MITES	*	*	*
WEEVIL	0.34	0.27	*
TEFF EATING ANT	6.89	6.32	*
GRASSHOPPER	*	*	*
FIELD TERMITE	*	*	*
HARVEST TERMITE	62.34	59.92	12.96
HOUSEHOLD pests	2.28	2.16	1.18
BODY pests	0.64	3.91	0.08
LIVESTOCK pests	1.05	0.26	3.71
LIVESTOCK pests without CHICKEN FLEA	28.55	28.47	7.83
CROP pests	54.86	51.58	14.89
All pests	1.77	3.50	0.90

*: calculation of X^2 inapplicable

Table 5.5: Summary of T tests on gender and USE (degrees of freedom: > 100)

Pest types	GLOBAL T values	ADULT T values	CHILD T values	GLOBAL MALE Aver. **	GLOBAL FEM Aver. **	ADULT MALE Aver. **	ADULT FEM Aver. **	BOY Aver. **	GIRL Aver. **
FLY	-0.23	-0.28	0.37	0.25	0.26	0.33	0.36	0.16	0.14
FLY ON WOUND	2.98	1.90	2.77	0.50	0.33	0.59	0.44	0.40	0.21
GROUND MAGGOT	1.43	1.40	0.92	0.39	0.29	0.56	0.40	0.22	0.15
JIGGER FLEA	1.42	1.49	0.21	0.08	0.04	0.11	0.03	0.05	0.04
EAR TICK	2.78	2.26	1.80	0.15	0.06	0.19	0.08	0.11	0.03
BED BUG	0.97	1.87	-0.96	0.12	0.09	0.20	0.09	0.04	0.08
EAR PEST	0.79	0.54	0.52	0.03	0.02	0.02	0.01	0.04	0.03
SCABIES	0.43	1.01	-0.64	0.10	0.09	0.17	0.11	0.03	0.05
BODY LICE	0.75	2.34	-1.64	0.62	0.55	0.97	0.63	0.28	0.45
MOSQUITO	*	*	*	*	*	*	*	*	*
HEAD LICE	-2.55	-1.60	-2.00	0.03	0.10	0.03	0.10	0.02	0.11
FLEA	1.03	1.01	0.69	0.17	0.12	0.26	0.18	0.09	0.05
TICK	*	*	*	*	*	*	*	*	*
LIVESTOCK LICE	5.26	4.97	2.81	0.41	0.12	0.59	0.18	0.22	0.05
LIVESTOCK FLEA	5.46	5.59	2.48	0.39	0.10	0.61	0.16	0.17	0.04
CHICKEN FLEA	-3.51	-3.87	-0.10	0.23	0.46	0.34	0.73	0.12	0.12
CATTLE TICK	0.51	0.34	1.25	0.06	0.05	0.11	0.09	0.02	0.00
MANGE MITES	1.55	1.57	0.36	0.04	0.01	0.06	0.00	0.02	0.01
WEEVIL	0.76	1.32	0.88	0.05	0.03	0.08	0.03	0.02	0.00
TEFF EATING ANT	2.86	2.70	1.47	0.14	0.04	0.23	0.07	0.05	0.00
GRASSHOPPER	*	*	*	*	*	*	*	*	*
FIELD TERMITE	2.85	2.53	1.44	0.08	0.00	0.12	0.00	0.04	0.00
HARVEST TERMITE	7.55	7.79	3.27	0.67	0.10	0.99	0.13	0.35	0.07
HOUSEHOLD pests	1.32	1.53	0.67	0.95	0.77	1.39	1.04	0.52	0.42
BODY pests	2.72	3.61	8.19	1.63	1.20	2.28	1.43	2.28	0.93
LIVESTOCK pests	3.73	3.59	2.80	1.34	0.75	2.04	1.17	0.64	0.23
CROP pests	7.20	7.08	3.66	0.94	0.17	1.42	0.26	0.47	0.07
LIVESTOCK pests without CHICKEN FLEA	6.51	6.41	3.58	1.11	0.29	1.70	0.44	0.52	0.11
All pests	4.81	5.45	2.45	4.86	2.89	7.13	3.90	2.61	1.66

*: calculation of Student t inapplicable
**: expressed in number of remedies used per person

On the other hand, there are no statistically significant gender biases in use regarding common household pest infestation. This is more surprising since the household maintenance and domestic activities are often believed to be the responsibility of women. The results point to the absence of rigidly defined gender rules regarding the management of pests within the household. Men and women are equally likely to make decisions in this respect and to use the appropriate plant remedies accordingly. Figures 5.1 to 5.5 present a visual summary of these statistically confirmed tendencies.

FIGURE 5.1: AVERAGE PLANT REMEDY USE FOR HOUSEHOLD PESTS ACCORDING TO GENDER

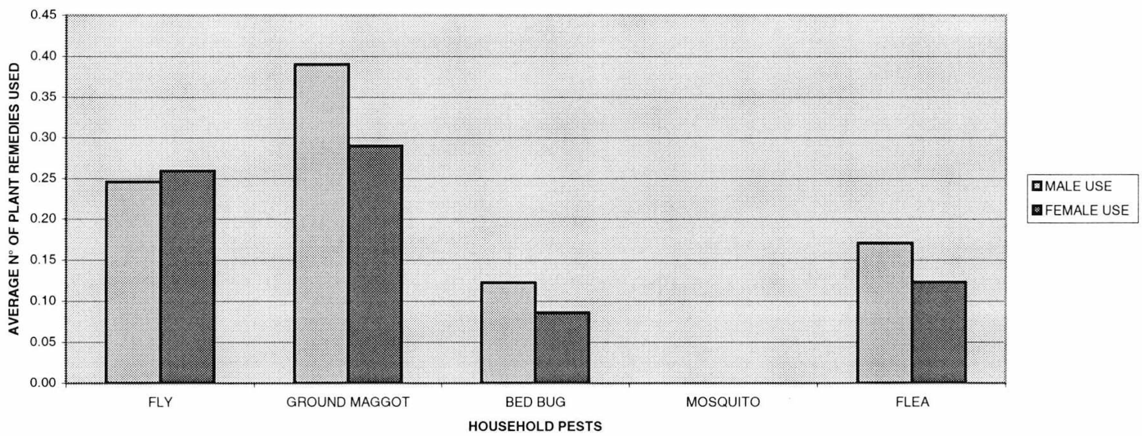


FIGURE 5.2: AVERAGE PLANT REMEDY USE FOR BODY PESTS ACCORDING TO GENDER

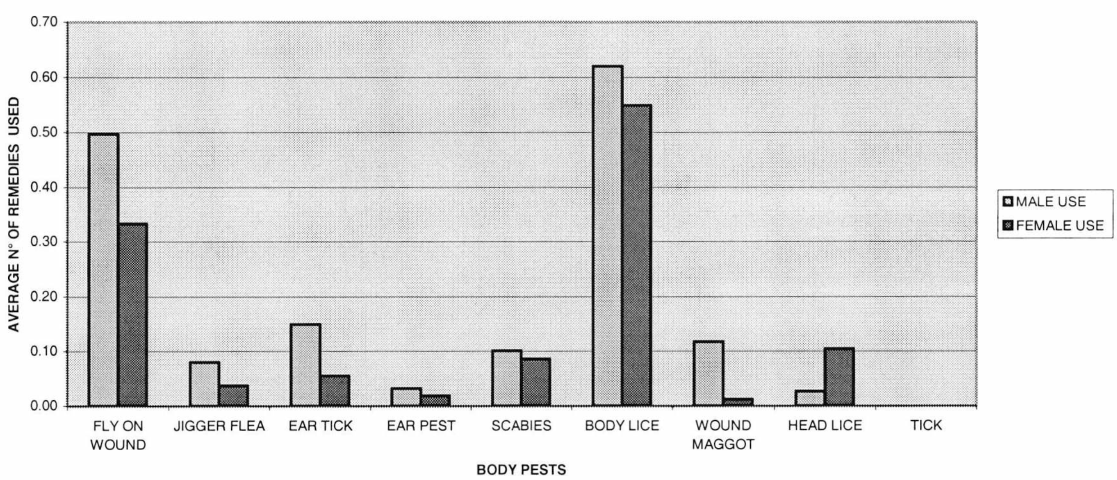


FIGURE 5.3: AVERAGE PLANT REMEDY USE FOR LIVESTOCK PESTS ACCORDING TO GENDER

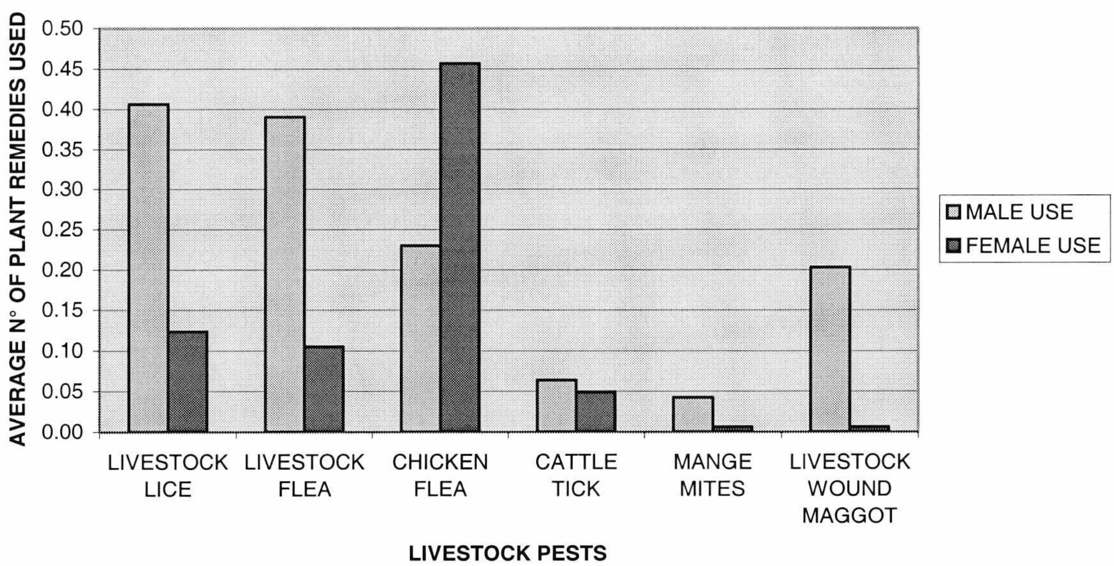


FIGURE 5.4: AVERAGE PLANT REMEDY USE FOR CROP PESTS ACCORDING TO GENDER

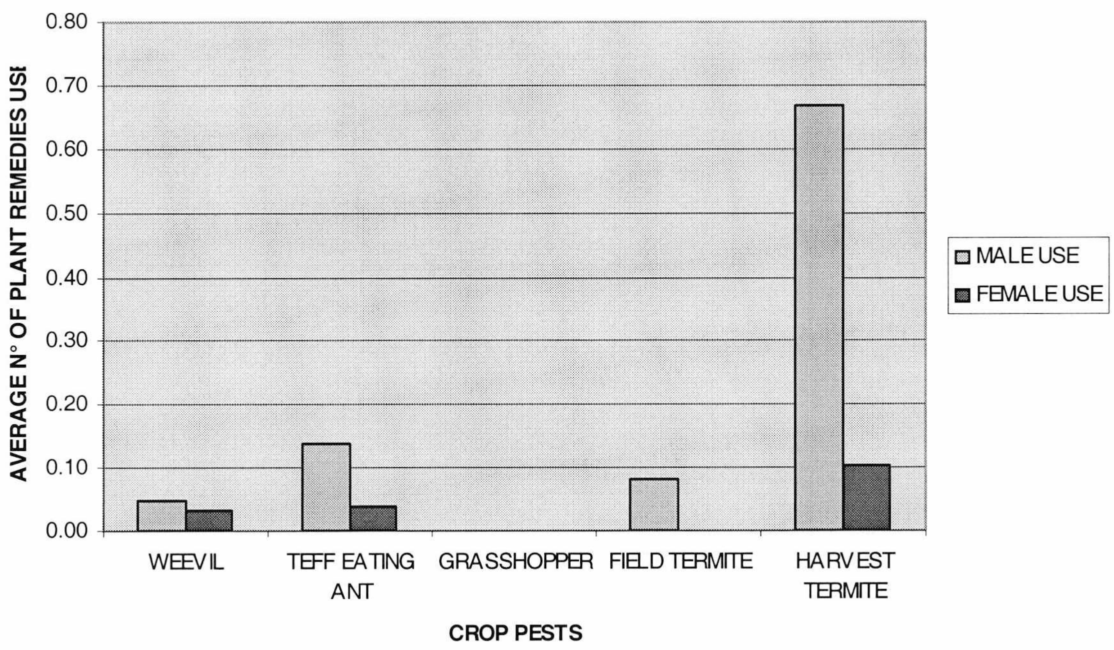
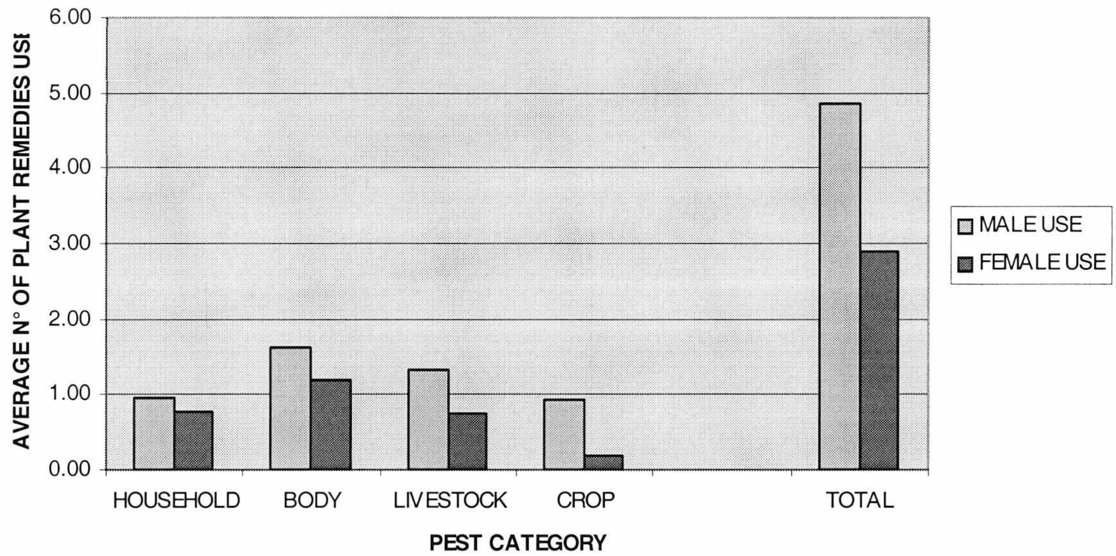


FIGURE 5.5: AVERAGE PLANT REMEDY USE FOR PEST MANAGEMENT ACCORDING TO GENDER



5.4.1.3 - RAW K, TOTAL K and Gender

In terms of unprompted knowledge, the tests performed on RAW K confirm most of the gender biases highlighted by X^2 and t tests on USE (Tables 5.6 and 5.7). For pests such as flies on wounds, body lice and most of the crop and livestock pests (except field termites, ticks and chicken fleas), male members of the population are more likely to be familiar with at least one plant remedy than female members of the population. For head lice and chicken fleas, female members of the population are more likely to be aware of the existence of plant remedies than male members of the population. These findings are significant at the 5% level (Annex 5.2). These results can be visualised on Figures 5.6 to 5.10.

To understand whether these gender knowledge barriers are due to the fact that people, unprompted, don't acknowledge a form of knowledge that is more commonly associated with the opposite sex, X^2 and t tests were also run on TOTAL K (Table 5.8 and 5.9).

The gender knowledge barrier is confirmed for the treatment of most of the pests that showed a "male" bias but unconfirmed for the treatment of chicken fleas and head lice, so far credited with a "female" bias. In addition, while the use of plants for field termites and cattle ticks showed respectively the existence and the absence of a gender bias, the analysis of unprompted knowledge reveals the absence of knowledge barriers for the treatment of both pests. To complicate matters further, the analysis of the prompted knowledge for the same pests shows a very marked "male" gender knowledge barrier.

Table 5.6: Summary of X^2 tests on gender and RAW K (Degrees of freedom: one)

Pest types	GLOBAL X^2 values	ADULT X^2 values	CHILD X^2 values
FLY	1.88	1.27	1.23
FLY ON WOUND	6.47	1.73	7.16
GROUND MAGGOT	1.41	2.19	0.36
JIGGER FLEA	0.64	2.92	0.59
EAR TICK	0.48	0.03	2.78
BED BUG	0.78	1.14	0.05
EAR PEST	0.62	0.03	0.96
SCABIES	0.51	3.31	1.12
BODY LICE	1.42	4.92	0.12
MOSQUITO	*	*	*
HEAD LICE	5.04	1.62	3.73
FLEA	4.38	4.61	0.71
TICK	*	*	*
LIVESTOCK LICE	17.62	17.34	4.61
LIVESTOCK FLEA	24.49	25.24	4.96
CHICKEN FLEA	8.51	5.16	2.47
CATTLE TICK	0.08	0.01	*
MANGE MITES	3.01	*	*
WEEVIL	1.11	0.91	*
TEFF EATING ANT	0.46	0.59	*
GRASSHOPPER	*	*	*
FIELD TERMITE	8.14	*	*
HARVEST TERMITE	7.82	0.47	12.39
HOUSEHOLD pests	2.32	1.70	1.63
BODY pests	0.17	0.87	0.00
LIVESTOCK pests	0.30	1.21	0.15
LIVESTOCK WITHOUT 19	14.88	17.12	3.88
CROP pests	9.98	0.27	17.71
All pests	2.95	0.78	3.16

*: calculation of X^2 inapplicable.

Table 5.7: Summary of t tests on gender and RAW K (degrees of freedom: >100)

	GLOBAL T values	ADULT T values	CHILD T values	GLOBAL MALE Aver.**	GLOBAL FEMALE Aver.**	ADULT MALE Aver.**	ADULT FEMALE Aver.**	BOY Aver. **	GIRL Aver. **
FLY	0.23	0.18	0.53	0.27	0.26	0.38	0.36	0.17	0.14
WOUND FLY	2.46	1.24	2.77	0.55	0.40	0.63	0.53	0.46	0.25
GROUND MAGGOT	1.93	1.75	1.52	0.57	0.42	0.81	0.60	0.34	0.21
JIGGER FLEA	0.98	1.67	-0.48	0.14	0.10	0.22	0.10	0.06	0.10
EAR TICK	0.64	-0.33	1.74	0.21	0.19	0.25	0.27	0.18	0.08
BEDBUG	0.94	1.17	0.13	0.17	0.13	0.23	0.15	0.12	0.11
EAR BUG	0.33	-0.09	0.58	0.09	0.08	0.09	0.09	0.10	0.07
SCABIES	0.37	1.57	-1.40	0.14	0.12	0.22	0.11	0.06	0.14
BODY LICE	0.90	2.30	-1.26	0.67	0.59	1.00	0.66	0.35	0.49
MOSQUITO	*	*	*	*	*	*	*	*	*
HEAD LICE	-2.73	-1.53	-2.34	0.04	0.14	0.04	0.11	0.04	0.18
FLEA	1.98	1.82	1.09	0.28	0.17	0.38	0.21	0.19	0.12
TICK	*	*	*	*	*	*	*	*	*
KIMANDGER	4.32	4.43	2.03	0.53	0.27	0.73	0.35	0.33	0.18
LIVESTOCK FLEA	5.45	5.65	2.30	0.50	0.17	0.75	0.22	0.26	0.11
CHICKEN FLEA	-2.46	-1.94	-1.15	0.39	0.56	0.60	0.81	0.17	0.26
LIVESTOCK TICK	0.51	0.24	0.89	0.12	0.10	0.16	0.15	0.07	0.04
MANGE MITES	1.68	1.68	0.52	0.07	0.02	0.11	0.02	0.04	0.03
WEEVIL	1.40	1.81	0.90	0.09	0.04	0.13	0.04	0.04	0.01
ANT	1.33	1.28	1.04	0.16	0.10	0.27	0.18	0.05	0.01
GRASSHOPPER	*	*	*	*	*	*	*	*	*
FIELD TERMITE	2.85	2.23	1.89	0.09	0.01	0.12	0.01	0.06	0.00
HARVEST TERMITE	2.27	0.84	2.74	0.94	0.73	1.01	0.90	0.87	0.52
LIVESTOCK pests	2.00	1.90	1.41	1.32	0.99	1.82	1.33	0.83	0.59
BODY pests	2.06	2.86	0.16	2.04	1.66	2.73	1.93	1.36	1.33
LIVESTOCK pests	3.63	4.06	1.83	1.88	1.21	2.78	1.66	0.99	0.66
LIVESTOCK without 19	5.81	5.99	2.86	1.50	0.65	2.18	0.85	0.82	0.40
CROP pests	3.22	1.96	3.44	1.28	0.88	1.54	1.16	1.03	0.55
All pests	3.49	3.61	2.23	6.53	4.75	8.87	6.08	4.21	3.12

*: calculation of t value or averages inapplicable

**: expressed in number of remedies per person

Table 5.8: Summary of X^2 tests on gender and TOTAL K
Model 1: proportion of people with knowledge (degrees of freedom: one)

Type of pest	GLOBAL X^2 VALUES	ADULT X^2 VALUES	CHILD X^2 VALUES
FLY	0.06	1.32	1.50
FLY ON WOUND	4.24	8.40	0.47
GROUND MAGGOT	2.32	2.02	2.25
JIGGER FLEA	0.98	3.75	0.30
EAR TICK	0.56	0.17	0.90
BED BUG	1.79	6.59	0.02
EAR PEST	1.32	0.08	1.37
SCABIES	0.16	1.00	1.65
BODY LICE	0.31	3.10	0.64
MOSQUITO	*	*	*
HEAD LICE	0.17	0.04	0.02
FLEA	2.15	10.56	1.17
TICK	*	*	*
LIVESTOCK LICE	16.02	21.55	3.68
LIVESTOCK FLEA	10.89	13.53	2.55
CHICKEN FLEA	0.76	0.00	0.38
CATTLE TICK	6.99	7.14	2.79
MANGE MITES	9.49	3.08	0.12
WEEVIL	0.20	0.19	0.41
TEFF EATING ANT	0.24	0.33	*
GRASSHOPPER	*	*	*
FIELD TERMITE	27.15	21.70	9.18
HARVEST TERMITE	21.21	14.06	10.76
HOUSEHOLD pests	0.12	0.81	0.47
BODY pests	2.15	*	1.13
LIVESTOCK pests	0.02	*	0.02
LIVESTOCK pests without 19	2.26	4.78	1.01
CROP pests	15.36	9.40	9.74
All pests	*	*	*

*: calculation of X^2 inapplicable

Table 5.9: Summary of t tests on gender and TOTAL K
Model 1: proportion of people with knowledge (degrees of freedom: >100)

	GLOBAL T values	ADULT T values	CHILD T values	GLOBAL MALE Aver.**	GLOBAL FEMALE Aver.**	ADULT MALE Aver.**	ADULT FEMALE Aver.**	BOY Aver. **	GIRL Aver. **
FLY	-0.25	1.14	-1.22	0.49	0.50	0.66	0.57	0.32	0.41
WOUND FLY	2.06	2.93	0.68	0.88	0.80	0.97	0.84	0.80	0.75
GROUND MAGGOT	1.52	1.41	1.49	0.64	0.56	0.83	0.74	0.46	0.34
JIGGER FLEA	0.98	1.93	-0.05	0.29	0.25	0.43	0.29	0.16	0.19
EARTICK	0.74	0.41	0.94	0.29	0.25	0.35	0.33	0.22	0.16
BEDBUG	1.33	2.59	-0.13	0.53	0.46	0.75	0.57	0.32	0.33
EARBUG	-1.15	-0.28	-1.16	0.35	0.41	0.46	0.48	0.23	0.32
SCABIES	-0.40	0.99	-1.28	0.42	0.44	0.63	0.56	0.20	0.29
BODY LICE	0.55	1.76	-0.79	0.45	0.42	0.60	0.47	0.30	0.36
MOSQUITO	1.50	1.29	1.25	0.22	0.16	0.32	0.24	0.13	0.07
HEAD LICE	-0.40	-0.20	-0.13	0.69	0.71	0.77	0.79	0.61	0.62
FLEA	1.46	3.31	-1.07	0.49	0.41	0.66	0.42	0.33	0.41
TICK	1.47	1.30	0.88	0.03	0.01	0.04	0.01	0.01	0.00
KIMANDGER	4.07	4.89	1.92	0.66	0.44	0.87	0.56	0.45	0.30
LIVESTOCK FLEA	3.33	3.78	1.59	0.61	0.44	0.80	0.54	0.44	0.32
CHICKEN FLEA	-0.87	-0.03	-0.61	0.54	0.59	0.78	0.79	0.30	0.34
LIVESTOCK TICK	2.66	2.70	1.67	0.41	0.27	0.59	0.39	0.22	0.12
MANGE MITES	1.47	1.75	0.34	0.23	0.17	0.29	0.18	0.17	0.15
WEEVIL	0.45	0.43	0.63	0.23	0.21	0.33	0.30	0.13	0.10
ANT	0.49	0.57	0.76	0.13	0.11	0.23	0.19	0.03	0.01
GRASSHOPPER	1.32	1.38	*	0.01	0.00	0.02	0.00	0.00	0.00
FIELD TERMITE	5.40	4.91	3.08	0.36	0.12	0.49	0.17	0.22	0.05
HARVEST TERMITE	4.72	3.86	3.35	0.90	0.70	0.97	0.79	0.83	0.60
HOUSEHOLD pests	-0.35	0.89	-0.68	0.81	0.83	0.94	0.90	0.69	0.74
BODY pests	1.46	1.40	1.05	0.96	0.92	0.99	0.96	0.93	0.88
LIVESTOCK pests	0.14	0.78	0.16	0.84	0.84	0.97	0.94	0.72	0.71
LIVESTOCK without 19	1.50	2.19	1.00	0.80	0.73	0.96	0.87	0.64	0.56
CROP pests	3.98	3.11	3.18	0.93	0.78	0.99	0.88	0.86	0.66
All pests	1.34	1.45	0.74	0.99	0.97	1.00	0.98	0.98	0.96

* : calculation of t value inapplicable
**: expressed in proportion of people

FIGURE 5.6: AVERAGE KNOWLEDGE (RAW K) FOR HOUSEHOLD PESTS ACCORDING TO GENDER

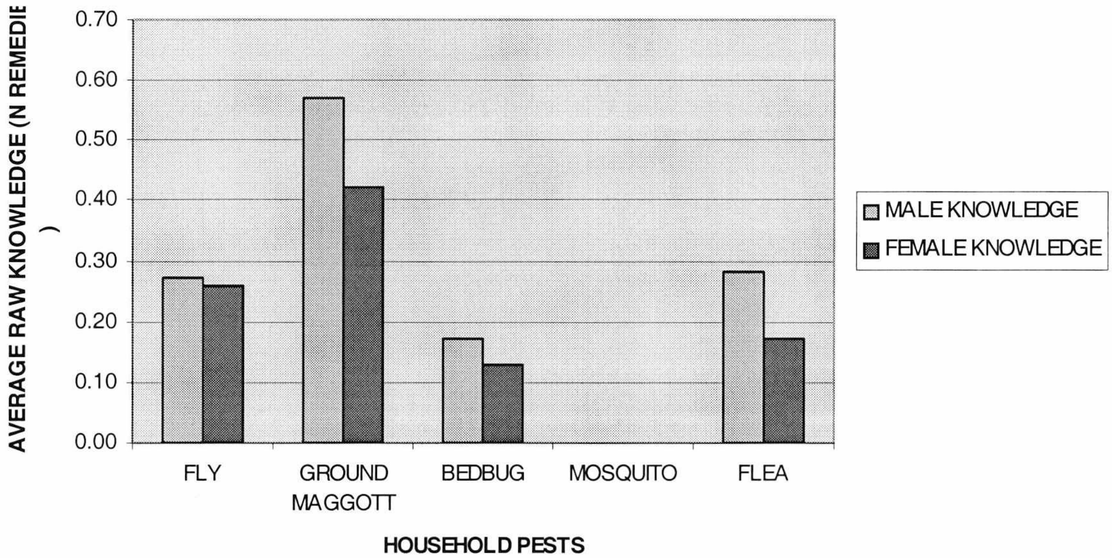


FIGURE 5.7: AVERAGE KNOWLEDGE (RAW K) FOR BODY PESTS ACCORDING TO GENDER

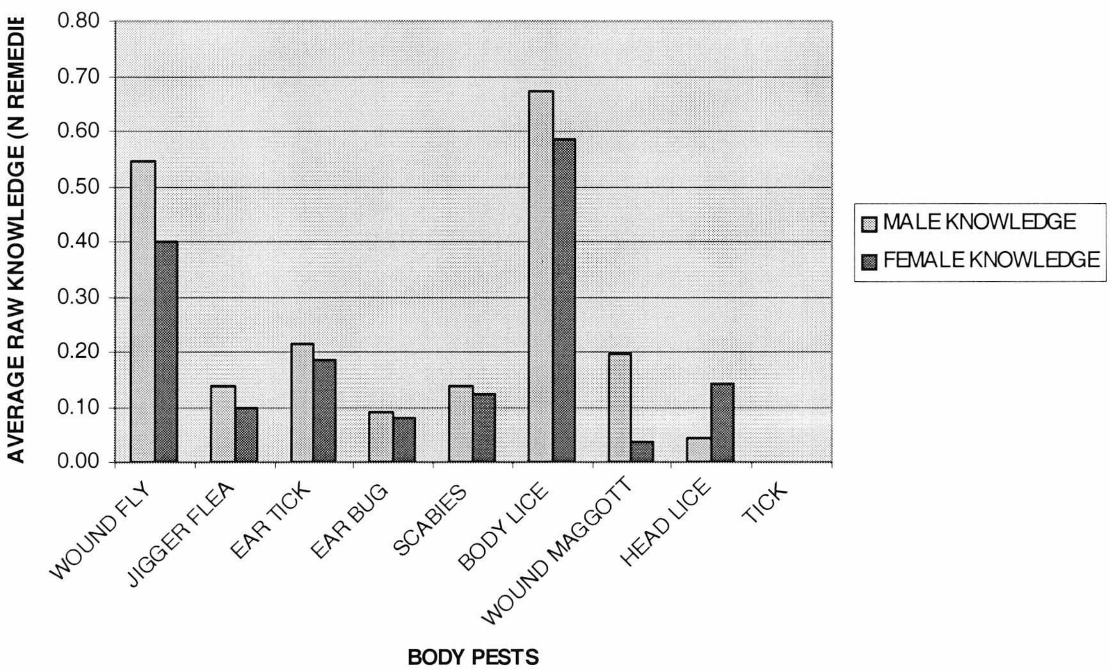


FIGURE 5.8: AVERAGE KNOWLEDGE (RAW K) FOR LIVESTOCK PESTS ACCORDING TO GENDER

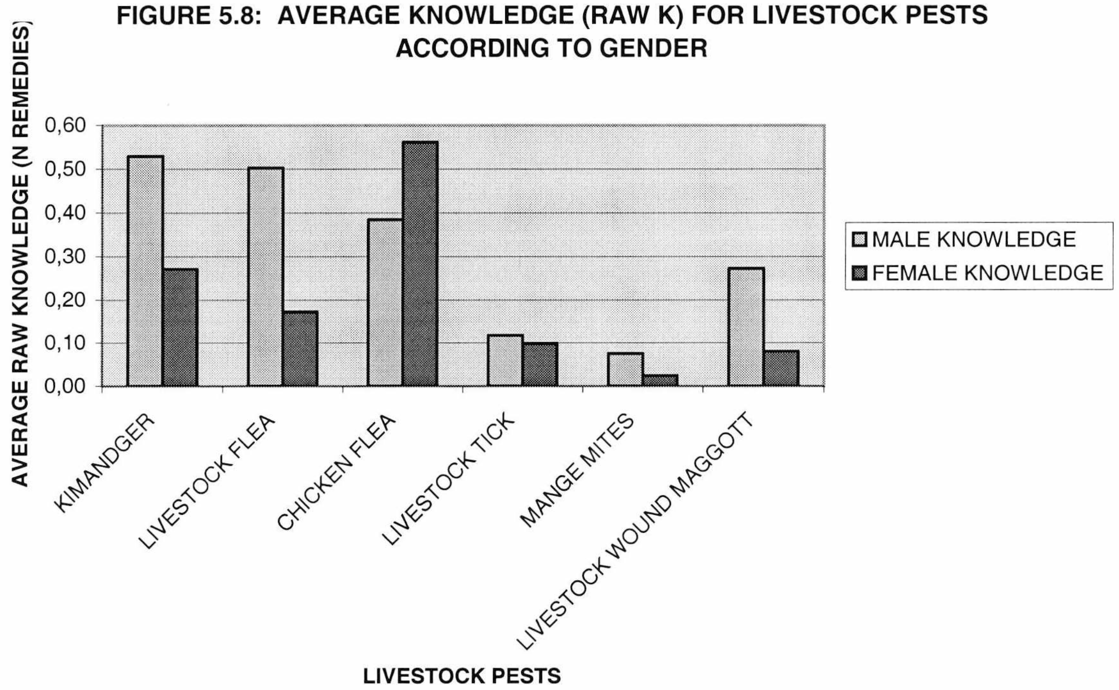


FIGURE 5.9: AVERAGE KNOWLEDGE (RAW K) FOR CROP PESTS ACCORDING TO GENDER

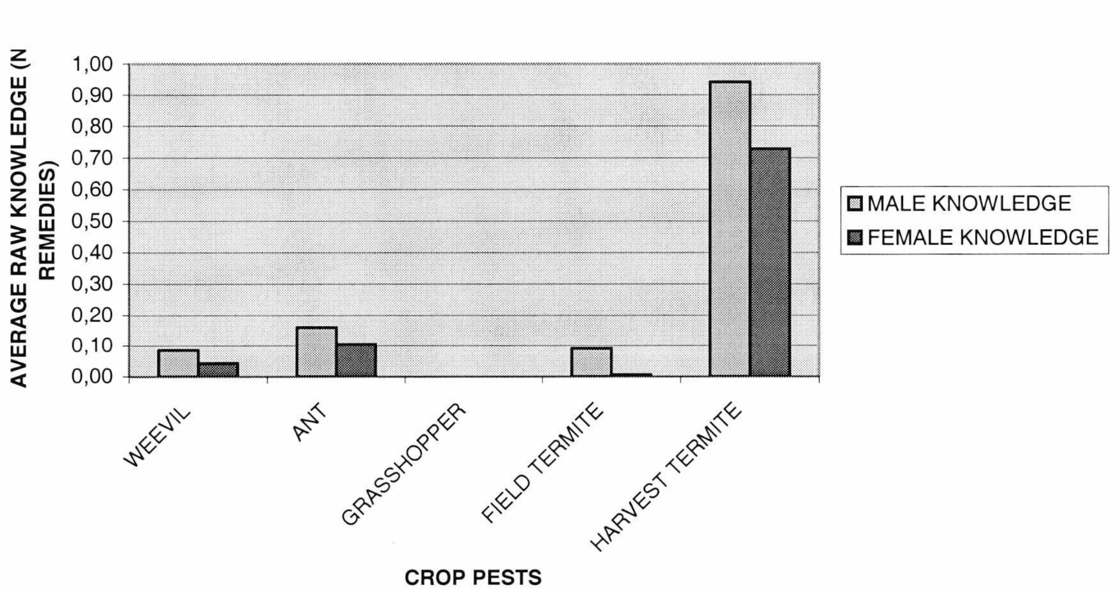
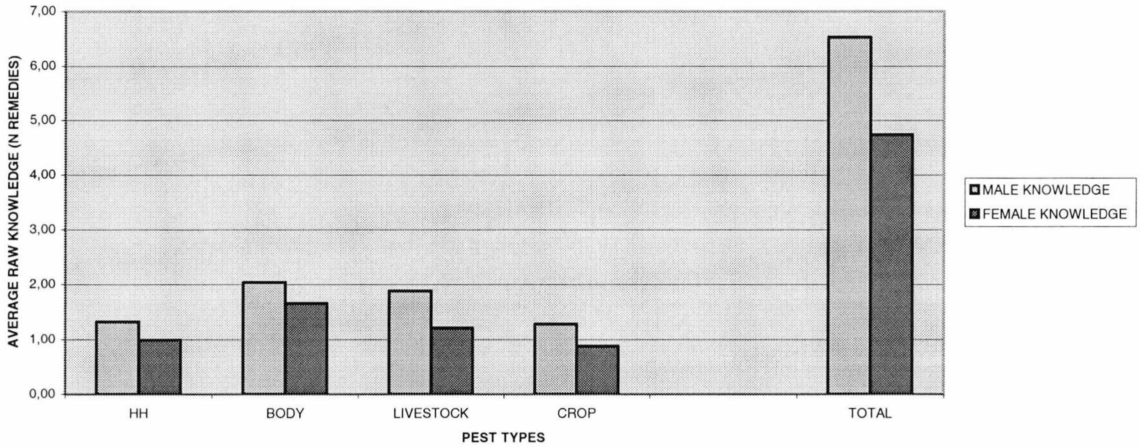


FIGURE 5.10: AVERAGE KNOWLEDGE (RAW K) FOR ALL PESTS ACCORDING TO GENDER



We can therefore draw several types of conclusion:

1. Most of the observed "male" gender knowledge barriers tend to be created because of the demarcation of specific life and work responsibilities within the household. Moreover, the circumstances in which a plant remedy is used for these pests also restricts to varying degrees the opportunities for the knowledge to be shared and acquired by members of the opposite sex. For instance, most of the pest treatments on livestock are performed far from the household (usually near rivers or streams when large amounts of water are necessary).

2. "Female" gender knowledge barriers apparently exist also but are superficial. If they are not prompted, most men will not bother to report knowledge of plant remedies that are commonly associated with "female" activities and areas of responsibility. However, when prompted, men will acknowledge equal levels of familiarity with plant remedies for these pests. It is likely that the thinness of these "female" knowledge barriers is related to the fact that the pest treatments are performed in the immediate vicinity of the household, where they are bound to be observed by men at some point.

3. Some of the "male" knowledge gender barriers (cattle ticks and field termites) appear to be equally superficial. Unprompted, an equal proportion of women report knowledge of treatments for these pests but this knowledge evaporates when they are specifically prompted on the subject. As for men, this suggests the existence of two types of knowledge: what women really know, including the knowledge they have acquired by helping their husbands in predominantly male activities (large livestock husbandry and crop production), and what women ought to know according to the accepted prevailing social rules in Wag society, that is, knowledge of plant remedies for female related subjects (poultry, hair beauty, etc).

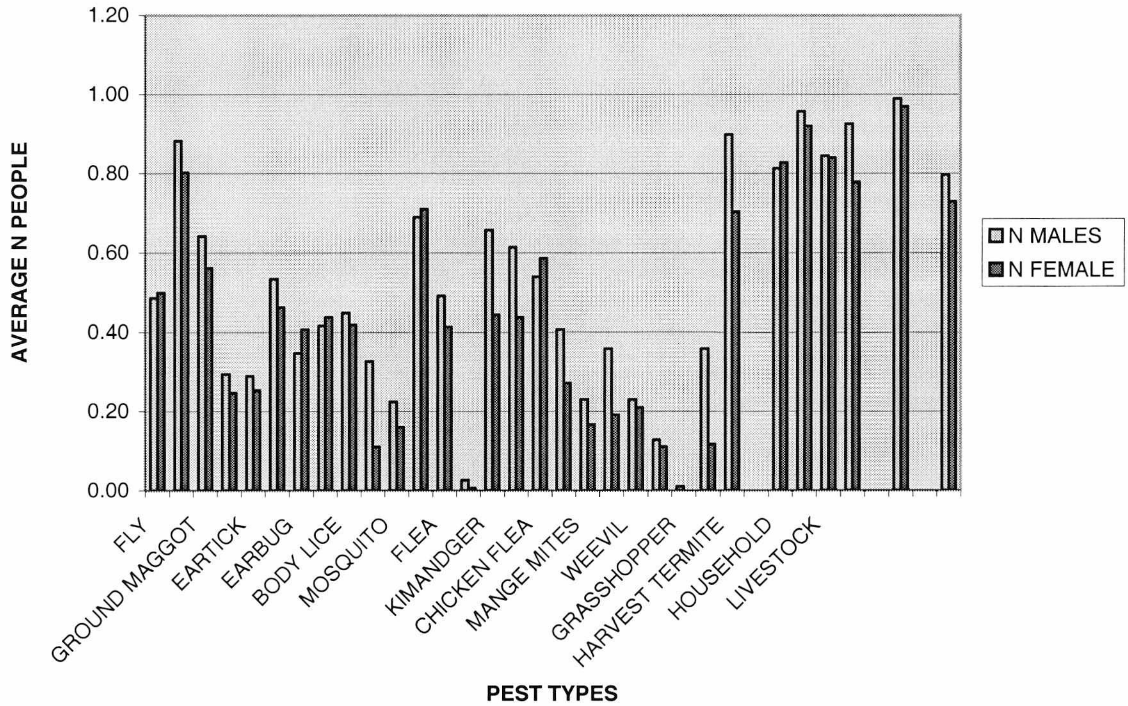
There is also the case of pest management interventions where the responsibility in the household is either loosely or jointly defined (most household pests, weevils and maybe cattle ticks). Tests on RAW K and TOTAL K confirm to some extent the absence of gender knowledge barriers for these activities. Men and women are equally likely to know which plant remedies to use and to use them.

If we aggregate data, there are few knowledge barriers at the global pest category level even if more men are likely to have knowledge of plant remedies than women for 10 out of the 25 individual pests surveyed. In comparison, there are no pests for which higher proportions of women report knowledge of plant remedies.

Equal proportions of men and women report knowledge of plant remedies for pests in general. It is only for crop pests and for livestock pests (if we exclude chicken fleas) that barriers seem to exist (but see conclusion 2 & 3 above). A visual illustration of these findings is presented in Figure 5.11.

Additional X^2 and t tests were run to tease out gender tendencies from the total amount of knowledge (number of plant remedies known) held by the respondents (Tables 5.10 and 5.11). At the individual pest level, we find that men know more remedies than women for 14 of the pests surveyed whereas there is not a single pest for which women know more remedies than men. Regarding gender barriers, most of the comments made above can be reiterated. However, noticeable differences include the strong male biases observed for a number of household pests (ground maggots, fleas and bedbugs), weevils and cattle ticks for which no significant knowledge barriers were previously reported. In these cases, men know more plant remedies for these pests than women. It is undoubtedly the superior exposure of men to life at other altitudes that is a consequence of their frequent travelling, that can best explain these differences. The ratio of remedies known by men to remedies known by women can reach 2:1 in the case of livestock pest treatments (Figure 5.12).

FIGURE 5.11: AVERAGE PROPORTION OF PEOPLE WITH TOTAL PLANT REMEDY KNOWLEDGE ACCORDING TO GENDER



Overall, we can conclude that gender is a strong factor underlying the distribution of knowledge of botanical pest management in Wag Hamra. This knowledge is predominantly held by men. More men are knowledgeable than women and men are more knowledgeable than women in terms of number of remedies known when it comes to pest management. This gender knowledge differentiation starts from childhood for a number of pest remedies.

Table 5.10: Summary of X^2 tests on gender and TOTAL K
Model 2: knowledge (number of remedies); degrees of freedom: one

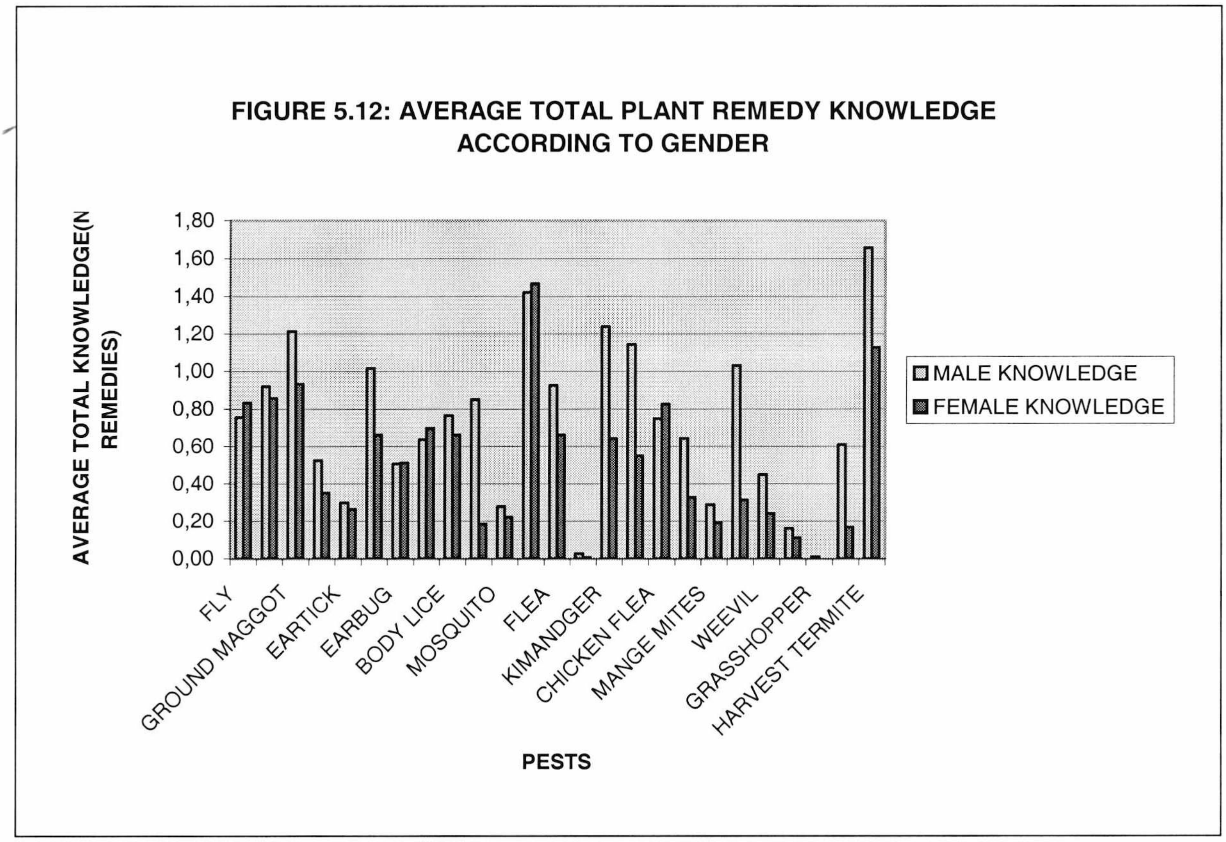
Pest types	GLOBAL X^2 values	ADULT X^2 values	CHILD X^2 values
FLY	2.14	2.15	3.37
FLY ON WOUND	5.85	8.79	*
GROUND MAGGOT	4.73	3.14	5.46
JIGGER FLEA	5.13	10.31	*
EAR TICK	*	*	*
BED BUG	8.28	9.33	4.47
EAR PEST	5.27	2.06	3.47
SCABIES	2.85	4.90	*
BODY LICE	0.35	3.44	0.90
MOSQUITO	3.16	3.10	*
HEAD LICE	2.87	0.36	2.80
FLEA	2.34	11.21	1.31
TICK	*	*	*
LIVESTOCK LICE	19.08	28.71	4.33
LIVESTOCK FLEA	18.48	21.26	3.59
CHICKEN FLEA	1.15	1.12	0.91
CATTLE TICK	11.31	9.74	*
MANGE MITES	2.33	*	*
WEEVIL	15.99	11.60	*
TEFF EATING ANT	*	*	*
GRASSHOPPER	*	*	*
FIELD TERMITE	28.44	22.21	*
HARVEST TERMITE	26.70	15.63	16.42
HOUSEHOLD pests	8.28	10.78	*
BODY pests	7.18	9.20	*
LIVESTOCK pests	20.75	20.95	*
LIVESTOCK without 19	36.68	38.10	*
CROP pests	30.56	21.67	*
All pests	20.83	23.90	*

* : calculation of X^2 inapplicable

Table 5.11: Summary of t tests on gender and TOTAL K
Model 2: knowledge (number of remedies); degrees of freedom: > 100

	GLOBAL T values	ADULT T values	CHILD T VALUES	GLOBAL MALE Aver.**	GLOBAL FEMALE Aver.**	ADULT MALE Aver.**	ADULT FEMALE Aver.**	BOY Aver. **	GIRL Aver. **
FLY	-0.74	0.96	-2.19	0.75	0.83	1.11	0.96	0.40	0.68
WOUND FLY	1.30	2.00	0.19	0.92	0.86	1.03	0.91	0.81	0.79
GROUND MAGGOT	2.40	2.07	2.34	1.21	0.93	1.68	1.34	0.76	0.44
JIGGER FLEA	1.93	3.03	-0.67	0.52	0.35	0.85	0.42	0.20	0.27
EARTICK	0.66	0.09	1.17	0.30	0.27	0.35	0.35	0.24	0.16
BEDBUG	2.97	3.20	1.40	1.02	0.66	1.39	0.85	0.65	0.42
EARBUG	-0.05	0.31	-0.17	0.51	0.51	0.67	0.63	0.35	0.37
SCABIES	-0.59	0.33	-1.29	0.64	0.70	1.04	0.99	0.23	0.34
BODY LICE	0.99	2.16	-0.90	0.76	0.66	1.10	0.75	0.44	0.55
MOSQUITO	0.93	0.60	1.45	0.28	0.22	0.41	0.35	0.15	0.07
HEAD LICE	-0.29	0.45	-0.71	1.42	1.47	1.86	1.75	0.99	1.12
FLEA	2.09	3.07	-0.51	0.93	0.66	1.40	0.78	0.46	0.52
TICK	1.47	1.30	0.88	0.03	0.01	0.04	0.01	0.01	0.00
KIMANDGER	4.32	4.71	1.69	1.24	0.64	1.81	0.82	0.68	0.42
LIVESTOCK FLEA	4.87	5.16	2.05	1.14	0.55	1.69	0.70	0.61	0.37
CHICKEN FLEA	-0.90	-0.42	-0.28	0.75	0.83	1.12	1.17	0.38	0.41
LIVESTOCK TICK	3.55	3.37	2.16	0.64	0.33	0.95	0.48	0.34	0.14
MANGE MITES	1.69	1.99	0.25	0.29	0.19	0.40	0.21	0.18	0.16
WEEVIL	2.33	3.09	1.42	0.45	0.24	0.70	0.24	0.20	0.10
ANT	1.17	1.11	1.04	0.16	0.11	0.27	0.19	0.05	0.01
GRASSHOPPER	1.32	1.38	*	0.01	0.00	0.02	0.00	0.00	0.00
FIELD TERMITE	5.55	5.00	3.37	0.61	0.17	0.89	0.26	0.33	0.05
HARVEST TERMITE	4.90	3.42	4.01	1.66	1.13	1.87	1.36	1.45	0.85
HOUSEHOLD pests	2.45	3.36	0.72	4.19	3.31	5.98	4.27	2.41	2.14
BODY pests	1.96	3.16	-0.37	5.95	5.01	8.42	6.10	3.51	3.67
LIVESTOCK pests	4.68	5.06	2.66	5.10	2.85	7.70	3.90	2.52	1.58
LIVESTOCK pests without CHICKEN FLEA	5.32	5.50	2.99	4.35	2.02	6.58	2.73	2.14	1.16
CROP pests	6.04	5.04	5.09	2.89	1.65	3.75	2.17	2.03	1.01
All pests	3.96	4.73	1.90	18.12	12.81	25.85	16.44	10.48	8.40

*: calculation of t value inapplicable
**: expressed in number of remedies per person



5.4.2 - Altitude

5.4.2.1 - Plant knowledge and altitude

To initially model how altitude could potentially influence the knowledge of plants, two scenarios were imagined. In the first one, plants are divided into those that can grow at the altitude of the household of the person being interviewed and those that are not found at the same altitude because of habitat preferences (temperature, hygrometry, etc). In the second scenario, plants are divided into those that can be found up to 300 m higher or lower than the altitude of the household of the person being interviewed and those that grow outside of this altitude band. The first scenario amounts to an opposition between the vicinity of the household and the outside world. In the second scenario, the 600 m altitude band corresponds roughly to the altitude variations that people are confronted with in the course of their daily activities. When travelling to the nearby market or to remote fields, when going to church or when fetching wood, people regularly climb up and down the hills and the mountains in Wag. Climbing is part of everyday life. Table 5.12 presents the results of plant knowledge sorted according to the proportion of plants known in each life scenario. The results were obtained by measuring the plant knowledge of each person against the range of plants[14] known to grow at each altitude.

Table 5.12: Analysis of plant knowledge according to various altitude zones

Different scenarios	Number of people reporting the identification of different proportions of plants			
	>90 %	>80 %	>70 %	<70 %
SCENARIO 1: ALTITUDE OF THE HOUSEHOLD OF RESIDENCE	88	109	48	104
SCENARIO 2: ALTITUDE BAND OF +-300 M SURROUNDING THE ALTITUDE OF RESIDENCE	289	16	19	25
SCENARIO 3: SAME AS SCENARIO 2 BUT EXCLUDING MARKETED PLANTS	291	16	21	21

Thus in the first scenario, we find that for nearly half of the population, more than four fifths of the plants they know potentially grow in the immediate vicinity of their household. For almost two thirds of the same population, more than 70 % of the plants they can identify potentially grow in the immediate vicinity of their household, which means that only a third of their plant knowledge concerns plant that are virtually never found in the vicinity of their household. Even if these findings were obtained with a sample of plants that are only a subset of people's plant knowledge, they are important in that they point to a strong sense of knowledge embededdness or territoriality. This sense of locality for plant knowledge is not defined by horizontal distances but by vertical gradients. People are predominantly familiar with plants that potentially grow at their altitude of residence.

The results of the second (and more realistic) scenario only reinforce this trend. For more than four fifths of the population, more than 90 % of the plants they know grow within the altitude boundaries of their regular life environment. For an overwhelming 95% of the population, more than 70 % of their plant knowledge concerns plants found to grow in their regular life environment.

[14] Only the plants that formed the basis of the quantitative survey were considered in this analysis. New plants mentioned by farmers during the survey were not included.

We can therefore conclude that the plant knowledge of an individual in Wag is largely shaped by his immediate environmental and altitudinal surroundings. Since the very high ruggedness and altitude variations that characterise the Wag environment also determine the high degree of variability in plant distribution, we can infer that the variability of plant knowledge is very high in Wag and that it is largely due to the altitude factor. Thus emerges an overall picture of plant knowledge constantly fluctuating as altitude and plant distribution vary.

In order to understand the whole structure of plant knowledge, t tests were run on the "non local" or unusual plant knowledge held by some of the respondents (knowledge of plants that grow only outside the 600 m altitude band surrounding the household). Tests were run on large altitude categories (1700-2100 or "low", 2200-2400 or "intermediate", 2500-3100 or "high") and narrower 200 m altitude bands (Table 5.13).

Tests on the broad altitude categories reveal the following pattern. Unusual plant knowledge is mainly held, not surprisingly, by people living either at higher or lower altitudes. People living approximately in the 2000-2400 m altitude range report very little knowledge of extreme lowland or highland plant species (an average of 0.56 plant per person compared to averages 7 to 9 times higher for respectively highland and lowland inhabitants). Similar t tests on narrower altitude bands confirm the existence of a knowledge bias against lowland plant species that would result in lowland people knowing more highland plants than the opposite. If we consider Figure 5.13, there are three times more plants used for pest management purposes growing in the lowland areas than in the highland areas but at the same time people living around the 1700-1899 m altitude band know three times as many "unusual" plants (from higher altitudes) than people living above 2500 m. This difference in knowledge is significant at the 5% level.

The interpretation of this result is not straightforward. Lowlanders travel more often to highland areas than highlanders to the lowlands (food aid, administrative procedures, etc) and, perhaps, are potentially more exposed to "unusual" highland plants than highlanders are to "unusual" lowland plants.

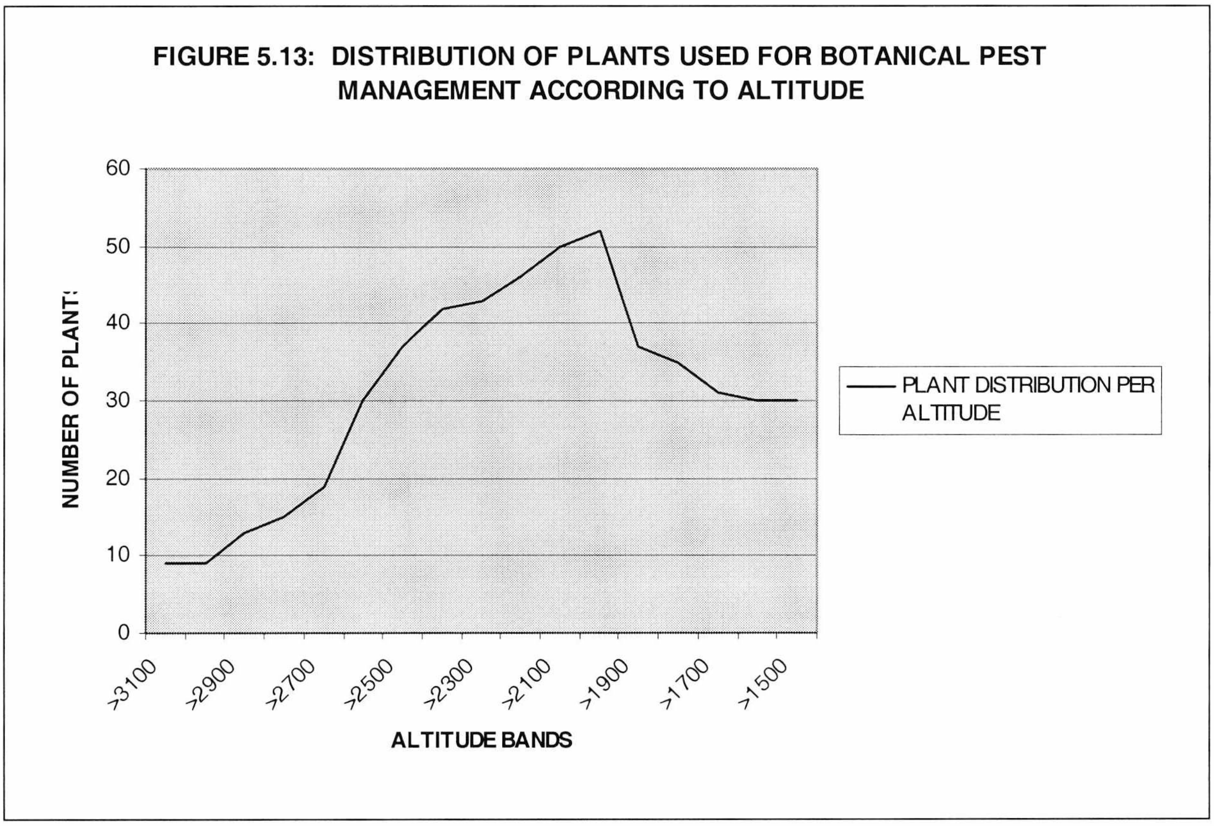


Table 5.13: Summary of t tests on altitude and the plant knowledge of 'unusual plants'

Types of unusual plant knowledge in terms of altitude orientation	kolla – woyna däga T values	däga – woyna däga T values	kolla – däga T values
EXTENDED (+ - 300 m)	8.65	6.54	1.61
EXTENDED UP (+ 300 m)	8.76	-6.67	6.88
EXTENDED LOW (- 300 m)	-2.85	7.84	-8.45
EXTENDED WITHOUT MARKET	6.84	7.51	0.30
EXTENDED UP WITHOUT MARKET	6.96	-4.29	5.20
EXTENDED LOW WITHOUT MARKET	-2.85	8.19	-8.84

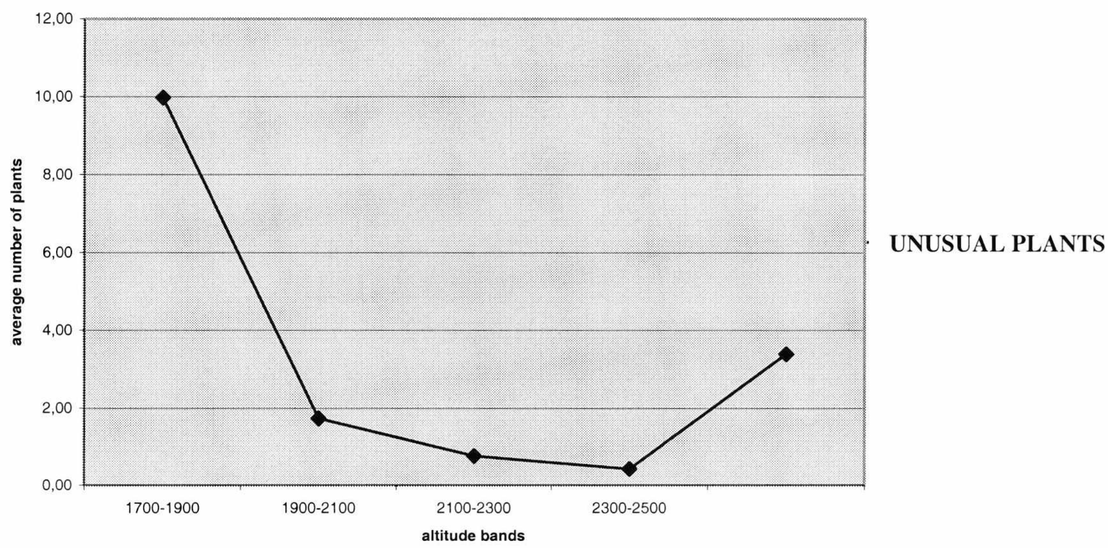
Types of unusual plant knowledge in terms of altitude orientation	1700 -1900 T values	1900 – 2100 T values	2100 – 2300 T values	2300 – 2500 T values	1700 – 2500 T values
EXTENDED (+ - 300 m)	12.88	6.09	3.14	-5.08	6.48
EXTENDED UP (+ 300 m)	12.88	6.09	4.95	5.05	13.11
EXTENDED LOW (- 300 m)	*	*	-3.89	-5.70	-5.00
EXTENDED WITHOUT MARKET	14.16	3.69	-2.79	-5.35	5.99
EXTENDED UP WITHOUT MARKET	14.16	3.69	-1.88	5.05	12.33
EXTENDED LOW WITHOUT MARKET	*	*	-3.89	-5.94	-5.23

*: calculation of t inapplicable

However, this greater frequency in travelling and exposure does not explain everything. For people to acquire knowledge of plants not commonly found in their daily life environment, there must be some kind of interest to learn new plants and retain the knowledge afterwards. In this respect, it would appear that knowledge-wise, lowlanders are less conservative than highlanders. However, the average figures also tell us that inhabitants of the 2300-2500 m belt are the most conservative of all. They know respectively 10 times and 30 times fewer unusual plants than their highland and lowland neighbours, despite the fact that they live geographically closer to both altitude extremes than any other population (Figure 5.14).

The results are identical even if we exclude plants commonly marketed (*ïndod* Phytolacca dodecandra, *adäs* Myrtus communis, *gäba* Ziziphus spina-christi and *näč šïnkurt* Allium sativum) that can potentially distort calculations of the influence of altitude. After making this adjustment, we still find that lowlanders know more "unusual plants" than highlanders.

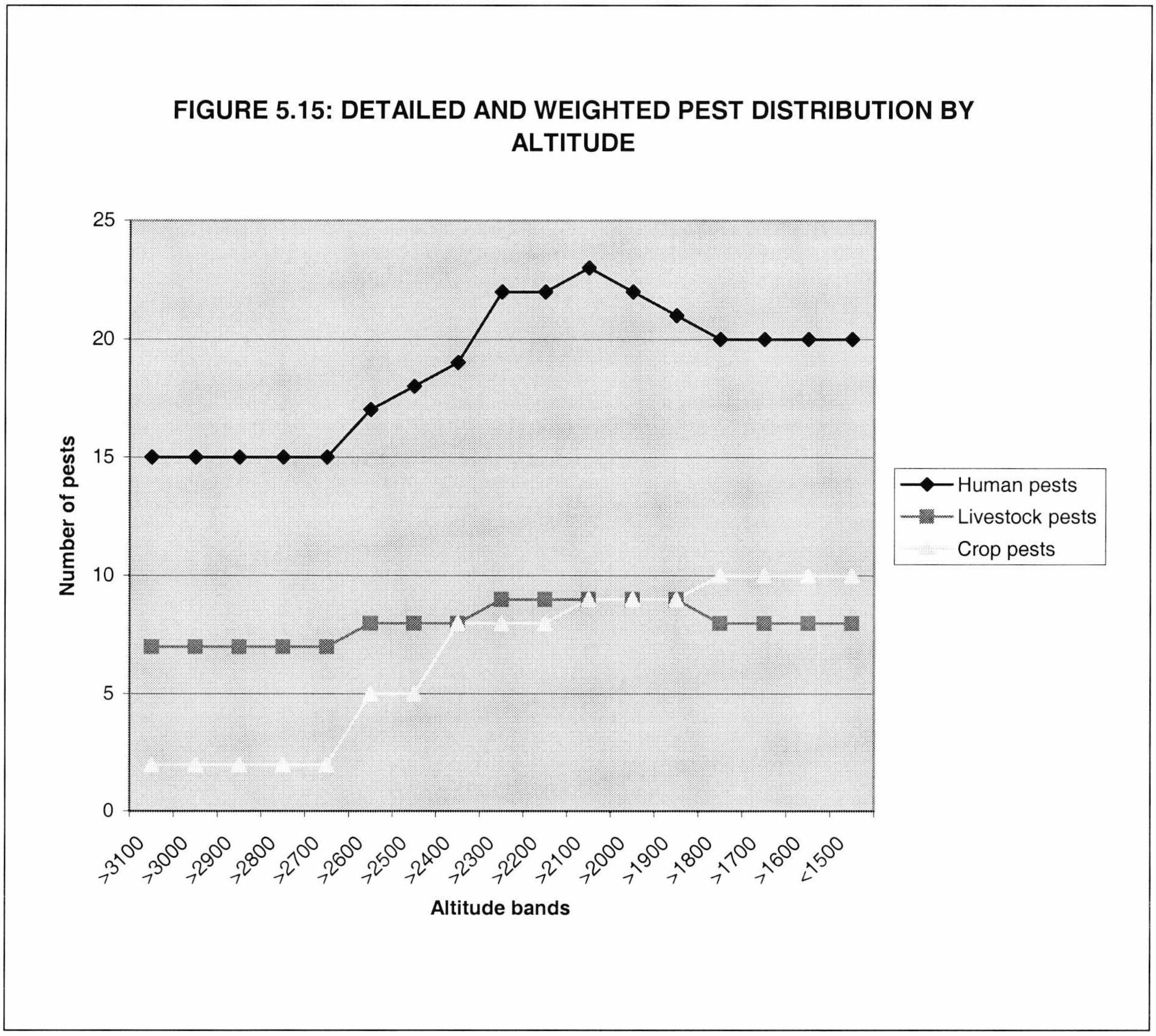
FIGURE 5.14: AVERAGE NUMBER OF "UNUSUAL" PLANTS KNOWN ACCORDING TO ALTITUDE OF RESIDENCE



5.4.2.2 - USE, KNOWLEDGE and Altitude

Since the distribution of pests follows altitude gradients (Figures 5.15 and 5.16), it was decided to run simple t tests on USE, RAW K and TOTAL K to check whether the pivotal altitudes for specific pests, i.e. the specific altitudes beyond which the pest was known not to occur, influenced the use of plant remedies for the said pest and if, less predictably, they also influenced the knowledge of plant remedies (Table 5.14).

Regarding USE, several conclusions can be reached. Altitude acts a natural use barrier for ground maggots, ear ticks and field termites. This is expected.



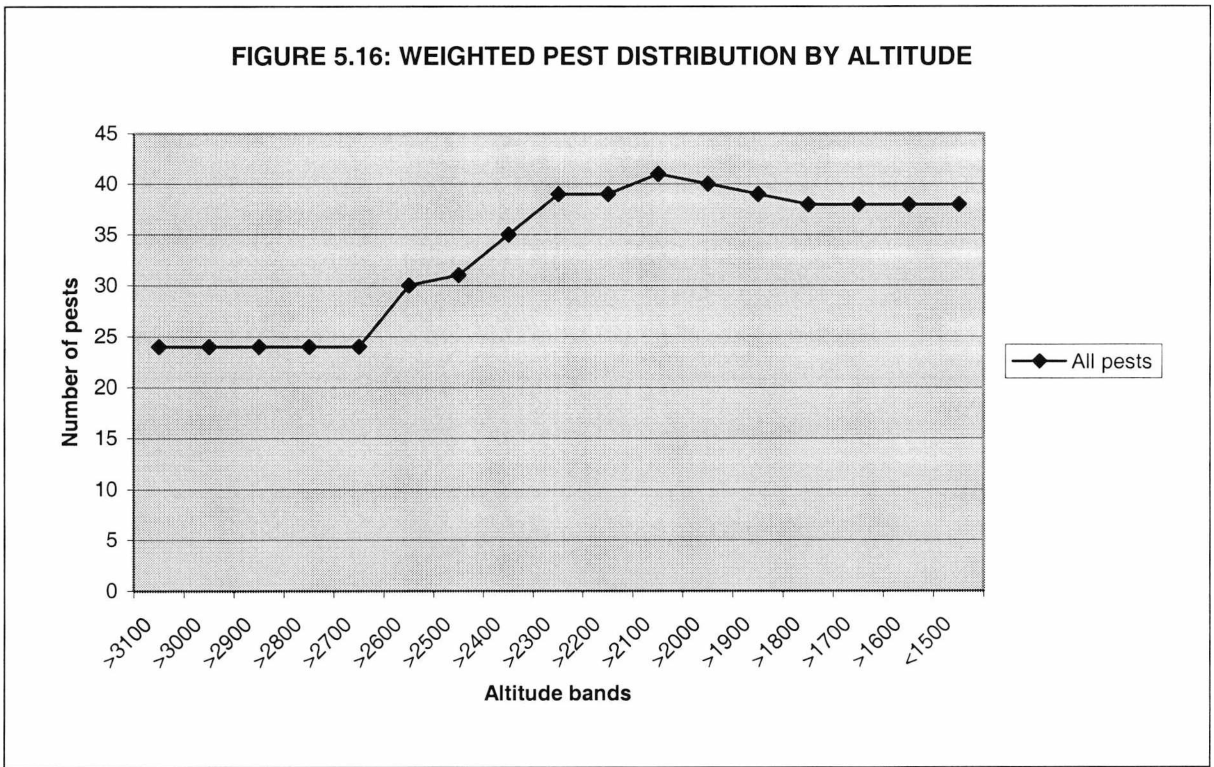


Table 5.14: Summary of t tests on critical altitude for pest distribution and USE, RAW K and TOTAL K
Degrees of freedom: > 100

		T values			Averages					
Critical distribution altitudes (m)	Pest Types	USE	RAW K	TOTAL K	USE above ALT.	USE below ALT.	RAW K above ALT.	RAW K below ALT.	TOTAL K above ALT.	TOTAL K below ALT.
2500	GROUND MAGGOT	**-2.87**	**-3.76**	**-4.34**	**0.33**	**1.39**	**0.5**	**2.02**	**1.83**	**4.26**
2100 to 2600	JIGGER FLEA	**0.48**	**0.38**	**1.3**	**0.24**	**0.19**	**0.46**	**0.39**	**1.8**	**1.33**
2400	EAR TICK	**-2.72**	**-3.13**	**-3.38**	**0.04**	**0.5**	**0.15**	**0.86**	**0.27**	**1.23**
2100	FLEA	**0.08**	**-0.99**	**2.98**	**0.53**	**0.51**	**0.7**	**0.95**	**3.5**	**1.84**
2600	CATTLE TICK	**-0.13**	**-0.98**	**0.01**	**0.18**	**0.2**	**0.18**	**0.4**	**1.73**	**1.72**
2400	WEEVIL	**-0.86**	**-1.5**	**-2.92**	**0.08**	**0.16**	**0.08**	**0.28**	**0.31**	**1.55**
2400	BEDBUG	**0.79**	**0.9**	**1.58**	**0.46**	**0.34**	**0.65**	**0.47**	**3.65**	**2.73**
2100	FIELD TERMITE	**-3.1**	**-3.45**	**-6.62**	**0**	**0.35**	**0**	**0.42**	**0.56**	**2.53**
2400	WEEVIL ADJUSTED	**-1.86**	**-2.2**	**-3.35**	**0**	**0.16**	**0**	**0.28**	**0.15**	**1.55**

People use remedies for pests that occur in their life environment. The same people are not expected to use plant remedies for pests that don't occur at their altitude of residence.

By contrast, the absence of a correlation between altitude and the use of plant remedies against jigger fleas, fleas, cattle ticks and weevils is more intriguing and begs a number of explanations. The case of the jigger flea is simple. As mentioned several times above, the distribution of the pest is linked to two environmental factors: altitude and soil types. Tests aimed at teasing out the simple altitude factor are therefore not conclusive. For the cattle tick, some degree of familiarity with the herding practises in Wag is necessary. There is no doubt that the various species of tick thrive and reproduce themselves within specific altitude ranges. But to assume that a tick only attacks cattle below a certain altitude and not above that altitude is not the correct way to apprehend the problem. The reality on the ground is different. Farmers who live above or below the preference range of the ticks sometimes send their cattle for grazing at altitudes where ticks occur. The parasite attacks the animals and is then carried back to the household at an altitude that is beyond its preferred range. At this point, the insect does not drop dead. Rather, it continues to parasitize and weaken the animal and has to be dealt with, hence the absence of influence of altitude on the use and knowledge of plant remedies to treat cattle ticks.

Regarding weevils, the t test on USE is confusing, suggesting that there is no significant relationship between altitude and the use of plants to control weevils (t value of –0.86 not significant at the 5% level). The pest is probably the one whose distribution is linked most closely to an altitude gradient. Farmers have pinned it down to precise altitude levels. They know beyond doubt that no weevils will ever be found beyond certain villages. In fact, a closer look at the detailed contents of the questionnaires reveals that the people who report the use of plants against weevils, whilst living above 2500 m, have all lived for some time at much lower altitudes. This confirms the importance of migrations on the distribution of plant remedy knowledge (see Chapter 6 for a more detailed analysis). If we exclude these migratory cases, we obtain a t value for USE of –1.86 that confirms the significance of the relationship between altitude and the use of plant remedies against weevils. The tests on the knowledge variables demonstrate that remedies for this pest are among the most altitude sensitive. In practise, and qualitatively, a clear altitude gradient is observed for the remedies against weevils (Table 5.15).

Table 5.15: Distribution of weevil remedies according to altitude

Altitude	Degree of pest incidence	Type of remedies used and/or known
Above 2300 m	Nil to very low	Generic ashes mixed with the grain[15]
2000 to 2300 m	Very low to medium	Generic ashes mixed with the grain Ash / dung plasters Specific plants pastes and smokes
Below 2000 m	Medium to very high	Generic ashes mixed with the grain Ash/dung plasters Specific wood ashes mixed with the grain Specific plant pastes and smokes Combined threshing (grain + plant remedy)

This leaves the case of the fleas for which the t values are inconclusive with regard to altitude. Several interpretations can be offered. It could be that there is confusion between human fleas and chicken fleas (the latter is found at all altitudes). Alternatively, the 2100 m limit beyond which farmers are adamant that fleas cease to bother human beings is not realistic. Direct observation of the near absence of human fleas in the lower altitudes would tend to suggest that the first interpretation is more plausible. Besides, qualitatively, there is no doubt that the highland areas offer a high degree of diversity when it comes to household flea remedies. Not only do people mention more potential plant remedies above 2100 m than below (22 different plants versus 11 respectively) but some of the modes of plant application, such as the laying of repellent plants on the ground or the sleeping couch are also unique to the higher altitude areas (Table 5.16).

Finally, the bedbug was tested as a "witness" pest since the pest is found at all altitudes and its distribution does not follow altitude. Predictably, we find that altitude neither influences significantly the use of plant remedies for bedbugs nor the distribution of the knowledge of these remedies, prompted or unprompted.

[15] In the past, this technique was only used above 2300 m when farmers stored any type of grain, except *teff*, for what they expected to be a prolonged period of time (several years at least), weevils being known to infest grain stores (wheat, barley, pulses) in the long run at intermediate altitudes (2300-2400 m). Farmers observe sadly that this practise is hardly relevant nowadays since large acreages and bumper harvests are a thing of the past. Nowadays, "the stores are empty before the weevils even have time to infest them."

Table 5.16: Distribution of flea remedies according to altitude

Altitude	Degree of pest incidence	Modes of application of plant remedies reported
Above 2400 m	High to very high	Plant smoke Floor plants as repellents Floor plants as glue
2100 to 2400 m	Low to high	Plant smoke Floor plants as glue
Below 2100 m	Very low to nil	Plant smoke Floor plants as glue (rare)

5.4.2.3 - Plant remedies and altitude of residence.

If we compare the altitude of residence (*sensu stricto* the altitude of the household or *sensu largo* as defined by the altitude band which encompasses the altitude of the household and within which most productive activities are performed) with the altitude ranges at which the plants mentioned as remedies are known to occur, it is possible to obtain a separation of plant remedies into "expected" (remedies that are based on the use of plants commonly found within the altitude band of residence) and "unusual" (remedies based on plants that farmers would never encounter during their normal life activities). Tables 5.17, 5.18 and 5.19 summarise the result of this segregation process for USE, RAW K and TOTAL K for various hypothetical altitude bands of residence (0 or exactly the household altitude, +-100, +-200, +-300).

Table 5.17: Summary of 'unusual' USE in different altitude scenarios

	Altitude band surrounding the household			
	300 m	200 m	100 m	0 m
UNUSUAL USE (number of quotes)	36	63	134	330
UNUSUAL USE (% OF TOTAL)	3	5	10	24
UNUSUAL USE of marketed plants (number of quotes)	17	26	47	93
UNUSUAL USE of marketed plants(% OF TOTAL)	1	2	3	7
UNUSUAL USE without marketed plants (number of quotes)	19	37	87	237
UNUSUAL USE without marketed plants (% OF TOTAL)	1	3	6	17

Table 5.18: Summary of 'unusual' RAW K in various altitude scenarios

	Altitude band surrounding the household			
	300 m	200 m	100 m	0 m
UNUSUAL RAW K (number of quotes)	46	76	175	434
UNUSUAL RAW K (% of total)	2	4	9	22
UNUSUAL RAW K of marketed plants (number of quotes)	21	30	52	100
UNUSUAL RAW K (% of total)	1	2	3	5
UNUSUAL RAW K without marketed plants (number of quotes)	25	46	123	334
UNUSUAL RAW K without marketed plants (% of total)	1	2	6	17

Table 5.19: Summary of 'unusual' TOTAL K in various altitude scenarios

	Altitude band surrounding the household			
	300 m	200 m	100 m	0 m
UNUSUAL TOTAL K (number of quotes)	227	357	658	1332
UNUSUAL TOTAL K (% of total)	4	7	12	24
UNUSUAL TOTAL K of marketed plants (number of quotes)	59	89	130	193
UNUSUAL TOTAL K of marketed plants (% of total)	1	2	2	4
UNUSUAL TOTAL K without marketed plants (number of quotes)	168	268	528	1139
UNUSUAL TOTAL K without marketed plants (% of total)	3	5	10	21

The trend outlined previously for the simple knowledge of plants is confirmed for the use and knowledge of plant remedies for pest management. The vast majority of plant remedies that people use and know to combat pests are potentially found in the vicinity of the household. For example, it turns out that almost 90% of plant remedies used or cited are based on the harvesting of plants that potentially grow within 100 m in altitude from the household. If, more realistically, we define the normal life environment of the Wag farmer as a 600 m altitude band centred on the household (corresponding to the second "life scenario" described above), the findings of the survey suggest that a staggering 95 % of the remedies used and known are harvested from this environment, leaving less than 5%

of the remedies in the "unusual" category. The conclusions are clear. For pest management purposes, farmers never travel very far to harvest a particular remedy. People may bring plants back home on their way from the field or from fetching wood. In the rugged and highly variable landscape of Wag Hamra, this finding strongly suggests that the use and knowledge of plant remedies for pest management is closely tied to the availability of plants in the immediate life environment of the farmer and therefore to altitude itself.

As for plant knowledge, the overall emerging pattern for plant remedy use and knowledge can be apprehended either as the absence of pattern or as the succession and juxtaposition of micro-patterns dependent on altitude and plant distribution, in other words as a *mosaic* of knowledge.

5.4.3 – Specialised knowledge

Much has been said and written about traditional health practises in Northern Ethiopia (see Mérab 1912, Rodinson 1967, Young 1970, Leiris 1996, Mercier 1976 and Pankhurst 1990 to name but a few). *Zar* cults and the esoteric knowledge and practises of the *däbtära* in particular have exerted an undeniable fascination among western scholars in the past century (Griaule 1930, Lifchitz 1941, Strelcyn 1959, 1964, 1968, Mercier 1976a, 1979a, b, 1988, Young 1975a, b).

Always torn between truth and deceit, light and obscurity, healing and spell casting, the *däbtära* or magico-religious healer remains an elusive figure (Mercier 1988). To some extent, the *däbtära* epitomises paradox and ambiguity in the society of northern Ethiopia. Young (1970: 139) provides the most comprehensive summary of this multi-talented character:

> To his public, the däbtära is most remarkable for his embodiment of so many significant contradictions. As an ecclesiastic, he is indispensable to the Church, he ensures its permanence by training boys for the priesthood, he enriches it with the fruits of his scholarly labour, and he sustains it by leading the performance of the Mass. Yet he is often regarded by the laity as a breaker of priestly vows, an adulterer and an intimate of the ganels (devils) against which the church's existence stands opposed. He is a healer of the sick; he divines the future and provides an impressive variety of prophylaxes for clients. He is also the most notorious sorcerer in the land and appears oblivious to the certain fate which satanic friendship and ensorcelling entail for him.

In the literature, the knowledge and knowledge acquisition process of the *däbtära* have been strongly contrasted with that of lay healers. The *däbtära* combines the use of plants with the reciting of secret prayers and names, each component reinforcing the potency of the other (Mercier 1988). Such prayers and remedies may be administered in a written talismanic form (see Mercier 1976a and 1997 for an extensive study of the subject). To Young's description, we must also add the (occasional) veterinary dimension of the work of the *däbtäras*. This was confirmed orally in Wag. In addition, the analysis of several *däbtära* compilations has revealed their knowledge of numerous remedies for livestock illnesses (Abebe and Ayehu 1993). The remedies appear to range from the simple plant remedies of the lay healer to the more complex combinations of plant and prayer remedies. The lay healer, by contrast, is only familiar with a few ailments and does not resort to the esoteric during the application of the remedy.

The *däbtära* is usually keen to increase his knowledge of proven remedies and to compile this empirical knowledge in a unique written form. *Däbtära*s can increase their knowledge by exchanging or acquiring remedies from other *däbtära*s, by purchasing old *däbtära*s compilations or by collecting or purchasing proven household remedies from different areas (Young 1970, 1982). Mercier (1979b, 1988) has revealed how most *däbtära*s are intent on coding their own knowledge, including plant names, which makes their compilations virtually undecipherable to any outsider (this is one of the reason why *däbtära*s rarely acquire books from deceased *däbtära*s if they don't have the key to the ingredients of the remedy).

In contrast, the lay healer clings to his unique and proven knowledge usually acquired from his father or a family member and does not wish to be seen as intent on acquiring new plant knowledge, for fear or being taken for a *däbtära*. One of the key differences noted by Young (1970: 217) between the *däbtära* and the lay healer is that the former is often on the move in search of new knowledge and clients while the latter remains sedentary:

> A däbtära is recognised by his public as being either strong or weak. If he is reputed to be "strong", a potential client assumes that he is competent in a broad range of maladies. In contrast, the professional reputation of the lay healer is tied to a specific ailment, just as he himself is tied to a specific locality, as the sedentary cultivator of ambilineage fields. Since a layman's medical reputation is fixed in space, potential purchasers of his medical knowledge are drawn from among his potential clients. Thus by sharing his medical knowledge with another secular healer, the lay

practitioner establishes a potential rival and dilutes the economic and social advantages of his practice.

It is therefore in the lay healer's interest to maintain and spread the belief that a remedy's potency is linked to the degree of secrecy surrounding it.

Overall, there has been a tendency by various scholars to over-zealously categorise the various actors in the traditional health sector. Young (1970) in particular identified around the town of Gondar what he considered as 20 separate categories of healers or people involved in the traditional health sector. Evidence collected in the area under study, best described as predominantly rural, suggests that the nomenclature of the traditional health sector in Wag Hamra is much less rigorously defined. First of all, all the actors and plant specialists of the health sector are farmers before anything else. They make their living out of their farming activities and their health activities are only secondary. In some extreme cases, they have acquired specialised knowledge as health practitioners that allows them to become experts in a particular agricultural field and to optimise their production. Bee-keeping is a good example. One farmer, also known to be the local plant specialist and "general practitioner" in his village, had succeeded in successfully maintaining and managing more than 300 bee-hives. Another, a *däbtära*, was the only farmer who kept bee-hives in a village otherwise notorious for its inability to attract and sedentarise bees.

For most farmers, any such person who is more knowledgeable than other farmers in terms of health issues is described as *bïl* (clever, bright) and more rarely *awoqi* (wise). Within this wide ranging category, people will recognise the priest who heals with prayers and Holy water, the *däbtära*, the *balzar* (*zar* doctor who orchestrates *zar* ceremonies), a cohort of local experts that span the human and veterinary health sectors but that do not systematically use plant remedies (*wogiesa* or bone setter, *awalya* or midwife, local dentist, rabies expert, anthrax expert, wound expert, etc) and the very loosely defined *balmädhanit* (or plant expert). *Däbtära* in Wag Hamra is also a very loosely defined term, often used by farmers in a generic sense. It encompasses the *däbtära sensu stricto* as described above (cleric/teacher/healer/sorcerer to varying degrees) but for instance also includes any person affiliated in some way with the church whilst lacking the official and approved Orthodox seal of priesthood. Young students aspiring to become deacons are therefore also *däbtäras*. Priests who renounce their priestly vows by marrying a second time become implicitly *däbtäras*. The *balmädhanit* category is not rigidly defined either. For farmers, it includes anyone in the village who knows more about plants than the average farmer without resorting to the esoteric practises of the *däbtära*. The *balmädhanit* then would be the first level "health practitioner" a person would turn to for a range of proven household remedies. Compared to Young's nomenclature in an urban setting, there are no traces in Wag of this diversity of titles in the plant expert category.

The important point to bear in mind is that a health practitioner is not rigidly associated with his title in the rural Wag society. A priest, a *balzar* or a *däbtära* in the generic sense can also be a *balmädhanit* or a *wogiesa*. A confirmed *däbtära* (*sensu stricto*) can be a *balzar* and also become an expert on a particular disease if he has acquired a proven remedy and successfully treated his clients. A few cases of priests who had become closely acquainted with esoteric *däbtära* practices were also heard of. However, it could not be ascertained whether they had lost their priesthood or not.

In Wag Hamra, the boundaries of the nomenclature used in the local health sector are further blurred by several disconcerting factors. It has already been mentioned above that plant species of the Loranthaceae family (*täkät'äla*) are referred to, traditionally, as the plants of the *däbtära*s who are said to make extensive use of them in their remedies and spells. This is why many farmers are reluctant to acknowledge their existence, even if the plant is one of the most conspicuous, particularly during the dry season, for fear of being associated with *däbtära* activities. While this tendency was confirmed during the statistical survey (see above), it was a surprise to note that of the farmers who did acknowledge the parasite, many[26] went on to mention, unprompted, several ways in which the plants can be used as remedies, both for veterinary (supplementary fodder for goats, especially after delivery, treatment of livestock wounds, bird traps on beehives, etc) and human health (pelegra, wounds, snake bites, midwifery, treatment of spiritual ailments, etc).

It appears clearly that plant parasites are part of the household pharmacopoeia and that their use and knowledge is not restricted to *däbtäras*. Equally noteworthy is the fact that at least a dozen of non-*däbtära* adult farmers interviewed had knowledge of very specific

[26] Out the 349 people interviewed, nearly one person in four (84) declared knowing a specific use for these plants.

täkät'äla remedies for spiritual ailments (*Shotälai*[27], *Säytan* in the generic sense, etc) and cited them unprompted. This suggests either the existence of significant leakages between the knowledge sphere of the *däbtäras* and the rest of the population or that the household pharmacopoeia in Wag is more than well developed and used for a wide range of ailments, including non-benign ones. Two facts tend to corroborate the latter hypothesis. First, non-*däbtära* farmers also use and know several proven evil eye remedies, particularly for newborn babies. When questioned on the matter, they oppose their knowledge and use of preventive remedies to the curative remedies and to what they describe as the ceremonies and manipulations of the *däbtäras*.

There also appears to be an altitude dimension to this phenomenon. In the lowland areas, nearly one person in two (including children) interviewed cites a *täkät'äla* as a specific remedy, compared to approximately one in eight in the midlands and highland areas, where mentions of specific parasites are much less frequent. In fact, it is quite possible that many farmers in the highlands and midlands keep a fair store of knowledge of *täkät'äla* remedies, but that contrary to their fellow lowlanders, they choose not to divulge it because of beliefs related to secrecy and potency that surround ethnobotanical knowledge in the traditional health sector. Traditionally, farmers believe that a free remedy has no healing power (see Balcha 1992 for the description of similar beliefs in neighbouring Wollo). Moreover, farmers in Wag also strongly believe that in the case of less than benign health problems, a particular remedy will loose its potency and efficacy if too many people become aware of it. It is interesting to note that the mention of such beliefs only raises scornful comments among inhabitants of the lowlands who are adamant that no such knowledge restrictions exist in their villages, and that such beliefs are only kept alive to maintain situations of near monopoly in some branches of the traditional health sector. After direct observation, there is no doubt that lowland farmers have a freer attitude to plant knowledge. Part of this attitude can probably be attributed to the specificities of the environment in the lowlands. For men, living in the sparsely inhabited lowlands implies spending prolonged periods of time alone in the wilderness, far from the villages (travelling, herding of cattle, etc). Should anything happen (wounds, bites, etc), the farmer cannot rely on the presence of nearby healers or plant experts. To survive (at least long enough to reach a confirmed healer), a farmer can only rely on his own knowledge.

[27] Evil spiritual entity known to target and harm foetuses in the womb.

To make things more confusing, there are many "small", unconfirmed *däbtära* (often failed deacons) who manage to increase their revenues by exploiting the gullibility of farmers. The fact is known and deplored by confirmed *däbtäras*. These charlatans are known to sell protections and amulets, which contain only worthless pieces of wood when they are supposed to contain rare *täkät'äla*.

There are also undeniable facts in favour of the leakage hypothesis. Some non-*däbtära* farmers use a number of so-called household remedies with numerical or symbolic connotations, which are known to be one of the trademarks of the *däbtära* (Young 1970, Mercier 1979b). When asked about the significance of the number, they are unable to give a positive answer and simply state that it is the tradition (*bal*). For example, farmers believe that the remedy to repel the evil eye and/or attract termites in their lowland *teff* fields (see Chapter 4) will have little potency if they do not travel to the neighbourhood of three distant villages to cut three branches of the same type of tree. Similarly, some of the evil eye protectants commonly used by farmers are believed to lose much of their efficacy if they are not harvested on a fasting day (Wednesday or Friday), a harvesting practise commonly associated with the *däbtära* intent on preparing remedies to cure spiritual ailments (Young 1970, Balcha 1992).

Moreover, the issue of the origin of the knowledge held by lay healers deserves a closer inspection. To this day, it has always been assumed that the knowledge of the lay healer is transmitted in a very conservative manner, usually from a father to his son when he is about to die (Young 1970). This explanation is satisfactory to explain intergenerational knowledge transmission but fails to address the issue of the acquisition of the remedy by the "first" lay healer. It may be that the remedies of the lay healers are the result of past leakages from *däbtäras*. It is otherwise hard to explain how so many different "experts" (rabies, anthrax, etc) would have empirically discovered remedies against so many important diseases throughout the former Abyssinia without some kind of "assistance". The modalities of a knowledge leakage from a *däbtära* to a simple farmer are at first difficult to imagine until one remembers that *däbtära*s in a rural context are themselves farmers with families and that such knowledge losses are more than likely to occur inside than outside of the family. Contrary to the lay healer, sons of *däbtäras* do not necessarily become *däbtäras* and some may move on in life with only a fraction of the proven remedies of their fathers, becoming thus potential "founders" of lines of lay healers.

It is against this background and structure of the health sector in the area under study that several *däbtäras sensu stricto*, lay healers/local experts and plant experts were interviewed. Their scores on use and knowledge of botanical remedies for pest management were compiled for comparison with the average plant use and knowledge recorded in their respective communities and for the whole survey, irrespective of altitude and community (Table 5.20).

Table 5.20: Summary of plant use and knowledge among community specialists (expressed in number of remedies)

	USE	RAW K	TOTAL K
SMALL DÄBTÄRA (TSAMLA)	7	10	21
TOOTH EXTRACTOR (TSAMLA)	9	11	27
LIVESTOCK DISEASE (TSAMLA)	3	3	15
PLANT EXPERT (TSAMLA)	21	21	86
AVERAGE TSAMLA MEN	8.58	10.04	32.88
DÄBTÄRA 1 (SHIMELA)	11	13	45
DÄBTÄRA 2 (SHIMELA)	16	18	44
WOUND EXPERT 1 (SHIMELA)	14	15	41
WOUND EXPERT 2 (SHIMELA)	4	5	35
SMALL DÄBTÄRA 1(SHIMELA)	12	24	78
SMALL DÄBTÄRA 2 (SHIMELA)	10	12	43
PLANT EXPERT (SHIMELA)	22	35	59
AVERAGE SHIMELA MEN	7.13	9.62	26.69
PLANT EXPERT (MESKELO)	15	17	42
PLANT EXPERT (MESKELO)	14	15	29
PLANT EXPERT (MESKELO)	18	19	30
WOUND EXPERT (MESKELO)	2	2	4
AVERAGE MESKELO MEN	5.79	6.75	18.14
AVERAGE TOTAL MEN	7.13	8.87	25.85

While this comparison has no statistical validity, the following trends emerged:

Lay healers

Lay healers have knowledge of botanical pest management that is apparently inferior to that of their neighbours. More significant is their reluctance to share any form of information on plants, even on benign pest conditions that clearly do not compete with the specificities of their health trade (for example flea infestations versus rabies). This phenomenon was apparent both during the qualitative semi-structured interviews and during the quantitative survey in the three communities. The fear of knowledge dilution cited by Young (1970) and the culture of secrecy are obviously real among lay healers in Wag.

Plant experts

Plant experts use more plants for pest management than their fellow farmers and have the most extensive and diversified knowledge of remedies for pest management in their communities. It is clear that pest management remedies are just one facet of their otherwise extended store of household remedies. During both interview phases, their interest in and superior knowledge of local plant remedies was made apparent in their capacity for compilation and innovation. Contrary to the knowledge acquisition process of the *däbtära*s, they only seem to compile household remedies of the area they live in and in an oral way. This makes them particularly aware of the multiple uses that can be made of plants found in their immediate environment. Moreover, it is very likely that this familiarity with multiple plant use encourages them to test new household remedies by drawing analogies between pests, plants and modes of application of the remedies. Equally significant is their readiness to share and discuss household plant remedies for pest management. In this respect, their global attitude to knowledge offers a marked contrast with the secretive habits of the lay healers.

Däbtäras

The use and knowledge of plant remedies for pest management by *däbtäras* is also superior to the average of the population and was observed to reach, in one instance, similar levels to that of the plant experts (a *däbtära* in Shimela). However, compared to the plant expert, there are two noticeable differences. First, *däbtäras* seem to have a superior knowledge of plants growing locally. During their interviews, two *däbtäras* alone cited household pest remedies involving the preparation of several local plants not mentioned by anyone else during the whole survey. Secondly, confirmed *däbtäras* involved during the first phase of the study recognised that they knew several plant remedies for pest management from other areas of Ethiopia. When probed further, they acknowledged that these remedies were simple but proven household remedies. There is no reason to doubt their sincerity. One of the reasons why seasoned *däbtäras* have a more extensive knowledge of remedies in the health sector is that they spend a large proportion of their lives travelling, in search of additional knowledge (Young 1970, Mercier 1988). If not all *däbtäras* reach the same knowledge of household pest management remedies as plant experts in their respective communities, it is probably because they are reluctant to share plant knowledge from distant areas when interviewed and also because they do not necessarily share the interest of plant experts in household remedies for mundane pests and ailments. Their own written compilations are more focused on remedies for serious disease conditions, often with spiritual connotations. There are, however, exceptions to this trend.

For instance, several *däbtära* compilations are known to contain a few remedies for benign pests such as fleas, flies and weevils (see respectively Abebe and Ayehu 1993 and Strelcyn 1966, 1968). In retrospect, these remedies seem anecdotal in the overall compilations, especially when compared to the much more regular quotation of remedies with plant components against ear pests, scabies and more importantly crop pests. If we focus in particular on the booklet examined and analysed by Strelcyn (1966), it is striking to observe very common household remedies (description of wild foods, Aloe sap as a fly repellent, etc) listed together with more *däbtära*-like remedies. In fact, it appears that the booklet was specially "ordered" by the Dakar-Djibouti French mission in the nineteen-thirties and is therefore not really representative of *däbtära* compilations. It could be argued that its author did a little bit of padding to satisfy the requirements of the "foreigners"...

In all the *däbtära* books surveyed, several distinct plant remedies for scabies and ear pests are compiled in a specific section of the book (Griaule 1930, Strelcyn 1968, Berhane Selassie 1971 and Abebe and Ayehu 1993). Although no compilations from Wag *däbtäras* could be directly consulted, this suggests that treatment for these pests is part of the regular health service that *däbtäras* can offer. In fact, findings from the field study indirectly corroborate this hypothesis. As mentioned above, farmers in Wag make a distinction between purposive and non-purposive scabies. If they believe in the existence of purposive scabies, it follows logically that they will resort to either a priest or a *däbtära* to treat this type of ailment.

In the case of ear pests, discussions with farmers on the subject invariably went back to the presence of a mysterious healer based in Chilameda, famous throughout the land for successfully extracting the troublesome insect(s) from the ear and for asking for five *birr* as a payment for each insect extracted. It could not be ascertained whether this healer was an ear pest expert or a *däbtära* making a lot of money out of this form of pest treatment.

As for crop pests, we have already observed that crop pest management is the main branch of pest management for which there is a dearth of efficacious and proven household plant remedies, hence the importance of the use of religious remedies, and more recently of chemical remedies. It is therefore interesting to note that a few *däbtära* compilations contain esoteric remedies for the same pests that farmers commonly associate with the wrath of God. Remedies against ants, termites and the dreaded locusts have been recorded (Berhane Selassie 1971, Strelcyn 1959, Kane 1983). Again, no *däbtära* compilations could be consulted to confirm or disprove this trend in the case of Wag, but it is significant that one of the *däbtära* compilations containing a remedy against locusts (*mäs'hafa anbäta*[28]) was itself a copy of a remedy held by a Falasha *däbtära* (Kane 1983).

5.4.4 - Cultural perceptions of the environment and their translation into ethnobotanical contrasts: the case of the Shimela community.

Of the five communities studied, the existence of two clear gradients (altitude and soil) is what makes the community of Shimela unique from an environmental perspective. The soil gradient in particular is striking as it literally divides the community into two parts on both sides of a central ridge, oriented north south. Compared to the stony, volcanic and shallower soils north of the ridge, the deeper loamy soils of the southern part of the community are much preferred by farmers for agricultural purposes. This ridge is also remarkable because it happens to be located in the middle of a transition area, where processes of integration of the Agaw and Amhara cultures have been at play for many decades now. While the integration of Agaw into Amhara is now virtually over in Shimela (Agawigna is hardly spoken anymore, and most people would define themselves officially as Amhara), there is a clear perception among the inhabitants of Shimela and of the surrounding communities that the areas that lie far south of the ridge are more Amhara than Agaw and that the opposite is true of the valleys lying north of the community.

In the everyday life of the people of Shimela, the ridge is not a barrier but one of the many physical obstacles to cross when embarking on a journey. Villages are scattered evenly and at similar altitudes on both sides, usually within very short reach of the other (between 10

[28] literally "the book of locusts". Esoteric *däbtära* remedy against migratory locusts.

minutes and half an hour walk; a very short distance by local standards). Farmers plough fields on both sides, the whole community is regularly engaged in community works on both sides, farmers regularly visit each other, etc. In short, an inhabitant of any village would regularly encounter plants growing in the vicinity of a village located on the other side of the ridge, because the other side is part of his daily life environment.

Based on these observations, it was decided to run several X^2 and t tests on the use and knowledge of remedies involving plants growing almost exclusively on the "Agaw" side of the ridge to check for a possible correlation between ethnobotanical knowledge and the locus of residence in relation to the ridge. Taking the answers in the survey of members of 27 households (total people 105 people) residing on both sides and within short distance of the ridge, tests were run on knowledge, USE, RAW K and TOTAL K for three tree species commonly found on the rocky shallow soils north of the ridge: Boscia angustifolia, conspicuous for its white veined trunk and the persistence of its foliage during a large portion of the dry season, two species of the Commiphora genus, *ankwa* (Commiphora spp.), well known for its lightness, and *batukwa* (Commiphora africana) widely reputed as a local medicine for skin ailments and often planted as a hedge tree in villages on the northern side of the ridge. The results of the tests are conclusive (Table 5.21 to 5.24).

Table 5.21: Summary of X^2 and t tests on population and plant knowledge
Degrees of freedom for X^2 and t tests: 1, >100

Plant species	X^2 values	T values
Boscia spp.	6.71	-2.63
Commiphora spp.1	17.40	-4.51
Commiphora spp.2	56.56	-11.42
All 3 species	11.24	-7.29

Table 5.22: Summary of X^2 and t tests on population and USE
Degrees of freedom for X^2 and t tests: 1, >100

Plant species	X^2 values	T values
Boscia spp.	*	0.86
Commiphora spp.1	*	*
Commiphora spp.2	*	-3.17
All three species	8.94	-2.79

*: calculation of X^2 or t inapplicable.

Table 5.23: Summary of X^2 and t tests on population and RAW K
Degrees of freedom for X^2 and t tests: 1, >100

Plant species	X^2 values	T values
Boscia spp.	*	-0.62
Commiphora spp.1	*	*
Commiphora spp.2	27.43	-3.76
All three species	28.3	-3.82

* : calculation of X^2 or t inapplicable

Table 5.24: Summary of X^2 and t tests on population and TOTAL K
Degrees of freedom for X^2 and t tests: 1, >100

Plant species	X^2 values	T values
Boscia spp.	*	-1.31
Commiphora spp. 1	7.84	-3.12
Commiphora spp. 2	40.25	-5.69
All three species	38.89	-6.18

*: calculation of X^2 inapplicable

For the three plants, we can reject the null hypothesis at the 5% level. Depending on which side of the ridge they live, people will not report or exhibit the same knowledge of the plants and of their use as potential remedies for pest management. The tests on straightforward plant knowledge are the most revealing in this regard (Table 5.21). People living on the southern Amhara side of the ridge have a tendency not to recognise typical plants of the northern side. This is a very striking finding considering that people on both sides are immediate neighbours living at comparable altitudes. A plausible interpretation is therefore that past ethnic divides and cultural constructs and associations of specific environments (soils and plants) with specific cultural groups (Agaw) are responsible for this extraordinary dissociation of knowledge within a very short perimeter. It is otherwise very difficult to explain this local "blindness" to local plant species, both conspicuous and known for the specificities of their use.

Knowledge of pest management remedies that require parts of these plants appears to follow similar discriminatory lines. The results are particularly significant with regards to the second Commiphora species (*batukwa*), which is also sometimes singled out by farmers as a plant remedy "*par excellence*" because of the multiple uses that can be made of it. Yet a significant number of people living sometimes only 10 minutes away from such a visible and famous remedy declare that they ignore the existence of both the plant and the household remedies that it provides for pest management and skin problems.

These findings illustrate the vividness of the interaction between the Agaw and Amhara cultures in the area under study and provide us with yet another example of the duality and ambiguity of feelings that seem to characterise this cultural integration process. It is also another example of ethnobotany (in this case of pest management) contributing to our understanding of wider cultural, linguistic

CHAPTER 6

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DIACHRONIC KNOWLEDGE PERSPECTIVES

6.1 -The difficulty of apprehending the dynamic nature of temporal or diachronic knowledge variation

References to the fluid and dynamic nature of cultural knowledge (Ellen and Harris 2000) and ethnobiological knowledge (Osseweijer 2000, Heckler 2002, Fitzpatrick 2004) are becoming increasingly abundant in the literature. While the study of knowledge dynamics is rapidly becoming a core field of research in modern ethnobiology, it appears simultaneously that ethnobiological knowledge is increasingly apprehended and analysed from a temporal perspective (e.g. Zent 2001, Heckler 2002, Compas and Ehringhaus 2003, Fitzpatrick 2004, in contrast to Hays 1974, Browner 1991 or Phillips and Gentry 1993). Favourite temporal themes include experiential learning, the co-evolution of cultural and biological diversity, knowledge and language loss and erosion (Maffi 2001), knowledge transmission generally (Hewlett and Cavalli-Sforza 1986, Mundy and Compton 1995, Ohmagari and Berkes 1997, Wilbert 2002), and specific processes and mechanisms of knowledge acquisition (Lancy 1999, Maynard 1999, Hunn 2002, Zarger 2002, Fitzpatrick 2004). In theory, research into how knowledge changes over time can only be carried out in ethnobiology if the methodology employed is longitudinal.

Knowledge variation over time, or diachronic knowledge variation, then, is precisely at the frontier of ethnobiology. We might distinguish two classes or levels of knowledge variation:

- That pertaining to the same individual or group of individuals over time (hereafter referred to as *simple diachrony*)

- That occurring between an individual or a group of individuals of a certain age and an individual or a group of individuals of the same age but living at a different point in time (hereafter referred to as *complex diachrony*).

Because of the difficulties entailed in measuring knowledge at different points in time, those few ethnobiologists who have tried have taken an indirect approach, and resorted to proxies. For example, in their attempts to measure simple diachronic variation in plant knowledge among children, Stross (1973) and more recently Hunn (2002) have taken the measurement of the average knowledge held by children of varying ages at a specific point in time as a proxy for the knowledge that an average child would gradually acquire as time goes. The approximation lies here in the fact that, for example, an average five year old child today may have a very different knowledge of plants than the average five year old child interviewed 10 years ago because of diachronic forces of change. With this type of approximation, both average children are assumed to be immune to diachronic forces of change and to have the same learning curve or plant knowledge acquisition profile.

Logically, it follows that in situations of acute change occurring within short time periods where a change in ethnobiological knowledge can be traced back to a measurable factor (the most obvious example being the direct relationship between the knowledge of a plant species and its presence/absence in the environment of the people), the measurement of simple diachrony becomes a proxy for the measurement of complex diachrony. It is this type of proxy that Zent (2001) and Ross (2002) use in their studies of knowledge erosion in Venezuela and Mexico respectively.

On the other hand, other scholars have chosen a different angle to tackle the study of diachronic knowledge. Instead of trying to measure diachronic knowledge variation, they have focused their attention on the processes of knowledge transmission that are at the heart of diachrony. Hewlett and Cavalli-Sforza (1986) carried out seminal work by studying the relationship between the type of knowledge transmission and intra-cultural variation among the Aka people in Central Africa. More recently Zarger (2002) and Fitzpatrick (2004) have made contributions by focusing on the mechanisms of knowledge acquisition among children in Central and Southern America.

The present chapter aims to highlight diachronic knowledge phenomena in the field of botanical pest management in Wag Hamra by presenting the results of the exploration of separate but complementary avenues of inquiry.

6.2 - Simple diachrony

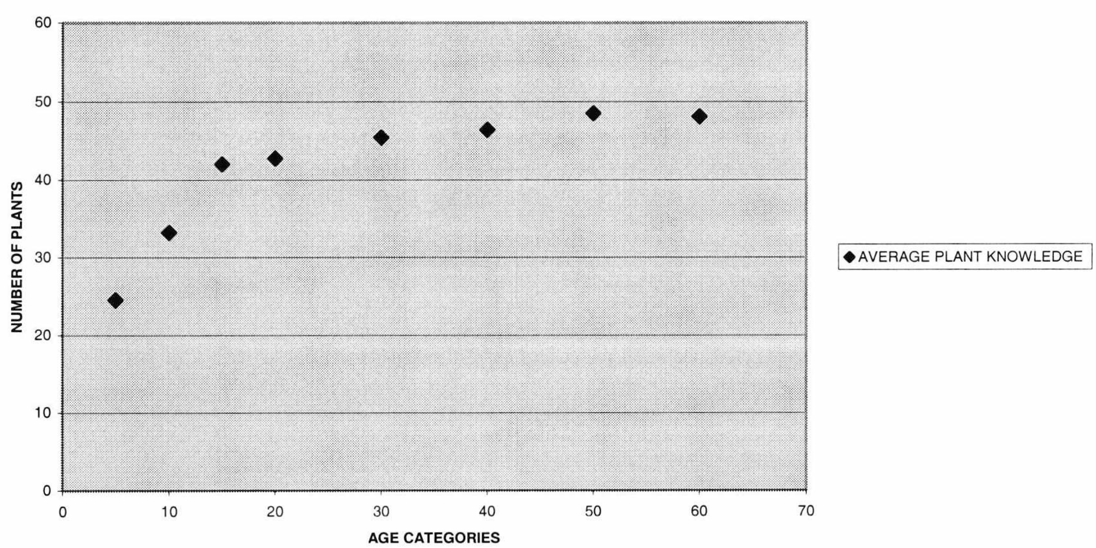
6.2.1 –The relationship between age, plant use and knowledge

Simple statistical tests (X^2, t tests and linear regression) were run on the quantitative survey data to estimate simple diachronic knowledge variation. The measurement of the average knowledge held by individuals of varying ages at a specific point in time was taken as a proxy for the knowledge that an average individual would gradually acquire over time.

6.2.1.1 - Plant knowledge

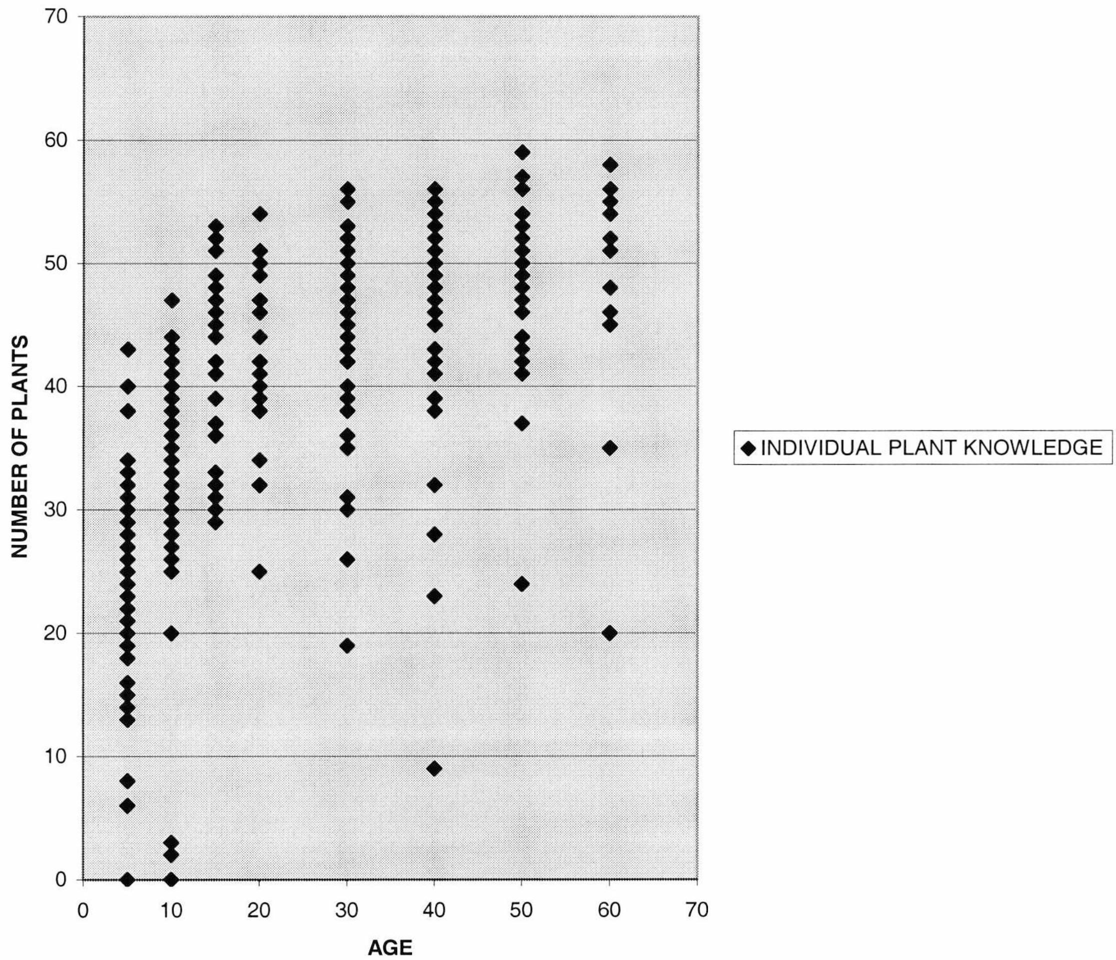
Figures 6.1 and 6.2 hint at the existence of a positive relationship between age and plant knowledge. To test this assumption, X^2 tests and linear regressions were run. First, individual plant knowledge scores were sorted into three categories of low, intermediate and high, and the eight age categories grouped two by two[29]. After organising the data, I calculated a X^2 value of 160.81 (Table 6.1) that is very significant at the 5% level for six degrees of freedom (See X^2 Tables in Annex 5.2). We can therefore reject the null hypothesis. Age and plant knowledge are strongly related. To further test this relationship, linear regression tests were run respectively on the 349 informants, the 187 male informants and the 162 female informants. In addition, linear regression tests were run on the first four and on the last five age groups to check for differential knowledge acquisition rates. A summary of these tests is presented in Table 6.2.

FIGURE 6.1: AVERAGE PLANT KNOWLEDGE BY AGE GROUP



[29] The age categories were grouped two by two, as X^2 calculations were inapplicable with single age categories (E values inferior to 5)

FIGURE 6.2: INDIVIDUAL PLANT KNOWLEDGE BY AGE



It appears, therefore, that plant knowledge is positively and linearly correlated with age, whether we take all the age groups or only the first four age groups, that is people aged between five and 30 (almost 40 % of the plant knowledge can be predicted from the age of the informants (Pearson r values of 0.62 and 0.61 respectively); see Pearson r validity Tables in Bernard (1994: 458)). What is more, the gradient of the linear regression for people aged 5 to 30 (1.35) is nearly three times greater than the gradient of the linear regression for all the age groups (0.43), suggesting greater rates of plant knowledge acquisition prior to adulthood than during adulthood. This is consistent with past findings in general ethnobotany (Stross 1973, Heckler 2002, Hunn 2002) and in the ethnobotany of wild foods (Fitzpatrick 2004).

If we segregate the sample by gender, the linear regressions yield equally conclusive findings regarding the positive and linear correlation of plant knowledge with age. In addition, the correlation and the gradients are stronger for men than for women during childhood, with r-values of 0.68 and 0.56 and gradients of 1.77 and 1.04 respectively. This can be interpreted as the result of greater exposure to the environment and plant world for boys during their shepherding activities.

Table 6.1: Calculation of global X^2 value for age and plant knowledge
Degrees of freedom: 6

Observed values

			KNOWLEDGE CLASS		
		LOW	INTERMEDIATE	HIGH	TOTAL
	5 to 15	52	55	21	128
	16 to 30	2	17	35	54
Age groups	31 to 50	5	13	97	115
	51 & above	2	2	48	52
	All	61	87	201	349

Expected values

			KNOWLEDGE CLASS	
		LOW	INTERMEDIATE	HIGH
	5 to 15	22.37	31.91	73.72
	16 to 30	9.44	13.46	31.10
Age groups	31 to 50	20.10	28.67	66.23
	51 & above	9.09	12.96	29.95

X^2 values

			KNOWLEDGE CLASS		
		LOW	INTERMEDIATE	HIGH	TOTAL
	5 to 15	39.24	16.71	37.70	93.65
	16 to 30	5.86	0.93	0.49	7.28
Age groups	31 to 50	11.34	8.56	14.29	34.20
	51 & above	5.53	9.27	10.88	25.68
				TOTAL X^2 VALUE	**160. 81**

Table 6.2: Linear regression tests for age and plant knowledge

All people	All ages	Male	All ages	Female	All ages
	GRADIENT 0.42		GRADIENT 0.39		GRADIENT 0.49
	ORDINATE 29.22		ORDINATE 30.72		ORDINATE 27.27
	PEARSON r 0.62		PEARSON r 0.64		PEARSON r 0.58
All people	Age 5 to 30		Age 5 to 30		Age 5 to 30
	GRADIENT 1.35		GRADIENT 1.77		GRADIENT 1.04
	ORDINATE 19.01		ORDINATE 15.09		ORDINATE 21.43
	PEARSON r 0.61		PEARSON r 0.68		PEARSON r 0.56
All people	Age 30 and above		Age 30 and above		Age 30 and above
	GRADIENT 0.14		GRADIENT -0.003		GRADIENT 0.03
	ORDINATE 40.78		ORDINATE 48.93		ORDINATE 42.37
	PEARSON r 0.20		PEARSON r -0.006		PEARSON r 0.02

Linear regression tests run on the plant knowledge of the last four age groups (30 years of age and above) are less conclusive as only about 4 % of plant knowledge can be predicted from the age of the older informants. If there is a relationship between age and plant knowledge during adulthood, then there is little linearity in it. While it is difficult to interpret this finding, we can bring forward the hypothesis that adults differ more among themselves in their life histories and learning opportunities than children who follow a more predictable learning pattern: learning first in the vicinity of the household and then increasingly away from the household. Chance migrations, encounters, family situations and contexts can explain to some extent the unpredictability of adult learning. It is also likely that senility and its correlation with knowledge degeneracy accounts for part of this non-linearity.

6.2.1.2 - USE and age

X^2 values for plants used were calculated for each pest where applicable[30], and are shown in Table 6.3.

Table 6.3: Summary of X^2 values calculated for age and USE
Degrees of freedom: 3

Pest type	X^2 VALUE
FLY	11.07
FLY ON WOUND	23.81
GROUND MAGGOT	26.63
JIGGER FLEA	*
EAR TICK	25.08
BED BUG	*
EAR PEST	*
SCABIES	*
BODY LICE	29.05
MOSQUITO	*
HEAD LICE	*
FLEA	16.12
TICK	*
LIVESTOCK LICE	49.35
LIVESTOCK FLEA	53.37
CHICKEN FLEA	56.30
CATTLE TICK	*
MANGE MITES	*
WEEVIL	*
TEFF EATING ANT	*
GRASSHOPPER	*
FIELD TERMITE	*
HARVEST TERMITE	57.46
HOUSEHOLD pests	34.82
BODY pests	31.53
LIVESTOCK pests	91.22
CROP pests	69.35
All Pests	48.10

*: calculation of X^2 inapplicable

[30] See Bernard (1994: 438) for cases when the calculation and interpretation of X^2 values is meaningless due to the low levels of E (Expected) values

Table 6.4: Linear regressions for age and USE

	All ages			Age 5 to 30		
	GRADIENT	ORDINATE	PEARSON r	GRADIENT	ORDINATE	PEARSON r
FLY	0.00	0.14	0.14	0.01	0.02	0.15
FLY ON WOUND	0.01	0.27	0.20	0.03	0.03	0.29
GROUND MAGGOT	0.01	0.14	0.20	0.04	-0.20	0.34
JIGGER FLEA	0.00	0.04	0.05	0.00	0.02	0.06
EAR TICK	0.00	0.01	0.20	0.01	-0.05	0.20
BED BUG	0.00	0.06	0.08	0.01	0.01	0.09
EAR PEST	0.00	0.03	-0.04	0.00	-0.01	0.10
SCABIES	0.00	0.03	0.14	0.01	-0.05	0.18
BODY LICE	0.01	0.23	0.27	0.02	0.17	0.12
MOSQUITO	0.00	-0.01	0.09	0.00	-0.02	0.14
HEAD LICE	0.00	0.09	-0.06	0.00	0.03	0.07
FLEA	0.00	0.07	0.13	0.02	-0.10	0.26
TICK	0.00	0.00	0.02	0.00	0.00	*
LIVESTOCK LICE	0.01	0.03	0.32	0.03	-0.12	0.31
LIVESTOCK FLEA	0.01	-0.02	0.37	0.01	0.00	0.15
CHICKEN FLEA	0.01	0.13	0.22	0.03	-0.13	0.28
CATTLE TICK	0.00	0.00	0.13	0.00	-0.02	0.12
MANGE MITES	0.00	0.01	0.04	0.00	0.00	0.07
WEEVIL	0.00	0.01	0.09	0.00	-0.04	0.14
TEFF EATING ANT	0.00	0.00	0.18	0.00	-0.02	0.08
GRASSHOPPER	0.00	0.00	0.02	0.00	0.00	*
FIELD TERMITE	0.00	-0.01	0.12	0.01	-0.05	0.17
HARVEST TERMITE	0.01	0.05	0.32	0.03	-0.13	0.28
HOUSEHOLD pests	0.02	0.41	0.23	0.08	-0.29	0.36
BODY pests	0.03	0.68	0.35	0.08	0.15	0.35
LIVESTOCK pests	0.04	0.11	0.43	0.08	-0.35	0.39
CROP pests	0.02	0.06	0.33	0.05	-0.23	0.32
All pests	0.11	1.25	0.46	0.29	-0.71	0.52
	Age 30 and above			Age 30 to 60		
	GRADIENT	ORDINATE	PEARSON r	GRADIENT	ORDINATE	PEARSON r
All pests	0.05	3.73	0.13	0.09	2.33	0.20

*: calculation of Pearson r inapplicable

Not surprisingly, for all the pests where the calculation was possible, we can reject the null hypothesis. However, to properly interpret the findings, it must be born in mind that the tests were run on USE which can only take the two values 1 (the respondent used one or more plants to deal with a certain pest) and 0 (the respondent did not use any plant to deal with a certain pest). Therefore, the correct interpretation of the X^2 values is that age and the proportion of people who report the use of botanical remedies for pest management are correlated. This relationship is significant at the 5% level and the finding can be generalised to the whole population.

Linear regression results (Table 6.4) inform us that this correlation is positive and much more pronounced during childhood than during adulthood: r values of 0.52 for people aged between 5 and 30 compared to 0.13 for people aged 30 and above. In fact, the latter r-value suggests that there is very little linearity in the relationship between age and plant use during adulthood.

It can be concluded, therefore, that plant use for pest management is positively correlated with age. In the socio-cultural context of Wag Hamra, individuals, starting from early childhood, are given responsibility for an increasingly higher number of domestic and productive activities as they get older. It is therefore only logical that the use of plants to deal with pests should increase with age. Children must first acquire the knowledge from their elders or peers and then be allowed to apply the knowledge, particularly in the case of livestock and crop production activities. Young boys become shepherds very early, sometimes by the age of five, but they always go out to pasture in groups and remain for some time under the supervision of older shepherds (aged 10 and above). It is only when a father considers that his son is mature and reliable enough that he will allow him to handle infestations of lice, ticks and fleas and ultimately wounds. For such pests, the application of plant remedies is fairly straightforward but the follow-up of the treatment requires a great deal of care. In particular, shepherds must ensure that animals do not lick their coats as some plant extracts can cause harm to the animal if ingested (the juice of *zïgïta*, Calpurnea aurea, is considered toxic for example). There is also the issue of pest incidence. A boy or young man can have the knowledge of a proven remedy but wait for many years until he is confronted with the same pest problem again. According to this principle, we would expect an ever-increasing number of people to report the use of plant remedies as they grow older, since the probability that they would have to deal with any given pest would increase with time.

It is precisely on this point that the non-linearity of the correlation between age and plant use after the age of 30 raises a number of questions.

FIGURE 6.3: AVERAGE PLANT USE BY AGE GROUP

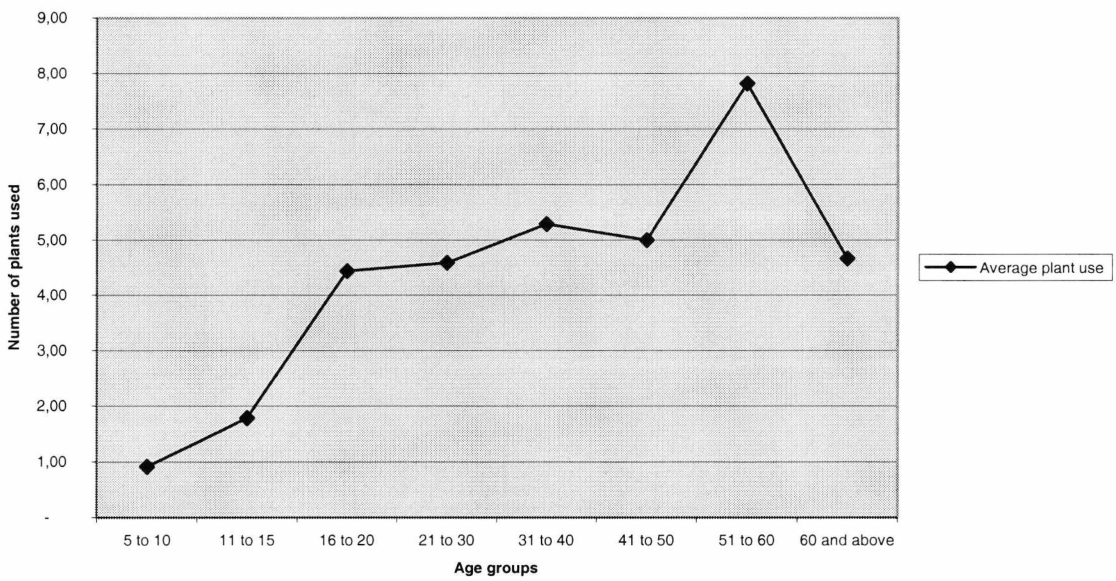
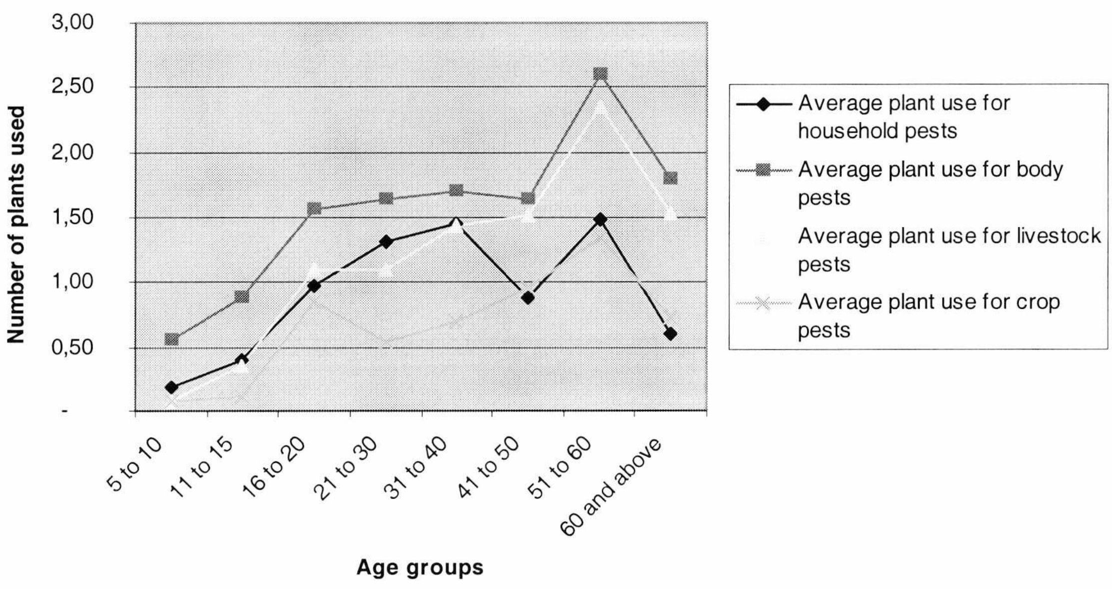


FIGURE 6.4: AVERAGE PLANT USE BY PEST CATEGORY AND BY AGE GROUP



Figures 6.3 and 6.4 of average total and detailed plant use per age category are purely indicative, but nevertheless suggest knowledge degeneracy after the age of 60, similar to the one noted for plant knowledge. However, the senility factor cannot explain everything. Regression tests run on people aged 30 to 60 (excluding people aged 60 and above to minimise the senility factor) yield a very unimpressive r-value of 0.2 (compared to 0.13 for the regression run on categories 4 to 8). There are a number of explanations for the weak linearity of plant remedy use after the age of 30: for example, altitude and its influence on plant and pest distribution, the incidence of disruptive diachronic forces such as the reduced availability of plants and the competition of plant remedies with other remedies (animal products, 'religious' remedies, chemical pesticides).

6.2.1.3 - RAW K and age

Compared to USE, X^2 values were calculated for a wider range of pests (Table 6.5). Most X^2 values are significant at the 5% level and we can reject the null hypothesis. Concerning a majority of pests and taking sub-groups of pests as a whole (household pests, body pests, livestock pests and crop pests), age and the proportion of people who report (unprompted) the knowledge of plant remedies to combat these pests are related. The linear regression values summarised in Table 6.6 tell us that this correlation is positive: the higher the age category the higher the proportion of people in each age category that report the knowledge of plant remedies for pest management. This again is a rather predictable result.

In short, the older people get the higher the chances that they will have acquired some form of knowledge of botanical pest management and internalised it. Both X^2 and r-values are significant at the 5% level and we can generalise the finding to the whole population.

However, the X^2 values are not significant at the 5% level for the jigger flea, bedbugs, scabies, and fleas, implying that we must accept the null hypothesis for these pests. In fact, the values for the jigger flea and scabies (2.37 and 2.6) are very low and barely significant at the 50 % level whereas the values for bedbugs and fleas would only be significant at the 30% level. The r-values in the regression tests are also among the lowest (inferior to 0.1) for the four pests. This indicates that other factors are responsible for the disruption of the experiential learning process.

Table 6.5: Summary of X^2 values calculated for age and RAW K
Degrees of freedom: 3

	X^2 Values
FLY	12.97
FLY ON WOUND	31.29
GROUND MAGGOT	40.49
JIGGER FLEA	2.37
EAR TICK	17.73
BED BUG	4.36
EAR PEST	*
SCABIES	2.60
BODY LICE	20.07
MOSQUITO	*
HEAD LICE	*
FLEA	5.43
TICK	*
LIVESTOCK LICE	30.61
LIVESTOCK FLEA	34.76
CHICKEN FLEA	55.95
CATTLE TICK	11.82
MANGE MITES	*
WEEVIL	*
TEFF EATING ANT	23.61
GRASSHOPPER	*
FIELD TERMITE	*
HARVEST TERMITE	9.38
HOUSEHOLD pests	33.31
BODY pests	25.42
LIVESTOCK pests	46.89
CROP pests	18.05
All pests	*

*: calculation of X^2 inapplicable

Table 6.6: Linear regressions for age and RAW K

	All ages			Age 5 to 30		
	GRADIENT	ORDINATE	PEARSON r	GRADIENT	ORDINATE	PEARSON r
FLY	0.01	0.14	0.16	0.01	0,03	0,15
FLY ON WOUND	0.01	0.32	0.20	0.04	0,01	0,34
GROUND MAGGOT	0.01	0.21	0.27	0.06	-0,26	0,42
JIGGER FLEA	0.00	0.07	0.09	0.00	0,09	-0,01
EAR TICK	0.00	0.10	0.16	0.02	-0,03	0,21
BED BUG	0.00	0.13	0.03	0.01	0,06	0,07
EAR PEST	0.00	0.10	-0.03	0.00	0,03	0,07
SCABIES	0.00	0.09	0.07	0.01	0,03	0,09
BODY LICE	0.01	0.31	0.24	0.02	0,27	0,10
MOSQUITO	0.00	0.00	0.07	0.00	-0,01	0,09
HEAD LICE	0.00	0.13	-0.08	0.00	0,11	0,01
FLEA	0.00	0.16	0.09	0.01	0,01	0,17
TICK	0.00	0.00	0.02	0.00	0,00	*
LIVESTOCK LICE	0.01	0.17	0.28	0.03	-0,04	0,29
LIVESTOCK FLEA	0.01	0.05	0.34	0.01	0,11	0,09
CHICKEN FLEA	0.01	0.20	0.26	0.03	-0,04	0,24
CATTLE TICK	0.00	0.08	0.06	0.00	0,06	0,00
MANGE MITES	0.00	0.04	0.03	0.00	0,03	0,00
WEEVIL	0.00	0.02	0.11	0.00	-0,02	0,10
TEFF EATING ANT	0.00	0.03	0.18	0.01	-0,08	0,22
GRASSHOPPER	0.00	0.00	0.02	0.00	0,00	*
FIELD TERMITE	0.00	0.01	0.10	0.01	-0,05	0,17
HARVEST TERMITE	0.01	0.69	0.12	0.03	0,45	0,15
HOUSEHOLD	0.02	0.64	0.23	0.09	-0,17	0,37
BODY	0.03	1.12	0.29	0.09	0,48	0,30
LIVESTOCK	0.04	0.52	0.40	0.08	0,08	0,31
CROP	0.01	0.75	0.20	0.05	0,31	0,26
All pests	0.11	3.03	0.37	0.31	0,70	0,44
	Age 30 and above					
	GRADIENT	ORDINATE	PEARSON r			
All pests	0.01	7.04	0.02			

*: calculation of r inapplicable

For the jigger flea, the explanation is relatively obvious. Due to its preference for specific habitats, the insect is only found in certain unidentified rocky areas and at specific altitude ranges. If we focused our investigations in the areas where the insects abound, we would probably obtain normal statistical indicators of experiential learning. Altitude and its influence on pest distribution and therefore on knowledge of plant remedies for these pests is also the most likely explanation for the low X^2 value for fleas. It might also be suggested that the relatively higher degree of significance found for the flea value (compared to the jigger flea) is due to the wider altitude range of the flea.

The low X^2 value for human scabies is more difficult to interpret. One suggestion is that non-purposive scabies is sometimes described as a typical child skin condition, because of the high degree of interaction between children, and because of the ease of transmission of the pest through simple contact. This accepted status of the disease during childhood would then have to be contrasted with its much more ambiguous status during adulthood (see Chapter 4 on purposive scabies versus non-purposive scabies). This could, to some extent, explain why children, proportionally, are more, or at least equally, likely to report the knowledge of plant remedies for scabies than adults.

The case of the bedbugs is also difficult to interpret. The distribution is not restricted by altitude and infestations of the pest are not associated with witchcraft. Since no argument comes to mind to explain why children proportionally report more or the same knowledge as adults, it is possible that the cause lies with adults themselves. In fact, it was common during the semi-structured interviews with knowledgeable informants to hear that there were no effective remedies against bedbugs. Plants laid on the ground and fumigants (see Chapter 5) were considered a waste of time. After exploring the issue, it invariably emerged that the only known remedy for bedbugs was *didit*. Further enquiry revealed that this term stands as a generic for both the actual DDT powder that was provided to farmers for the malaria eradication campaign during the late sixties and early seventies, and for pesticides / insecticides / acaricides of all kinds provided by the current Ministry of Agriculture. Farmers discovered 30 years ago that DDT is a multipurpose remedy and began using it inside the household (for all household pests) and inside grain stores. The practice is forbidden by the current government, but farmers have not abandoned it. The only difference is that they now use liquid pesticides. This would explain to some extent why farmers, judging the efficacy of plant remedies as inferior to that of chemical remedies, would proportionally mention them less during the first part of the questionnaire, even if they still retain the knowledge of the plant remedies.

Regression tests for people aged 30 and above (r value of 0.02) almost allow us to accept the null hypothesis that there is virtually no linear relationship between age and knowledge of plant remedies during adulthood. As in the case of USE, the senility factor can be put forward as part of the explanation. Figures 6.5 and 6.6 are quite explicit in this respect. The unpredictability and saturation of the learning process after the age of 40 and the impact of diachronic forces of change that would hinder the adult learning process are the two most plausible factors underlying this near absence of linearity in the adult knowledge acquisition process. In fact, a closer look at the graphs shows a curious decline in knowledge in the age groups from 40 and above, particularly for body and household pests. Adults from this age group would have been in their infancy during the first irruption of chemicals in Wag and would have reached the age of 30 ten years ago, after the end of the war when the second wave of chemicals reached the Zone. This could somehow explain their lower uptake and knowledge of plant remedies for pest management.

FIGURE 6.5: AVERAGE RAW K FOR ALL PESTS BY AGE GROUP

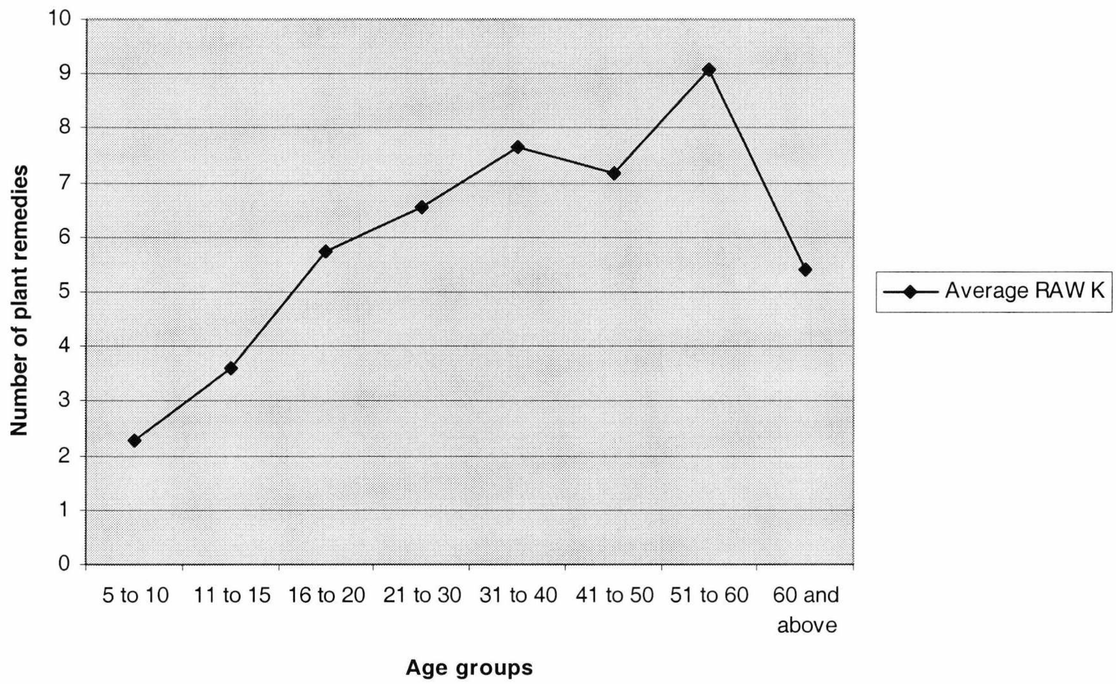
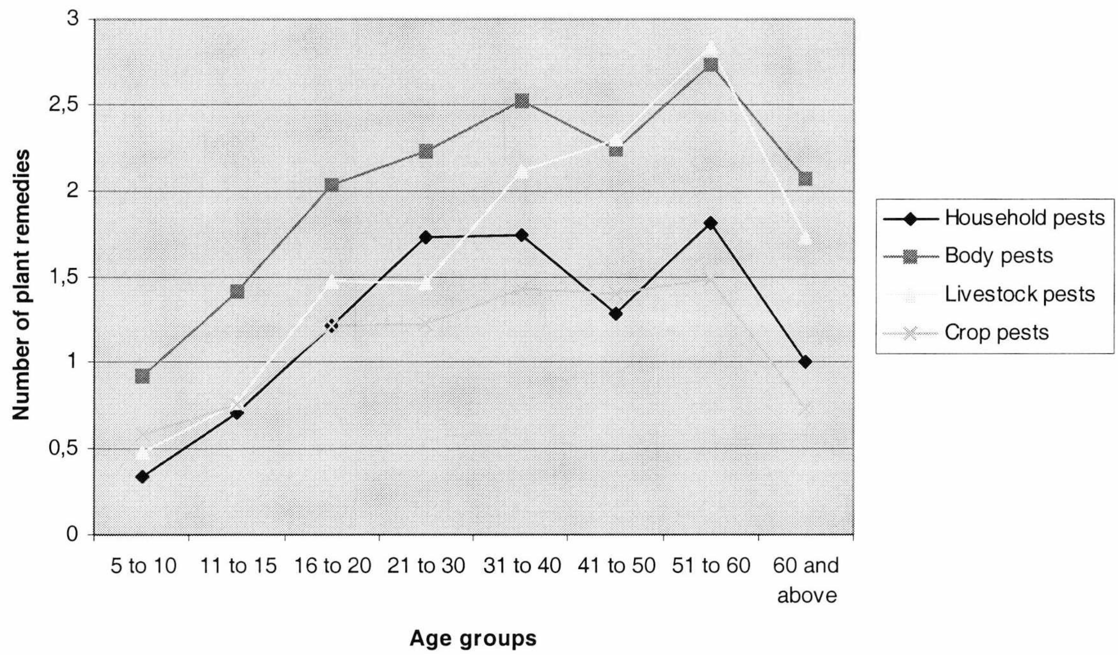


FIGURE 6.6: AVERAGE RAW K BY PEST CATEGORY BY AGE GROUP



6.2.1.4 - TOTAL K and age

X^2 tests and linear regressions were run on both the proportion of people who reported knowing a plant pest remedy when prompted and on the amount of knowledge held by people (number of remedies known for a given pest). The statistical findings are conclusive in both cases (Tables 6.7, 6.8, 6.9 and 6.10).

A positive relationship exists between: (1) age and the number of people who report knowledge of plant remedies for pest management, and (2) between age and the number of remedies that individuals are familiar with. This finding is significant at the 1% level. In other words, as they become older, more people are likely to become familiar with at least one plant remedy for a given pest. Concurrently, those who already have some knowledge are likely to acquire *additional* knowledge of plant remedies for pest management. A comparison of the gradients of the regressions lines for all age groups and for people aged 5 to 30 suggests that rates of knowledge acquisition are higher during childhood than during adulthood.

Table 6.7: Summary of X^2 tests for age and TOTAL K
Model 1: Proportion of people reporting TOTAL K by pest type
Degrees of freedom: 3

Pest type	X^2 VALUES
FLY	21.71
FLY ON WOUND	16.05
GROUND MAGGOT	73.35
JIGGER FLEA	19.15
EAR TICK	25.39
BED BUG	45.49
EAR PEST	15.27
SCABIES	51.61
BODY LICE	14.97
MOSQUITO	29.12
HEAD LICE	22.57
FLEA	23.20
TICK	*
LIVESTOCK LICE	47.66
LIVESTOCK FLEA	40.40
CHICKEN FLEA	82.04
CATTLE TICK	40.93
MANGE MITES	3.70
WEEVIL	28.01
TEFF EATING ANT	23.15
GRASSHOPPER	*
FIELD TERMITE	40.57
HARVEST TERMITE	27.57
HOUSEHOLD pests	33.75
BODY pests	*
LIVESTOCK pests	40.01
CROP pests	37.95
All pests	*

*: calculation of X^2 inapplicable

Table 6.8: Linear regressions for age and TOTAL K
Model 1: proportion of people reporting TOTAL K by pest type

	All ages			Age 5 to 20		
	GRADIENT	ORDINATE	PEARSON r	GRADIENT	ORDINATE	PEARSON r
FLY	0.05	0.28	0.23	-0.03	0.41	-0.04
FLY ON WOUND	0.04	0.69	0.23	0.09	0.60	0.16
GROUND MAGGOT	0.10	0.22	0.43	0.26	-0.10	0.37
JIGGER FLEA	0.04	0.09	0.22	-0.01	0.17	-0.01
EAR TICK	0.04	0.09	0.21	0.22	-0.22	0.39
BED BUG	0.08	0.19	0.34	0.09	0.15	0.14
EAR PEST	0.03	0.25	0.14	-0.06	0.38	-0.10
SCABIES	0.08	0.09	0.37	0.11	0.02	0.18
BODY LICE	0.05	0.23	0.22	0.00	0.31	0.00
MOSQUITO	0.05	-0.01	0.27	0.05	-0.03	0.14
HEAD LICE	0.04	0.53	0.20	0.17	0.27	0.25
FLEA	0.06	0.23	0.24	0.11	0.14	0.16
TICK	0.01	-0.02	0.14	0.00	0.00	*
LIVESTOCK LICE	0.09	0.20	0.39	0.18	0.04	0.26
LIVESTOCK FLEA	0.08	0.21	0.35	0.11	0.16	0.17
CHICKEN FLEA	0.11	0.13	0.47	0.19	-0.05	0.29
CATTLE TICK	0.07	0.06	0.33	0.01	0.15	0.02
MANGE MITES	0.02	0.13	0.10	0.03	0.10	0.06
WEEVIL	0.05	0.02	0.26	0.09	-0.06	0.19
TEFF EATING ANT	0.03	-0.01	0.22	0.03	-0.03	0.14
GRASSHOPPER	0.00	0.00	0.07	0.00	0.00	*
FIELD TERMITE	0.06	-0.01	0.32	0.17	-0.17	0.34
HARVEST TERMITE	0.05	0.62	0.26	0.17	0.39	0.27
HOUSEHOLD pests	0.05	0.60	0.30	0.18	0.36	0.28
BODY pests	0.02	0.87	0.16	0.22	0.77	0.17
LIVESTOCK pests	0.06	0.61	0.34	0.21	0.44	0.22
CROP pests	0.05	0.66	0.31	0.12	0.37	0.34
All pests	0.01	6.16	0.10	0.73	2.32	0.13

*: calculation of r inapplicable

Table 6.9: Summary of X^2 tests for age and TOTAL K
Model 2: knowledge held (number of remedies)
Degrees of freedom: 6

Pest type	X^2 VALUES
FLY	24.12
FLY ON WOUND	*
GROUND MAGGOT	82.72
JIGGER FLEA	22.98
EAR TICK	*
BED BUG	48.75
EAR PEST	22.09
SCABIES	62.86
BODY LICE	16.95
MOSQUITO	*
HEAD LICE	28.50
FLEA	36.60
TICK	*
LIVESTOCK LICE	50.81
LIVESTOCK FLEA	48.49
CHICKEN FLEA	87.56
CATTLE TICK	45.88
MANGE MITES	*
WEEVIL	*
TEFF EATING ANT	*
GRASSHOPPER	*
FIELD TERMITE	48.71
HARVEST TERMITE	36.02
HOUSEHOLD pests	84.01
BODY pests	78.71
LIVESTOCK pests	94.49
CROP pests	71.12
All pests	120.14

*: calculation of X^2 inapplicable

Table 6.10: Linear regressions for age and TOTAL K
Model 2: knowledge held by people (number of remedies)

	All ages			Age 5 to 20		
	GRADIENT	ORDINATE	PEARSON r	GRADIENT	ORDINATE	PEARSON r
FLY	0.01	0.48	0.21	0.00	0.50	0.03
FLY ON WOUND	0.01	0.76	0.20	0.01	0.67	0.13
GROUND MAGGOT	0.03	0.41	0.41	0.08	-0.15	0.40
JIGGER FLEA	0.01	0.13	0.25	0.01	0.15	0.07
EAR TICK	0.01	0.16	0.18	0.03	-0.06	0.28
BED BUG	0.02	0.39	0.27	0.05	0.05	0.23
EAR PEST	0.01	0.34	0.15	0.02	0.16	0.14
SCABIES	0.02	0.19	0.33	0.03	-0.01	0.24
BODY LICE	0.01	0.39	0.23	0.01	0.38	0.07
MOSQUITO	0.01	0.03	0.26	0.02	-0.09	0.26
HEAD LICE	0.02	0.95	0.22	0.07	0.35	0.27
FLEA	0.02	0.26	0.31	0.03	0.14	0.19
TICK	0.00	-0.01	0.15	0.00	-0.02	0.14
LIVESTOCK LICE	0.03	0.22	0.37	0.07	-0.17	0.34
LIVESTOCK FLEA	0.03	0.20	0.38	0.02	0.29	0.13
CHICKEN FLEA	0.02	0.27	0.42	0.05	-0.07	0.35
CATTLE TICK	0.01	0.13	0.29	0.03	-0.02	0.21
MANGE MITES	0.00	0.15	0.12	0.01	0.11	0.09
WEEVIL	0.01	0.05	0.24	0.02	-0.01	0.16
TEFF EATING ANT	0.00	0.03	0.18	0.02	-0.10	0.25
GRASSHOPPER	0.00	0.00	0.07	0.00	0.00	*
FIELD TERMITE	0.02	0.00	0.35	0.02	-0.04	0.21
HARVEST TERMITE	0.02	1.02	0.25	0.06	0.56	0.29
HOUSEHOLD pests	0.09	1.57	0.44	0.18	0.45	0.34
BODY pests	0.11	2.70	0.42	0.22	1.49	0.34
LIVESTOCK pests	0.13	0.78	0.48	0.21	-0.02	0.39
CROP pests	0.05	1.10	0.41	0.12	0.40	0.39
All pests	0.38	6.16	0.50	0.73	2.32	0.44
	Age 20 and above			Age 20 to 60		
All pests	0.24	11.92	0.19	0.38	7.60	0.25

*: calculation of r inapplicable

As in the case of USE and RAW K, the near non-linearity of knowledge acquisition during adulthood is confirmed (r value of 0.19). However, the important point to observe is that the degree of linear correlation between age and total knowledge of botanical pest management is much greater than it is between age and unprompted knowledge of botanical pest management (RAW K). This higher degree of linearity is apparent in Figures 6.7 and 6.8. Part of the difference lies in the fact that when prompted (see second part of the questionnaire which forms the basis of TOTAL K), farmers are less reluctant to acknowledge that plants can be used as remedies for pests. They might add that they have heard it from other people or that they believe that the remedy works or does not work. But the bottom line is that even if they have been conditioned by the recent influx of chemicals to discard plant remedies when they face a pest problem, they still retain the old traditional knowledge and will mention it when prompted.

FIGURE 6.7: AVERAGE TOTAL K FOR ALL PESTS BY AGE GROUP

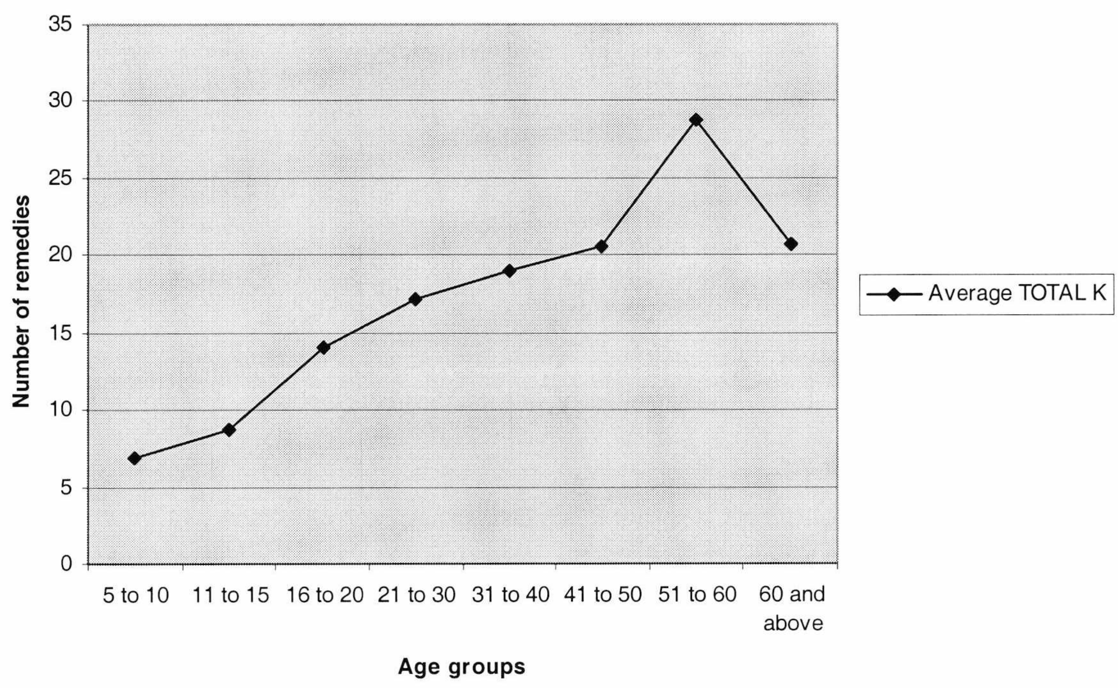
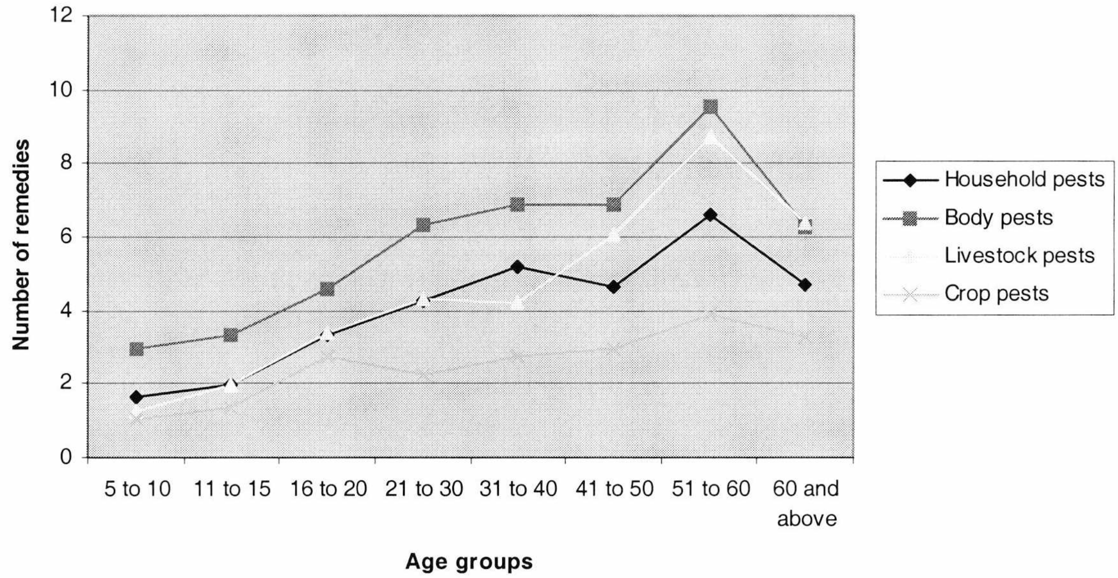


FIGURE 6.8: AVERAGE TOTAL K BY PEST CATEGORY BY AGE GROUP



6.3- The impact of migration

6.3.1 - Female marital relocation

In rural Wag, as in most areas of the Northern highlands of Ethiopia, young women move to the household of their husbands immediately after the wedding. This sometimes implies a radical change in life environment (altitude, topography, vegetation, etc)

Simple X^2 and Student t tests were run on USE, RAW K and TOTAL K to measure the impact of this type of migration on simple diachronic knowledge variation among adult women in Wag. The 89 women in the sample were sorted into two groups, those who married within a short distance of their household of birth (not further than one or two villages) and those who relocated to distant villages or communities after their wedding. The basic assumption underlying the test is that women exposed during their life to two successive and possibly different environments would acquire ethnobotanical knowledge of pest management in excess of women born and exposed to the same environment throughout their life.

6.3.1.1 - USE and RAW K

The results of the tests are compiled in Tables 6.11 and 6.12. From the USE figures, it is not possible to draw firm conclusions. On the basis of the total X^2 value (5.32 for three degrees of freedom significant at the 10 % level), we can conclude that there is a relationship between plant use and female migration but that it is not a strong one. It is hinted at rather than firmly established.

Table 6.11: Summary of X^2 and T tests for female migration and USE
Degrees of freedom for X^2 tests: 1 for all individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

	X^2 values	T values
FLY	*	1.79
FLY ON WOUND	*	0.25
GROUND MAGGOT	*	-0.19
JIGGER FLEA	*	1.15
EAR TICK	*	-0.01
BEDBUG	*	-0.43
EAR PEST	*	0.85
SCABIES	*	0.70
BODY LICE	1.04	0.70
HEAD LICE	*	-0.09
TICK	*	*
FLEA	*	-0.50
MOSQUITO	*	0.85
CATTLE LICE	*	0.88
CATTLE FLEA	*	0.56
LIVESTOCK TICK	*	1.59
MANGE MITES	*	*
CHICKEN FLEA	0.07	1.13
WEEVIL	*	-0.79
TEFF EATING ANT	*	0.47
GRASSHOPPER	*	*
HARVEST TERMITES	*	1.68
FIELD TERMITES	*	*
All pests	5.32	1.72

*: calculation of X^2 or t inapplicable

On the whole, migrant women have on average higher plant use values than those who married in the vicinity of their place of birth. However, the t value of 1.72 tells us that this difference is barely significant at the 10 % level and that it is not entirely safe to generalise this result to the whole population. Furthermore, no individual pest stands out statistically to exemplify this trend (with the possible exception of remedies used to treat flies; t value of 1.79 also barely significant at the 10 % level). It is therefore safer to interpret these results in a conservative manner. For a majority of individual pests, the fact that there is no sign of any relationship between migration and plant use has probably a lot to do with the male gender bias that characterises plant use for pest management (see Chapter 5). Expressed in other terms, women in Wag are simply not going to begin interfering with predominantly male activities, simply because they have come from a distant village. If migration had any influence at all on specific forms of pest management, one would expect to witness it on the pests that show a clear female gender bias: head lice and chicken flea. The answer is very clear. The insignificant t values for both pests signal the total absence of a relationship between migration and plant use.

In light of the individual pest results, extreme caution is necessary to interpret the barely significant X^2 and t values for all the pests taken as a whole. It is probably safest to argue that the exposure of migrating women to a higher degree of diversity of plant remedies in their life increases their chances of using plant remedies for botanical pest management purposes. In some rare cases, it may be that women mentioned plant uses from their childhood, prior to their wedding and migration to the household of their husbands.

The statistical results obtained on unprompted knowledge of plant remedies (RAW K) are in line with the previous results but with two notable differences. First, there are now several pests for which the t values are significant at the 10 % level and clearly indicate that migrating women have a superior knowledge of plant remedies for pest management (cattle lice and termites) than non-migrating women. More importantly, in the case of termite ground repellents, this trend is tied to the existence of a relationship between migration and unprompted knowledge of plant remedies for pest management (Table 6.12 where the X^2 value of 4 is significant at the 10% level). As for X^2 and t values for all pests taken as a whole, they do not just hint, but this time signal clearly the existence of a tangible connection between migration and knowledge of botanical pest management, confirming the initial assumption. Women who relocate after their wedding reach higher levels of knowledge of botanical pest management than non-migrating women.

Table 6.12: Summary of X^2 and T tests for female migration and RAW K
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

	X^2 values	T values
FLY	*	1.79
FLY ON WOUND	*	-0.72
GROUND MAGGOT	0.006	1.03
JIGGER FLEA	*	-0.09
EAR TICK	*	-0.79
BEDBUG	*	-0.25
EAR PEST	*	-1.03
SCABIES	*	0.70
BODY LICE	1.51	1.00
HEAD LICE	*	0.15
TICK	*	*
FLEA	*	0.04
MOSQUITO	*	0.85
CATTLE LICE	*	2.60
CATTLE FLEA	*	1.29
LIVESTOCK TICK	*	1.41
MANGE MITES	*	1.22
CHICKEN FLEA	0.05	1.43
WEEVIL	*	-1.21
TEFF EATING ANT	*	1.01
GRASSHOPPER	*	*
HARVEST TERMITES	4	2.19
FIELD TERMITES	*	0.85
All pests	6.02	2.17

*: calculation of X^2 or t inapplicable

6.3.1.2 - TOTAL K

The statistical findings of the tests on the total knowledge held by both groups of women are impressive and significant at the 10 % level.

It appears that there is a marked relationship between migration and total knowledge of botanical pest management for numerous individual pests (flies, ground maggots, scabies, cattle lice and fleas, chicken fleas and heap termites) and for all pests taken as a whole (Table 6.13: X^2 value of 10.73 with three degrees of freedom).

Table 6.13: Summary of X^2 and T tests for female migration and TOTAL K
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

	X^2 values	T values
FLY	4.46	2.23
FLY ON WOUND	*	0.26
GROUND MAGGOT	3.35	2.41
JIGGER FLEA	*	-0.63
EAR TICK	*	0.09
BEDBUG	0.16	0.98
EAR PEST	*	0.25
SCABIES	6.06	2.13
BODY LICE	0.08	0.82
HEAD LICE	0.34	-0.65
TICK	*	*
FLEA	0.48	1.40
MOSQUITO	*	1.62
CATTLE LICE	6.69	3.06
CATTLE FLEA	3.07	1.60
LIVESTOCK TICK	*	0.11
MANGE MITES	*	1.81
CHICKEN FLEA	1.41	2.03
WEEVIL	*	1.28
TEFF EATING ANT	*	1.21
GRASSHOPPER	*	*
HARVEST TERMITES	12.15	2.95
FIELD TERMITES	*	2.05
All pests	10.73	3.14

*: calculation of X^2 or t inapplicable

T tests performed on the same individual pests are significant at the 10 % level and suggest that migration is positively correlated with knowledge. The interpretation of the results is clear: in the area under study, migrating women know more botanical pest management remedies than non-migrating women. This comes as the result of their exposure to pests and plant remedies from two distinct environments. Because of the high altitude variability and its direct impact on pest and plant distribution, differences of a few hundred meters between the altitude of life at birth and the altitude of the household of the husband can be very significant.

6.3.2 - Male labour migration

Similar tests were run for those adult men in the sample population who had at some point in their lives travelled to distant communities or regions for prolonged periods of time. While the sample size of migrant men (12) allowed for fewer calculations, trends similar to those observed for female migration emerged (see Tables 6.14, 6.15 and 6.16 for summaries of X^2 and t values for USE, RAW K and TOTAL K). Moreover, compared to female migration, the positive correlation between migration and knowledge of botanical pest management remedies is more pronounced. Men who migrate have knowledge of botanical pest management superior to men who do not migrate.

Table 6.14: Summary of X^2 and T tests for male migration and USE
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

Pest type	X^2 values	T values
FLY	*	1.01
FLY ON WOUND	*	-1.64
GROUND MAGGOT	*	-0.94
JIGGER FLEA	*	0.21
EAR TICK	*	-2.12
BEDBUG	*	-1.59
EAR PEST	*	-1.56
SCABIES	*	-1.36
BODY LICE	*	-0.70
HEAD LICE	*	0.66
TICK	*	*
FLEA	*	-1.07
MOSQUITO	*	0.51
CATTLE LICE	*	-2.88
CATTLE FLEA	*	-2.61
LIVESTOCK TICK	*	-0.59
MANGE MITES	*	0.61
CHICKEN FLEA	*	-2.96
WEEVIL	*	-2.49
TEFF EATING ANT	*	-1.45
GRASSHOPPER	*	*
HARVEST TERMITES	*	-1.43
FIELD TERMITES	*	-4.20
All pests	6.74	-3.64

*: calculation of X^2 or t values inapplicable

Table 6.15: Summary of X^2 and T tests for male migration and RAW K
Degrees of freedom for X^2 tests: 1 for individual tests (2 for 'All pests')
Degrees of freedom for t tests: > 100

Pest type	X^2 values	T values
FLY	*	0.74
FLY ON WOUND	*	-1.23
GROUND MAGGOT	*	-0.86
JIGGER FLEA	*	-0.26
EAR TICK	*	-2.21
BEDBUG	*	-1.39
EAR PEST	*	0.02
SCABIES	*	-2.77
BODY LICE	*	-0.87
HEAD LICE	*	0.77
TICK	*	*
FLEA	*	-1.18
MOSQUITO	*	0.51
CATTLE LICE	*	-2.62
CATTLE FLEA	*	-2.41
LIVESTOCK TICK	*	-1.43
MANGE MITES	*	0.19
CHICKEN FLEA	*	-2.08
WEEVIL	*	-3.66
TEFF EATING ANT	*	-2.85
GRASSHOPPER	*	*
HARVEST TERMITES	*	-1.34
FIELD TERMITES	*	-4.20
All pests	3.26	-3.72

*: calculation of X^2 or t inapplicable

Table 6.16: Summary of X^2 and T tests for male migration and TOTAL K
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

Pest type	X^2 values	T values
FLY	*	-3.39
FLY ON WOUND	*	-0.55
GROUND MAGGOT	2.39	-1.37
JIGGER FLEA	*	-3.31
EAR TICK	*	-3.98
BEDBUG	*	-3.98

EAR PEST	*	-5.28
SCABIES	*	-3.76
BODY LICE	*	-1.26
HEAD LICE	6.93	-3.89
TICK	*	*
FLEA	*	-3.55
MOSQUITO	*	-2.44
CATTLE LICE	13.57	-5.33
CATTLE FLEA	5.12	-3.70
LIVESTOCK TICK	*	-5.39
MANGE MITES	*	-0.54
CHICKEN FLEA	*	-1.77
WEEVIL	*	-5.19
TEFF EATING ANT	*	-2.85
GRASSHOPPER	*	*
HARVEST TERMITES	*	-2.02
FIELD TERMITES	*	-1.62
All pests	12.28	-6.56

*: calculation of X^2 and t inapplicable

6.3.3 - The concept of "sterile" knowledge

To understand the fate of this increased knowledge held by migrant adults, both men and women, further tests were conducted on the knowledge data of their children. The knowledge of the children of migrant adults was compared to the children of the children of non-migrant adults (Tables 6.17 and 6.18).

Table 6.17: Summary of X^2 and T tests for children & female migration and TOTAL K
Degrees of freedom for X^2 tests: 1 for individual pests (4 for 'All pests')
Degrees of freedom for t tests: > 100

Pest type	X^2 values	T values
FLY	0.41	1.03
FLY ON WOUND	*	0.07
GROUND MAGGOT	0.08	-0.29
JIGGER FLEA	*	1.23
EAR TICK	*	-0.98
BEDBUG	3.43	2.35
EAR PEST	*	-1.60
SCABIES	*	1.11
BODY LICE	1.13	1.18
HEAD LICE	0.98	-0.77
TICK	*	*

FLEA	0.00	0.25
MOSQUITO	*	-1.01
CATTLE LICE	0.10	0.30
CATTLE FLEA	0.10	-0.42
LIVESTOCK TICK	*	1.45
MANGE MITES	*	0.87
CHICKEN FLEA	0.11	-0.84
WEEVIL	*	1.15
TEFF EATING ANT	*	1.25
GRASSHOPPER	*	*
HARVEST TERMITES	0.91	-1.53
FIELD TERMITES	0.15	-0.21
All pests	7.30	0.47

*: calculation of X^2 or t values inapplicable

Table 6.18: Summary of X^2 and T tests for children & male migration and TOTAL K
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: > 100

Pest type	X^2 values	T values
FLY	*	1.28
FLY ON WOUND	*	0.00
GROUND MAGGOT	*	0.88
JIGGER FLEA	*	-0.16
EAR TICK	*	1.57
BEDBUG	*	1.86
EAR PEST	*	-0.15
SCABIES	*	1.13
BODY LICE	*	0.41
HEAD LICE	0.54	-0.50
TICK	*	*
FLEA	*	-0.31
MOSQUITO	*	0.91
CATTLE LICE	*	-0.08
CATTLE FLEA	*	0.68
LIVESTOCK TICK	*	0.98
MANGE MITES	*	2.52
CHICKEN FLEA	*	-0.28
WEEVIL	*	-1.49
TEFF EATING ANT	*	-0.72
GRASSHOPPER	*	*
HARVEST TERMITES	0.1	-0.09
FIELD TERMITES	*	1.75
All pests	4.66	1.23

*: calculation of X^2 or t inapplicable

In both cases, the X^2 and t values for individual pests and for all pests indicate a clear trend. There is no relationship between migration and the botanical pest management knowledge of the children of the migrants. In other words, children from migrant parents do not know more about botanical pest management than children whose parents have never migrated. From the two sets of data, there is one exception (the bedbug case indicated in Table 6.17). However, there is absolutely no reason why children from migrant women should have more knowledge of plant remedies than other children for this pest alone, whilst being on a par with other children for the other individual pests and for all pests taken as a whole. It is impossible to explain or interpret this result.

On the whole, it appears that the increased knowledge of botanical pest management held by migrant adults is not passed on to their children. There may be a number of plausible explanations to this. Foremost, it is likely that the experiential learning process by demonstration that takes place between parents and their children is restricted to plant remedies and situations of pest infestation occurring at the altitude of residence of the household, or at least within the altitude boundaries where members of the household spend most of their lives. For example, a Meskelo highland farmer who would have spent some time working in the lowlands and learned about the use of Commiphora spp. to repel lice will not pass on this knowledge to his children, since this particular tree species does not grow in his immediate environment and since other highland plant remedies based on the use of plants commonly found in Meskelo are available. Similarly, a young bride travelling from the mid or lowland communities of Yekatit Dewol to highland Meskelo will never have the opportunity to mix weevil repellent leaves with the grain inside the grain store since the distribution of weevils follows a strict altitude gradient. Moreover, the existing gender barriers that exist for most pests implicitly preclude the transmission of specific aspects of knowledge pertaining to the opposite sex. In fact, the conditions under which a migrant man or woman would transmit his or her unique knowledge (acquired respectively during and before the migration) to his/her children would have to be exceptional: migration of the whole family to the place of birth of the mother or to the area of labour migration of the husband.

In the five communities under study, the most significant cases of this virtually useless accumulation of knowledge of botanical pest management remedies concern the young women born in mid altitudes up to 2500 m who follow their husbands to live in the very high altitude villages of Dink and Zoamba (3000 and 3100 m respectively). Because there are so few insect pests that cause harm to human activities at these altitudes, most of the knowledge acquired by young women at lower altitudes during their childhood is never put into practice.

Thus emerges the concept of *sterile* knowledge that is useless, never put into practice and therefore never transmitted to the next generation. This type of knowledge as a consequence of the migration of simple farmers should of course be contrasted with the migrations and knowledge acquisition patterns of the *däbtära*. In contrast to the farmer, the *däbtära* acquires new knowledge of plant remedies from distant provinces and colleagues in order to use it. In many cases, this type of knowledge is compiled, written down and transmitted in turn at some point to visiting *däbtäras* or to young apprentice *däbtäras*. In contrast to farmers, *däbtäras* will not hesitate to travel long distances to harvest plants not found in their daily life environment. Where possible they will also store such plant remedies in a dried form.

The concept of sterile knowledge is slightly different from what Fitzpatrick (2004: 39) refers to as "deactivated or frozen" knowledge, i.e. knowledge that is not passed on to children, not because of the absence of the plants in the environment, but because of specific social and changing cultural factors.

6.4 - Identification of factors causing complex diachrony

To analyse complex diachronic knowledge variation of botanical pest management in Wag, several distinct methods were adopted.

First, simple statistical tests (X^2, Student t tests and linear regression) were run on the field data to tease out the possible influence of specific exogenous factors. The idea was not so much to measure precisely complex diachronic knowledge variation, as this is virtually impossible to accomplish, than to prove that it exists, is statistically significant and related to the incidence of specific and measurable factors. The factors for which such tests were run include the introduction of veterinary health posts over the last 10 years, the introduction of synthetic substances and products in Wag (soap, chemical pesticides) and the building of schools and the gradual increase in enrolment of children over the same period. These findings were complemented by the largely qualitative analysis of the history of the natural resource base in the area under study over the last 30 years.

6.4.1 - Veterinary health clinics and the provision of chemical ecto-parasiticides

During the last decade, two veterinary clinics have been built, equipped and staffed to serve the surrounding communities. The Kewzba clinic opened in 1996 and provides veterinary health services for farmers living in the communities of Meskelo and Shimela. On the other hand, the Arbit clinic was only opened in 1998 and was temporarily closed between 2000 and 2002. Among others, it serves the community of Tsamla. Regarding pest management, both clinics are equipped with modern chemical acaricides and sprayers to treat cattle ticks, fleas, lice and mange mites. The spraying of one animal usually costs 25 cents.

As far as the current study is concerned, the leading assumption was that the building of veterinary clinics and the provision of chemical acaricides to farmers by the government had begun to exert competitive pressure on traditional and botanical forms of pest management on livestock. It was further assumed that this form of competition would gradually decrease as the distance of the farmers' household from the clinic increased[31]. Therefore, the main assumption was that plant use, knowledge of plant remedies and chemical use and knowledge of chemical remedies (acaricides) were correlated with the distance from the households of farmers to the veterinary clinic.

To test this hypothesis, X^2 and linear regressions were run on the field data collected on the main livestock pests in the area, cattle lice and fleas, ticks and mange mites. In a first step, all the individual data, irrespective of the age of the household members, were aggregated into household average data. In addition, the distances from the household to the clinic recorded during the survey were adjusted in the case of Tsamla residents to account for the fact that the Kewzba clinic has been in operation for twice as long as the Arbit clinic. A factor of two was introduced for the distances from Tsamla households to the clinic.

[31] It is worth mentioning that the distance from a household to a veterinary clinic is a unit of measurement primarily used by the Ministry of Agriculture to decide on the number and location of new veterinary clinics to build. Currently, for example, the Ministry of Agriculture in Ethiopia considers that a clinic can provide a service to farmers living within a radius of 5 kilometres.

In the case of acaricide use, the X^2 values presented in Table 6.19 are sufficiently low for us to accept the null hypothesis: the use of chemicals to treat livestock pests and the distance from the households to the clinic are not related. This result is significant at the 10% level. For chemical knowledge, i.e. the knowledge that acaricides can be used to treat livestock pests, the results indicate a trend more in line with the key assumption outline above. For cattle flea and lice, ticks and all the livestock pests taken a whole, the X^2 values calculated are significant at the 10 % level. We can reject the null hypothesis: the closer to the veterinary clinic, the more likely farmers, unprompted, will cite chemical acaricides as a remedy against livestock pests. The negative gradients and intermediary Pearson r-values of the linear regression tests confirm the inverse correlation of chemical knowledge with household distance from the clinic.

While the results for chemical knowledge confirm the initial assumption, there are several ways in which to explain the seemingly incoherent absence of correlation between household location and chemical use. As the research proceeded, I discovered that government veterinary staff don't stay confined to their clinics. At regular intervals, they set out to visit the communities normally served by their clinic. It is an opportunity for them to monitor the general health of livestock herds and to provide treatment, including acaricide treatment, on the spot. Based on informal discussions with farmers, it emerged that many prefer to wait for the visits of the government staff rather than to travel long distances with sick animals to the clinic.

Moreover, the Ministry of Agriculture has recently launched a scheme to increase indirectly the geographical coverage of veterinary clinics by training farmers as animal health workers to provide basic veterinary service, including acaricide treatment, to other farmers in their communities. Both factors, to a large extent, explain why chemical use is not related to distance from the clinic.

Farmers tend to resort to acaricide treatment in specific circumstances. They treat their animals when they are heavily infested with pests or when they are about to sell them, even if pest infestation is low. The distinction is important since farmers are unlikely to drive their animals over long distances if they are already seriously weakened by pest infestation. However, an animal appearing to be in prime condition with no signs of pest infestation (mange mites for sheep and goats particularly) will sell easily and at a bonus price. This is why farmers living far from clinics will not hesitate to drive their healthy animals over long distances to have them doused with chemical acaricides.

Table 6.19a: Summary of X^2 tests at household level: measures of correlation with distance from the veterinary clinics

	CHEMICAL USE		CHEMICAL RAW K		PLANT USE		PLANT RAW K		PLANT TOTAL K	
	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF
CATTLE LICE	2.28	*	12.03	13.65	2.53	5.67	3.07	7. 39	*	3.96
CATTLE FLEAS	*	*	7.14	*	2.87	5.18	4.37	5. 84	*	5.96
CATTLE TICKS	5.94	*	13.98	17.27	*	*	4.21	*	8.69	14.43
MANGE MITES	2.24	5.02	*	15.60	*	*	*	*	4.22	*
TOTAL LIVESTOCK	3.23	4.63	*	14.44	*	7.69	*	5.58	2.04	12. 99

*: calculation of X^2 inapplicable

Table 6.19b: Summary of linear regression tests at household level: measures of correlation with distance from the veterinary clinics

	CHEMICAL USE			CHEMICAL RAW K			PLANT USE			PLANT RAW K			PLANT TOTAL K		
	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r
CATTLE LICE	0.00	0.05	0.14	0.00	0.27	-0.05	-0.01	0.36	-0.22	-0.02	0.57	-0.29	0.00	0.98	-0.03
CATTLE FLEAS	0.00	0.05	-0.07	-0.01	0.17	-0.23	-0.01	0.31	-0.14	-0.01	0.43	-0.17	0.02	0.71	0.15
CATTLE TICKS	-0.01	0.20	-0.13	-0.02	0.50	-0.37	0.00	0.09	-0.16	-0.01	0.17	-0.22	-0.02	0.67	-0.27
MANGE MITES	0.00	0.29	-0.09	-0.01	0.78	-0.24	0.00	0.03	-0.07	0.00	0.07	-0.07	0.00	0.27	-0.08
TOTAL LIVESTOCK	-0.01	0.62	-0.08	-0.05	1.85	-0.36	-0.01	0.79	-0.09	-0.02	1.22	-0.11	0.09	2.41	0.22

These findings regarding chemical use and chemical knowledge are apparently incompatible. It makes no sense for acaricide knowledge to be correlated with the distance from the clinic when acaricide use is not, especially in light of the arguments brought forward above. Believing that gender and age could distort the results (since the analysis is based on average household data which are made of the aggregated values of adults and children), the same tests were run on a sample of 98 adult men only (Table 6.20). The results are more coherent. Not only is the absence of correlation between acaricide use and distance from the clinic confirmed, but also the tentative relationship between knowledge of acaricide use and distance from the clinic ceases to exist (see X^2 value of 8.34 insufficient at the 10 % level with 6 degrees of freedom to reject the null hypothesis).

The results compiled in Table 6.19 and 6.20 also indicate that the use and knowledge (USE, RAW K and TOTAL K) of plant remedies to deal with livestock pests is virtually independent from a household's exposure or proximity to modern acaricide treatment in the veterinary clinic. Farmers living in the near vicinity of clinic are as likely to use and to cite plant remedies against cattle fleas, lice and ticks as those living far from the clinics. The issue of botanical treatments for mange mites is barely relevant here since most farmers agree that there are no real plant remedies to cure this skin condition. The plant remedies exist and are used on human beings to treat the same condition but the quantities of plant material necessary to treat a whole goat or an ox are rarely available.

Table 6.20a: Summary of X^2 tests for adult men: measures of correlation with distance from veterinary clinics

	CHEM USE		CHEM K		PLANT USE		PLANT RAW K		PLANT TOTAL K	
	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF	X^2 3 DOF	X^2 6 DOF
CATTLE LICE	3.95	*	11.26	*	2.79	*	2.65	*	*	*
CATTLE FLEAS	*	*	*	*	0.52	*	1.51	*	*	*
CATTLE TICKS	4.63	*	2.65	*	*	*	*	*	9.91	*
MANGE MITES	1.76	*	*	*	*	*	*	*	9.63	*
LIVESTOCK PESTS	*	4.45	*	8.34	*	9.56	*	11.48	*	11.45

DOF: degrees of freedom
*: calculation of X^2 inapplicable

Table 6.20b: Summary of linear regression tests for adult men: measures of correlation with distance from veterinary clinics

	CHEMICAL USE			CHEMICAL RAW K			PLANT USE			PLANT RAW K			PLANT TOTAL K		
	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r	GRAD	ORD	r
CATTLE LICE	0.01	0.13	0.13	0.01	0.36	0.07	-0.02	0.78	-0.17	-0.02	0.95	-0.22	0.02	1.71	0.05
CATTLE FLEAS	0.00	0.12	-0.08	-0.01	0.17	-0.13	0.00	0.61	-0.01	0.00	0.75	-0.01	0.07	1.04	0.24
CATTLE TICKS	-0.01	0.38	-0.10	-0.02	0.67	-0.22	0.00	0.14	-0.06	-0.01	0.21	-0.07	-0.03	1.25	-0.17
MANGE MITES	-0.01	0.51	-0.10	0.00	0.86	0.07	-0.01	0.15	-0.14	-0.01	0.19	-0.13	-0.01	0.46	-0.07
LIVESTOCK PESTS	-0.01	1.16	-0.07	-0.02	2.20	-0.14	0.00	1.70	0.00	0.00	2.17	-0.01	0.25	4.18	0.24

There is some degree of unresolved ambiguity in the results that concern USE since it also measures the last use in time of a plant remedy against a specific pest. The above analysis is therefore quite coarse as it fails to highlight the gradual impact of the introduction of veterinary clinics on the change in plant use measured through the dates of last plant use. It could therefore be that if gradual "extinction" of plant use is correlated to the distance from the clinic, overall recorded use (which does not mention the time elapsed since the last use) appears to be unaffected by the operations of the clinic. To check for the existence of such a relationship, all the recorded cases of use of plant remedies for cattle lice and fleas were divided into two groups, one of "recent" use, when the last use of the remedy occurred less than five years ago and one of "past" use, when the last use of the plant remedy occurred more than five years ago. The X^2 variables calculated for both types of pest are inferior to the 10% benchmark for two degrees of freedom (Table 6.21). We can therefore accept the null hypothesis and conclude finally that the impact of veterinary clinics on plant use for livestock pests has been uniform, irrespective of distances from the clinic. It is however impossible to conclude that it is not related to the introduction of chemical acaricides since farmers are familiar with these products irrespective of their location in the area under study.

Table 6.21: Refined X^2 tests to measure the correlation between distance from the clinic and last dates of plant use

Pest type	X^2 VALUES	Degrees of freedom
CATTLE LICE	1,94	2
CATTLE FLEAS	2,1	2

Overall, we can conclude that the building of veterinary clinics, and the subsequent provision of modern chemical acaricide treatments has had a measurable impact on the use and knowledge of chemical acaricides by farmers, throughout the areas surrounding the clinics and irrespective of their distance from the clinics. On the other hand, use and knowledge of plant remedies for livestock pest management is not related to the distance of a farmer's household from the nearest clinic. The results of the tests neither confirm or deny the competitive impact of the provision of acaricides (at the clinic level and through the outreach activities) on the use and knowledge of plant remedies for pest management in the area under study as changes in plant use and knowledge of plant remedies for livestock pests appear to be not related to the location of the clinic and its distance from the households.

To highlight the existence of a possible competition between various forms of treatment (plant versus chemical) additional tests were run, this time with the objective of testing the existence of a direct relationship between the use of synthetic substances (soap and chemicals) and the use and knowledge of plant remedies for pest management and of trying to decipher some of the mechanisms which ultimately result in complex knowledge diachrony.

6.4.2 - The introduction of soap and its impact

6.4.2.1 – Soap use versus plant use

Soap has been available in Wag Hamra for the last 30 years at least. According to the results of the survey, soap is commonly used to treat scabies, body lice, head lice and cattle lice and fleas. The breakdown by gender of adults reporting the past use of soap to treat these pests is presented in Table 6.22.

That soap is commonly used as a pesticide to treat a variety of pests is very instructive as it suggests the existence of a significant potential for testing and innovation in the area.

Initially, soap was introduced in rural markets as a personal hygiene item. 30 years later many people use it as a pesticide for several different pests, affecting both human beings and livestock.

Table 6.22: Breakdown of soap and plant use among adults (number of cases)

Number of people reporting the past use of soap	Head lice	Body lice	Scabies	Cattle fleas	Cattle lice	One of the five pests
Adults (total=189)	68	79	15	40	27	132
Men (total=98)	45	46	7	22	18	76
Women (total=91)	23	33	8	18	9	66

The results of the X^2 tests on USE are conclusive (Table 6.23). To begin with, the X^2 value calculated on USE for all five pests taken as a whole is significant at the 10 % level. We can reject the null hypothesis. There is a relationship among adults in Wag between those who have used soap and those who have used plants to treat one of the five types of pests. The t and linear regression values show clearly that this relationship is a positive one. In short, adults who have used soap as a remedy are more likely to have used a plant remedy than those who have never used soap to treat these pests. On an individual pest basis, body lice exemplify this trend with a very high X^2 value of 27.3 and a t value of –4.32.

Table 6.23: Summary of X^2, T and linear regression tests on soap use and USE
Degrees of freedom for t tests: > 100

				Average plant use		Linear regressions		
	X^2 values DoF (1)	X^2 values DoF (2)	T values	NO SOAP USE	SOAP USE	GRADIENT	ORDINATE	PEARSON r
SCABIES	*	*	-2.65	0.12	0.4	0.13	0.06	0.19
BODY LICE	27.3	27.3	-4.32	0.54	1.14	0.15	0.3	0.3
HEAD LICE	*	*	1.75	0.09	0.015	-0.21	0.37	-0.13
CATTLE LICE	0	*	0.24	0.4	0.37	-0.01	0.15	-0.02
CATTLE FLEA	0.85	*	-0.77	0.37	0.45	0.04	0.2	0.06
TOTAL	13.7	14	-2.9	1.28	2	0.13	0.99	0.19

*: calculation of X^2 inapplicable

There is only one plausible interpretation of these results. If soap users are more likely to be plant users than non-soap users, it can only mean that there has been a *switch* in use from plant remedies to soap after the introduction of soap in the area. To understand the nature and the magnitude of this switch it is necessary to analyse comparatively the figures of plant use with those of soap use.

For two of the five pests, scabies and more notably head lice, soap use has become the norm at the expense of plant use (see the superior figures of total soap use in Table 6.24). Compared to previous times when soap was not available in the area, it is the sign that the introduction of soap has had an erosive impact on the use of plant remedies for scabies and head lice. The magnitude of this impact is made all the more apparent by the number of adults who are familiar with at least one plant remedy against scabies and head lice (111 adults and 147 adults out of 189 for scabies and head lice respectively) and that these adults know on average more than one remedy (more than two in the case of head lice). Possible reasons for this erosive switch include the faster healing power of soap and the ease with which it can be procured and used compared to the use of plants that have to be harvested and prepared several times for the treatment to be effective. The issue of plant availability at community level is of course critical in this regard.

On the other hand, for three of the five pests (body lice, cattle fleas and lice), the figures compiled in Table 6.24 point to the overall persistence and predominance of plant use over soap. Moreover, the three pests total most of all the reported cases of dual or joint soap and plant use, when farmers report having used a plant remedy and soap on different occasions.

In the 82 reported cases of dual use for body lice, cattle lice and fleas, a comparison between the dates of last use for plant remedies and soap respectively indicates that in a very large majority of cases (81), soap use is not more recent than plant use. In only one case (cattle flea) do the comparative dates of last use show a precedence of soap use over plant remedy use signalling a very marginal and negligible erosion of plant use in favour of soap use. The coexistence of both types of use suggests, first, that plant remedies are considered as effective in treating these pests as soap (or that soap is not considered more effective than a plant remedy) and, secondly, that the switch in use from plant to soap is of a different kind than the one observed for scabies and head lice.

Table 6.24: Comparison of plant use versus soap use for selected pests

Number of adults:	Head lice	Body lice	Scabies	Cattle flea	Cattle lice
Dual users of soap and plant at some point in the past	1	57	5	16	9
Plant use only	9	37	19	48	55
Soap users only	66	22	10	24	18
Plant users total	10	94	24	64	64
Soap users total	67	59	29	40	27

Several factors may explain the coexistence of soap and plant use. The first point to mention is the financial constraint. A standard block of soap costs two to three birr in the local market and there are several times in the year, particularly during the bridging period prior to the harvest, when soap can become a secondary necessity for most farmers who prefer to spend their scarce liquidities on priority items such as food, spices, coffee or salt. In comparison, for the treatment of body lice and the washing of clothes, a standard dose of *ïndod* berries (Phytolacca dodecandra) can wash the same amount of clothes as a block of soap and is 10 times cheaper on the local market. For those farmers who grow or can harvest the plant in their gardens or community, this organic soap/pesticide is virtually free. Regarding livestock lice and fleas, farmers may hesitate to buy soap if the infestation is moderate and can be dealt easily with plant remedies. But if, say, a calf is seriously infested, a farmer can decide that a soap bar or a trip to the clinic is worth the investment. Poorer farmers with serious cash constraints on the other hand will not hesitate to harvest and prepare plant remedies for several days or even choose mechanical and less effective remedies (immersion in water for example) in order to save a few *birr*.

Availability is another important constraint, but this time on plant use. If a plant remedy becomes rare in the community or simply in the area surrounding the household of the farmer, a farmer may chose the easier option of purchasing a bar of soap rather than spending several hours in search of a plant. The issue of relative plant availability is all the more critical if we bear in mind that a plant remedy has to be prepared and applied for several days in succession in order to be effective. Seasonality is an important factor determining availability particularly for the treatment of body lice. The two main plant remedies are based on the use of *ïndod* and *wïfč'ïš* (Momordicus spp.), two species that can only be harvested at a specific time of the year. Many farmers interviewed during the semi-structured interviews explained that they used the plants when they were available and switched to soap after the harvest season had passed. To a lesser extent, seasonality is also an issue for the use of *batukwa* sap (Commiphora spp) against cattle lice and fleas, since the production of sap varies significantly before and after the rainy season.

There is finally an issue of quality for the treatment of body lice. In the view of the farmers interviewed, organic soaps/pesticides such as *ïndod* present the added value of impeccably restoring and sometimes increasing the whiteness of traditional Ethiopian clothing. The issue is by no means trivial as cultural perceptions of the colour white are very important for followers of the Ethiopian Orthodox church.

In the end, and given all these constraints, we can conclude that the observed switch from soap to plant use for the treatment of body lice, cattle fleas and lice remains highly contextual. For instance, unless plants are immediately available in the vicinity of the household, farmers are unlikely to travel specifically to distant places in the community in search of a plant. Rather, a farmer on his way back from his field or a woman fetching water at the stream will notice a plant that can be useful to deal with a bothering pest at that particular point in time.

Moreover, this contextual type of switch does not appear to be irreversible, since many soap users continue to use plant remedies. For one thing, in the case of plants with seasonal harvest constraints, the introduction of soap appears to have provided farmers with a very effective *complementary* remedy that enables them to treat certain pests in the off-season when plant remedies are not available.

6.4.2.2 - Soap use versus knowledge of plant remedies

Similar X^2 and t calculations on RAW K and TOTAL K yield the same type of results (Tables 6.25 and 6.26). This indicates that adults who have used soap as a remedy to treat one of the five pests are more likely to know plant remedies for the same pests than adults who have not used soap.

For the total knowledge of botanical pest management held by adults, and on an individual pest basis, cattle flea and body lice stand out as examples of this overall trend. These findings again support the switch theory, i.e. that it is people who have used plants and who are knowledgeable about plant remedies for pest management who are more likely to have taken the risk of testing soap on certain pests.

Table 6.25: Summary of X^2, T and linear regression tests on soap use and RAW K Degrees of freedom for t tests: > 100

				Average RAW K		Linear regression		
	X^2 values (DoF=1)	X^2 values (DoF=2)	T values	NO SOAP USE	SOAP USE	GRADIENT	ORDINATE	PEARSON r
SCABIES	*	*	-2.18	0.14	0.4	0.1	0.06	0.16
BODY LICE	26.52	26.8	-4.52	0.56	1.18	0.16	0.29	0.32
HEAD LICE	*	*	2.02	0.1	0.015	-0.23	0.37	-0.15
CATTLE LICE	1.56	*	1.25	0.57	0.41	-0.05	0.17	-0.09
CATTLE FLEA	0.06	*	0.12	0.49	0.48	-0.01	0.21	-0.01
TOTAL	24	24	-2.59	1.6	2.31	0.08	1.04	0.13

*: calculation of X^2 inapplicable

Table 6.26: Summary of X^2, T and linear regression tests on soap use and TOTAL K Degrees of freedom for t tests: > 100

				Average TOTAL K		Linear regressions		
	X^2 values (DoF=1)	X^2 values (DoF=2)	T values	NO SOAP USE	SOAP USE	GRADIENT	ORDINATE	PEARSON r
SCABIES	1.43	*	-1.47	0.95	1.4	0.03	0.05	0.11
BODY LICE	20.7	21	-4.12	0.65	1.27	0.13	0.29	0.29
HEAD LICE	1.12	1.16	-2.15	1.61	2.15	0.05	0.27	0.16
CATTLE LICE	1.56	1.59	-1.29	1.28	1.7	0.02	0.11	0.09
CATTLE FLEA	5.72	6.06	-3.13	1.02	1.77	0.07	0.13	0.23
TOTAL	*	15.83	-3.94	4.33	7.07	0.07	0.76	0.3

*: calculation of X^2 inapplicable

X^2 values for scabies, head lice and cattle lice stand inferior to the 2.71 benchmark value indicating that there is no relationship between the use of soap and total knowledge of plant remedies for these pests. In theory, this finding seems to contradict the existence of the erosive switch observed for scabies and head lice on plant use since one would expect to witness an erosion in the knowledge of plant remedies as a consequence of the reduced use of plant remedies. The high t value for head lice is equally disturbing (-2.15, see Table 6.26).

There are several ways in which to interpret this contradiction. The first is to assume that the reduction in plant use as a consequence of the introduction of soap has occurred quite recently, more or less in the last 20 years, and that adults are old enough to have retained their plant knowledge acquired before the switch.

A second explanation is that there exists a correlation between age status and type of remedy used, and that plant use against scabies and head lice is almost exclusively restricted to children. As mentioned previously in Chapter 5, non-purposive scabies is much more frequent among children than adults and is an indirect consequence of the higher degree of interaction that characterises their games and daily life in general. Moreover, most males resort to hair cutting or head shaving when faced with the problem of head lice. Whatever the cause, the statistical findings clearly indicate that the introduction of soap has so far had no visible erosive impact on adult knowledge of botanical pest management in the area under study.

6.4.3- The impact of the introduction of chemical pesticides

The introduction of chemical pesticides has taken place in two distinct phases in Wag Hamra. First, a large malaria eradication program sponsored by the American government in the early seventies saw the dissemination and widespread use of large quantities of DDT throughout the area of study. This was farmer's first exposure to chemical pesticide. One of the legacies of this phase is that farmers nowadays still use the term *didit* as a generic for any chemical pesticide, whether liquid or in powder. The second phase occurred in the late eighties and early nineties after the liberation of the area from the *Derg* and the coming to power of the TPLF regime. The re-establishing of health and agriculture ministries saw the introduction into the zone of new exogenous pesticides such as Malation or Karate. If a serious agricultural pest infestation occurs in a community, such as the *dägäza* (Decticoides brevipennis) infestation of the mid nineties, the government takes the responsibility to supply farmers with restricted quantities of free pesticide. As mentioned above, since the mid nineties, veterinary clinics provide chemical acaricide treatment at a moderate price (25 cents for the dousing of a goat kid and 50 cents for the dousing of a calf).

Since their introduction more than 30 years ago, chemical pesticides have had a tangible impact in the area under study. Throughout the study area, from the remote highland villages of Meskelo to the sparsely inhabited lowlands of the Tekkeze watershed, a vast majority of farmers are familiar with chemical pesticides and with the fact that they are much faster and in some cases much more effective in killing insect pests than traditional plant remedies. In the three communities of Meskelo, Shimela and Tsamla, 99 % of the households interviewed report on one occasion at least, unprompted, that a chemical pesticide is a suitable remedy for a given pest. More impressive still, 94% of the households interviewed report having used at least one chemical pesticide for pest management in the last 30 years. These figures reflect quite eloquently the very fast dissemination, almost epidemic-like, of use and knowledge of chemical pesticides in the area under study.

On an individual basis, Table 6.27 presents the figures for chemical pesticide use for selected pests disaggregated by gender. The clear predominance of male use for most pests is understandable in light of the gender division of responsibilities inside the household (see chapter 5 for details). However, the relatively high figures of chemical use by women for mange mites and grasshoppers may seem surprising considering that the treatment of these pests are the sole responsibility of men. They are in fact nothing more than a collective expression of "ownership" of the treatment within the household. After all, the spraying of chemicals on grasshoppers and goats attacked by mange mites is usually performed by government staff or a specially trained farmer and very rarely by the male head of the household.

Table 6.27: Breakdown of chemical pesticide use by gender

Number of people reporting the past use of chemical pesticides	Bedbug	Scabies	Cattle lice	Cattle flea	Cattle ticks	Mange mites	grasshoppers
Adults (total=189)	36	19	27	10	41	68	95
Men (total=98)	25	9	21	8	30	42	56
Women (total=91)	11	10	6	2	11	16	39

As with soap, X^2 and t tests were run on USE, RAW K and TOTAL K to elucidate the interaction between chemical pesticide use and plant use and knowledge for pest management. The statistical values presented in Tables 6.28, 6.29 and 6.30 suggest an overall switch phenomenon comparable with the one noted for soap use. Plant users are more likely to become chemical pesticide users than non-plant users. Adults who have used chemical pesticides are more likely to have higher levels of knowledge of plant remedies for the group of pests listed in Table 6.31 than non-chemical users.

Table 6.28: Summary of X^2, T and linear regression tests on chemical use and USE

Degrees of freedom for t tests: > 100

				Average plant USE		Linear regressions		
	X^2 values (DoF = 1)	X^2 values (DoF=2)	T values	NO CHEMICAL USE	CHEMICAL USE	GRADIENT	ORDINATE	PEARSON r
WOUND FLY	0.42	*	0.78	0.52	0.42	-0.03	0.12	-0.06
BEDBUG	*	*	0.06	0.14	0.13	-0.01	0.2	-0.01
SCABIES	*	*	1.05	0.15	0.05	-0.06	0.11	-0.08
CATTLE LICE	2.87	*	-1.13	0.37	0.51	0.05	0.12	0.08
CATTLE FLEA	*	*	-0.07	0.38	0.4	0.01	0.05	0.03
CATTLE TICK	*	*	-0.55	0.09	0.12	0.17	0.22	0.13
MANGE MITES	*	*	0.64	0.04	0.015	-0.08	0.36	-0.05
TOTAL	10.88	11.32	-3.21	1.21	2.03	0.23	0.8	0.28

*: calculation of X^2 inapplicable

Table 6.29: Summary of X^2, T and linear regressions on chemical use and RAW K
Degrees of freedom for t tests: > 100

				Average RAW K		Linear regressions		
	X^2 values (DoF=1)	X^2 values (DoF=2)	T values	NO CHEMICAL USE	CHEMICAL USE	GRADIENT	ORDINATE	PEARSON r
WOUND FLY	1.42	*	1.33	0.6	0.42	-0.05	0.13	-0.1
BEDBUG	0.02	*	0.19	0.18	0.16	0.01	0.19	0.01
SCABIES	*	*	1.16	0.17	0.05	-0.06	0.11	-0.09
CATTLE LICE	0.17	*	-0.1	0.54	0.56	0	0.14	0.01
CATTLE FLEA	*	*	-1.02	0.47	0.7	0.03	0.04	0.08
CATTLE TICK	0	*	0.45	0.15	0.12	0.05	0.23	0.04
MANGE MITES	*	*	-0.75	0.05	0.09	0.08	0.35	0.06
TOTAL	7.51	7.52	-3.14	1.63	2.54	0.2	0.76	0.28

*: calculation of X^2 inapplicable

Table 6.30: Summary of X^2, T and linear regressions on chemical use and TOTAL K
Degrees of freedom for t tests: >100

				Average TOTAL K		Linear regressions		
	X^2 values (DoF=1)	X^2 values (DoF=2)	T values	NO CHEMICAL USE	CHEMICAL USE	GRADIENT	ORDINATE	PEARSON r
WOUND FLY	*	*	-0.35	0.96	1	0.02	0.08	0.03
BEDBUG	8.3	18	-3.54	0.99	1.77	0.09	0.1	0.26
SCABIES	1.95	2.64	-1.11	0.96	1.26	0.02	0.08	0.08
CATTLE LICE	0.1	0.44	-0.49	1.32	1.48	0.01	0.13	0.04
CATTLE FLEA	*	*	-0.27	1.17	1.3	0	0.05	0.01
CATTLE TICK	5.8	5.8	-2.14	0.64	1	0.1	0.16	0.2
MANGE MITES	9.5	*	-2.95	0.19	0.47	0.17	0.31	0.21
TOTAL	*	7.11	-2.4	5.56	7.37	0.09	0.61	0.32

*: calculation of X^2 inapplicable

Table 6.31: Comparison of plant use versus chemical pesticide use for selected pests

Number of adults:	Bedbug	Scabies	Cattle lice	Cattle flea	Cattle tick	Mange mites	Grasshoppers
Dual users of chemicals and plant remedies at some point in the past	5	1	13	4	5	1	1
Plant use only	19	23	51	60	10	2	0
Chemical users only	31	18	14	6	36	67	94
Plant users total	24	24	64	64	15	3	1
Chemical users total	36	19	27	10	41	68	95

The switch phenomenon resulting from the introduction of chemical pesticides differs from the soap switch in several aspects.

First of all, the switch has been very erosive on plant use in the case of grasshoppers and mange mites. This is largely because few plant remedies were used by farmers to treat these pests prior to the introduction of chemicals. Moreover, these rare remedies were not considered to be very effective. Thus farmers have massively and rapidly adopted the use of chemicals to treat pests against which they were virtually defenceless in the past.

The impact of the introduction of chemicals has also been erosive, often very erosive, in the case of treatments against, respectively, cattle fleas and lice, and cattle ticks and bedbugs, to the extent that there are nowadays more chemical pesticide users than plant remedy users. The low number of adults reporting the use of both types of remedy also serves to highlight this erosive trend, largely confirmed during semi-structured interviews. Many farmers have rapidly embraced an "all-chemical" philosophy, thereby disregarding any form of plant remedy as ineffective and a waste of time. In this regard, the success of the introduction of liquid chemicals in the early nineties was as much due to the effectiveness or killing power of the chemicals as to a cumulative knock-on effect building on the initial success of DDT in the early seventies.

The spread of chemical use at the expense of plant use was undoubtedly stimulated by the influence of other and simultaneous factors. The decrease in plant availability is one, particularly in the case of bedbugs. *Towant'äla* (Commicarpus plumbagineus) has become scarcer in the lower areas of Meskelo and in most parts of Shimela and Tsamla due to the expansion of cultivated areas and hedge cutting. Large quantities of the plant are required at regular intervals (every day or two) for the remedy to have a visible impact on bedbug populations. In addition, the plant presents the disadvantage of being seasonal (harvesting period between October and December).

In the case of cattle ticks, a favourite and effective traditional remedy was a mixture of toasted *ïnkïrdad* (Lolium temulentum) with ghee. However ghee production in the area under study, noticeably in the communities of Meskelo and Shimela, has dramatically decreased over the last 30 years as a direct consequence of the reduction in herd size that has hit most households. The product is a luxury in the highlands and is becoming scarce in the lowlands. It is most likely that this has had an impact on the use of the traditional remedy against ticks since the plant product alone is considered much less effective than its combination with ghee.

However, against this chemical "epidemic", the persistence and in some cases predominance of plant use over chemical use for the treatment of bedbugs, cattle ticks, cattle lice and fleas indicates that other constraining factors are at play. The issue of the availability of chemical pesticides appears to be critical in this respect. For example, in the case of chemical treatment against bedbugs, farmers do not purchase the chemical or ask the government to supply it but simply take advantage of campaigns of chemical spraying against crop pests to discreetly have their households sprayed with whatever quantity of pesticide is leftover. This diversion of pesticides from their primary use began after the introduction of DDT in the early seventies. Despite government efforts to prohibit this practise, potentially harmful in terms of public health, farmers continue to this day to spray their houses against bedbugs with government supplied pesticides. This places constraints on the timing of their use of pesticides since it is implicitly tied to outbreaks of crop pests. The issue of acaricide treatment (against cattle ticks, fleas and lice) has already been mentioned in a previous paragraph. If farmers do not take their animals to the nearest veterinary clinic they have to wait for outreach workers to reach their village. Moreover, although acaricide treatments are relatively cheap (25 cents for the dousing of a goat), a farmer may think twice before driving a young animal, possibly weakened by the pest infestation, to the nearest clinic, encouraging the use of local plant remedies.

There is finally the thorny issue of toxicity of chemical pesticides. An increasing number of farmers are beginning to complain about the adverse effects of crop pesticides on bee populations, particularly in the lowlands and midlands. The spraying of calves and goats with acaricides has also come under close scrutiny since farmers have observed or heard confirmed reports of several young animals dying from licking their coats after being sprayed. Whilst young animals have to be watched after being treated with a plant remedy against lice or fleas for example (particularly in the case of Calpurnea aurea juice extracts), farmers have begun to realise that the chemical pesticides are as effective as they are toxic.

Compared to soap use for botanical pest management, the coexistence of chemical and plant use is rare due mainly to problems of availability of the chemicals. While the introduction of chemicals has had an undeniable erosive effect on plant use for specific pests, the uncertain availability of chemicals has also contributed to maintaining, and in some cases reviving, plant use. This last fact is evidenced by the few cases of dual chemical/plant use where plant use is more recent (by several years) than chemical use for the treatment of the same pest.

6.4.4- Education

X^2 and student t tests were run on various field data to tease out the possible influence of schooling on children in regard to their knowledge of pest management, the basic assumption being that exposure to more modern ideas and concepts in school would negatively impact on the acquisition and retention of traditional ethnobotanical knowledge of pest management. For these tests, 120 children residing in Meskelo or Shimela (the two communities where the prevalence of most pests is relatively similar and where two schools have been built in the last decade) were sorted into two groups, those who had attended school at least one year and those who have never attended. The calculations are summarised in Table 6.32.

The first finding is that there are few pests for which X^2 and t values of plant knowledge (RAW K and TOTAL K) are significant at the 10 % level. They include ground maggots for RAW K and flies, body lice and fleas for TOTAL K.

Much more significant and visible is the impact of schooling on children's knowledge of soap and chemicals as remedies for pest management. X^2 and t values are very significant at the 10 % level for head and body lice (soap) and for cattle fleas, lice, ticks, mange mites, bedbugs and scabies (chemical pesticides).

We can therefore conclude that schooling reinforces children's attitudes and perceptions of soap and chemical pesticides as potential remedies against a number of pests. On the other hand, its impact on traditional ethnobotanical knowledge of pest management is difficult to evaluate. It does not appear to be directly negative but the increased chemical exposure will certainly increase the likelihood of a switch in latter years, when children become adults and start using chemicals and soap more frequently.

Whichever form of remedy, schooling contributes to exposing children to western scientific concepts and principles of biology and chemistry. Moreover, schools invariably serve as the primary locus for national campaigns of public health (vectors of disease, hygiene, sanitation, etc). It is therefore logical to find that children who go to school are more aware of modern remedies against a number of pests. Either children acquire the knowledge directly in school or have become more aware of the need to control certain pests.

Table 6.32: Summary of X^2 and T tests for education
Degrees of freedom for X^2 tests: 1 for individual pests (2 for 'All pests')
Degrees of freedom for t tests: >100

	X^2 values				T values			
	Soap RAW K	Chemical RAW K	Plant RAW K	Plant TOTAL K	Soap RAW K	Chemical RAW K	Plant RAW K	Plant TOTAL K
Fly	*	*	0,03	9,4	*	*	0,25	2,36
Fly on wound	*	*	2,33	5,5	1,76	1,63	1,69	2,49
Ground maggot	*	*	4,62	0,1	*	1,44	2,47	1,28
Bedbug	*	7,4	0,9	1,2	*	2,7	0,89	1,4
Scabies	*	5,4	*	0,8	1,79	2,2	1,43	1,45
Body lice	13,7	*	3,18	5,6	3,87	0,06	1,24	1,08
Head lice	12,4	*	3,06	2,5	3,66	1,88	1,86	3,03
Fleas	*	*	1,18	5,9	*	2,3	1,03	2,79
Cattle lice	*	9,7	0,57	0,4	1,73	3,11	-0,46	0,77
Cattle fleas	0,07	8,4	0,13	0,3	-0,27	2,88	-0,5	0,37
Chicken fleas	*	*	1,86	2,5	*	*	1,21	2,03
Cattle ticks	*	4,5	*	*	*	1,88	0,05	-0,2
Mange mites	*	3,4	*	*	-1,39	1,14	0,97	-0,32
All pests	13,6	21,5	7,6	15,5	4,15	4,29	3,03	3,49

*: calculation of X^2 or t values inapplicable

6.4.5- Vegetation change and recent history

In order to understand the history of the natural resource base in the area under study, semi-structured interviews were conducted with elderly farmers. Informants were asked in particular to compare the vegetation in their communities nowadays with the vegetation that surrounded them more than 30 years ago, during the last years of the reign of the Emperor Haile Selassie. They were also asked to suggest plausible explanations for the observed changes (or absence of changes). To complement these data, I carried out quantitative plant surveys in Meskelo, Shimela and Tsamla. Given the impossibility of drawing quadrats on the last patches of undisturbed natural vegetation, often located on steep and very steep escarpments, I restricted my field screening to the vicinity of streams and rivers. 20 streams and rivers were surveyed by travelling up and down the watercourse during the dry season. Plants of relevance to this research and growing within a 50-meter band on either side of the watercourse were counted. Altitude and distance were measured with a standard GPS. See Table 6.33 for a summary of plant densities at community level.

Table 6.33: Density estimates of selected plant species in their river habitats

MESKELO COMMUNITY

	Number of plants counted	Distance covered (m)	Density (Plants/km)
Ficus palmata	242	12448	19.44
Calpurnia aurea	263	12448	21.13
Buddleja polystachya	129	13492	9.56
Otostegia integrifolia	60	12448	4.82
Olea europea	152	13684	11.11
Phytolacca dodecandra	123	5396	22.79
Clematis simensis	413	12079	34.19
Croton macrostachyus	61	12448	4.90
Otostegia sp.	21	13684	1.53
Akocanthera shimperi	22	7704	2.86
Euphorbia ampliphylla	2	7843	0.26
Senna singuinea	44	4936	8.91
Euclea shimperi	50	9684	5.16
Dodonea angustifolia	50	9684	5.16
Asparagus sp.	3	10184	0.29
Myrtus communis	5	10967	0.46

SHIMELA COMMUNITY

	Number of plants counted	Distance covered (m)	Density (plants/km)
Euphorbia ampliphylla	451	16955	26.60
Croton macrostachyus	143	14955	9.56
Senna singuinea	400	18436	21.70
Calpurnia aurea	194	7510	25.83
Otostegia sp.	15	21992	0.68
Akocanthera shimperi	68	21992	3.09
Dodonea angustifolia	120	13975	8.59
Otostegia integrifolia	17	18877	0.90
Ricinus communis	190	21992	8.64
Olea europea	9	7020	1.28
Buddleja polystachya	73	18877	3.87
Ficus palmata	104	7020	14.81
Commiphora sp.	539	11615	46.41
Clematis simensis	35	5520	6.34
Cissus sp.	6	8645	0.69
Commiphora sp.	24	8645	2.78
Terminalia browni	226	8645	26.14
Jasminum abyssinicum	65	16037	4.05
Euphorbia sp.	72	8645	8.33
Calotropis procera	1	8645	0.12
Ziziphus spina-christi	2	21992	0.09

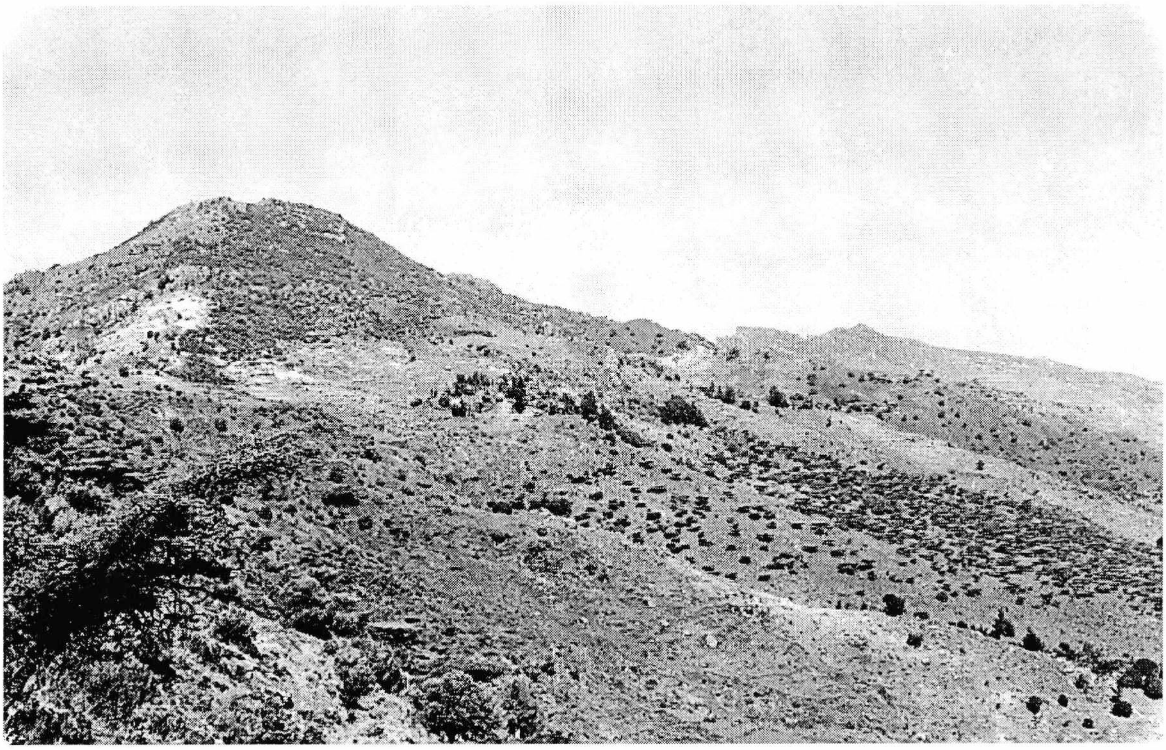
TSAMLA COMMUNITY

	Number of plants counted	Distance covered (m)	Density (plants/km)
Jasminum abyssinicum	27	6595	4.09
Euphorbia ampliphylla	66	4772	13.83
Akocanthera shimperi	5	6271	0.80
Buddleja polystachya	6	4272	1.40
Terminalia browni	250	6595	37.91
Senna singuinea	25	3272	7.64
Commiphora sp.	136	6595	20.62
Otostegia sp.	12	4272	2.81
Commiphora sp.	10	6595	1.52
Mota (unidentified)	1	6595	0.15
Boscia sp.	25	6595	3.79
Ziziphus spina-christi	19	6595	2.88
Cissus sp	192	6595	29.11
Euphorbia sp	83	6595	12.59
Calotropis procera	1	6595	0.15

Two trends emerge clearly from the combined results of the interviews and surveys.

6.4.5.1 - The sharp decline of the natural resource base.

Photograph 6.1: Forest areas in the highland community of Meskelo (alt: > 2700m)



Farmers are unanimous on this point. Over the last 30 years, agriculture has encroached significantly on the areas of wilderness. Every year, new fields are cleared, even in marginal areas too rocky, too steep and barely suitable for agriculture. This trend is very pronounced in the highland and midland communities and has significantly contributed to the fast shrinking of uncultivated areas covered with natural vegetation. A direct consequence of the expansion of cultivated land has also been the reduction of grazing areas for livestock. This trend, combined with an equal or increasing livestock feeding pressure has had the net result of increasing the degradation of the vegetation in uncultivated areas. Despite intensive human and financial investment in soil and water conservation activities in the five communities under study, a further consequence of the degradation of the vegetation has been the increased frequency of soil erosion through water runoffs. Farmers have observed that run-offs are particularly destructive as they gather momentum and reach the streams where they cause the uprooting of many plants including small to medium sized trees such as *märänz* (Akocanthera shimperi), *bäläs* (Ficus palmata) or *anfar* (Buddleja polystachia), three species used in botanical pest management and more commonly found on the banks of streams and rivers (see photographs 6.2 and 6.3).

During the same period, the population living in the five communities has noticeably grown, thereby sharply increasing the every day life demand for many species. Fuel wood is in highest demand, with wood from most big tree species being sought after for the cooking of food and shrubs being specially harvested to bake *ïnjära* (Ethiopian pancake made of *teff*). This has undoubtedly exerted pressure on dwindling populations of *wäyra* (Olea europea var africana), *kulkwal* (Euphorbia ampliphylla) and *kosso* (Hagenia abyssinica) in the highlands, and populations of *wäyra* and *hïkïma* (Terminalia browni) and *alqwaza* (unidentified) in the midland and lowland areas respectively. Moreover, increased demand for wood materials for posts and rafters used in housing construction is likely to have affected the same large tree species. It is worth also noting the construction of tools (particularly the swing plough) that require special hard quality woods such as *wäyra* or *kosso*. After the end of the war with the *Derg* regime in the late eighties, many farmers resumed their farming activities and demand for such noble woods in the area sharply increased.

Photograph 6.2: Akocanthera shimperi, near Gudia Yesus

Picture 6.3: Budleja polystachia flower

It appears that several non-woody species with market value such as *wïgïrt* (Silene macroselen) and *dwa* (Kleinia spp.) have been actively harvested in the wild, not only for local consumption within the community but also to meet a rapidly rising demand from urban consumers both in the nearby small town of Kewzba and in the larger zone capital, Sekota. In the lowland areas, *batukwa* (Commiphora spp.) is a powerful and common remedy for many different skin ailments and is much sought after.

To make matters worse, the 1983-1985 drought, whilst bringing much misery to the people, had a devastating effect on vegetation, particularly in the midland community of Shimela. The drought was so severe that most of the large and mid-sized tree species perished, particularly *wäyra*, *wanza* (Cordia africana) and *märänz* (Akocanthera shimperi). According to elderly informants, the decimation was such that entire woodland areas disappeared, the only surviving species being *dädäho* (Euclea shimperi).

Overall, then, the last three decades have witnessed not only the near disappearance of natural vegetation in most parts of the highlands and midlands but also a qualitative change in vegetation type in the last remaining areas of wilderness. Woodlands have been replaced by fields or reduced to degraded shrub land in the highlands and midlands. The situation is somehow less severe in the extreme highlands of Meskelo (>3000 m) and in the extreme lowlands of Yekatit Dewol and Tsamla where tracts of woodlands and/or woody grasslands remain (see Transect). In the intermediary zone, approximately between 2800 m and 1500 m, the disappearance of large trees combined with livestock overgrazing has resulted in the survival, adaptation and proliferation of a few fast spreading shrubs such as *dädäho* (Euclea shimperi), *mäntäsie* (Becium ovatum) or *kitkita* (Dodonea angustifolia) in the highlands and midlands. As mentioned earlier, this change in vegetation has favoured the spread of ticks. Hedges are also cut down to free-up more space for agriculture. In the lowlands of Tsamla and Yekatit Dewol, the tendency is for the grassland to persist after the trees have been cut down. There is no proliferation of small bushes as observed in higher altitudes.

To put a halt to this declining trend, the Ethiopian government took two significant measures: the creation of protected enclosures on steep and rocky areas not suitable for agriculture, and the prohibition of tree-cutting (for wild non-planted species). After several years of enforcement, the former is having some degree of success in regenerating the natural vegetation, particularly in Meskelo. Concerning the latter, farmers are allowed to cut a few branches of a tree if it happens to grow on their land and one is left to wonder about the impact of this measure. Many farmers end up cutting branches one by one until the remaining stump slowly dies off. At that point, the farmer is allowed to remove the stump and a new large tree is effectively removed from the map. Much more counterproductive in this respect is the rising urban demand for charcoal throughout Wag (Kewzba, Amdework, Sekota). After surveying 20 streams and rivers in three communities and encountering numerous sites of charcoal production, it is obvious that this new demand is putting a strain on the surviving populations of several large tree species.

Concerning the plant species of relevance to this study, it is possible to draw a "red" list of "endangered"[32] species community by community. Other species not mentioned in the following list may have seen their population decrease in Meskelo. On the basis of estimates of their current densities (see Table 6.33 for those found in river habitats) and of direct qualitative observations in many different parts of the community (hedges, fields, shrub land), it is apparent that their populations are not endangered for the time being.

<u>MESKELO:</u>

Dwa (Kleinia spp.) has been virtually extinct from Meskelo for several years. The few places where it could be found have been over-harvested.

Wïgïrt (Silene macroselen) is becoming very rare in the community due to the spread of agricultural land and due to excessive harvesting for marketing purposes. The last significant populations of the species are only found in the enclosure and at very high altitude (>3000 m).

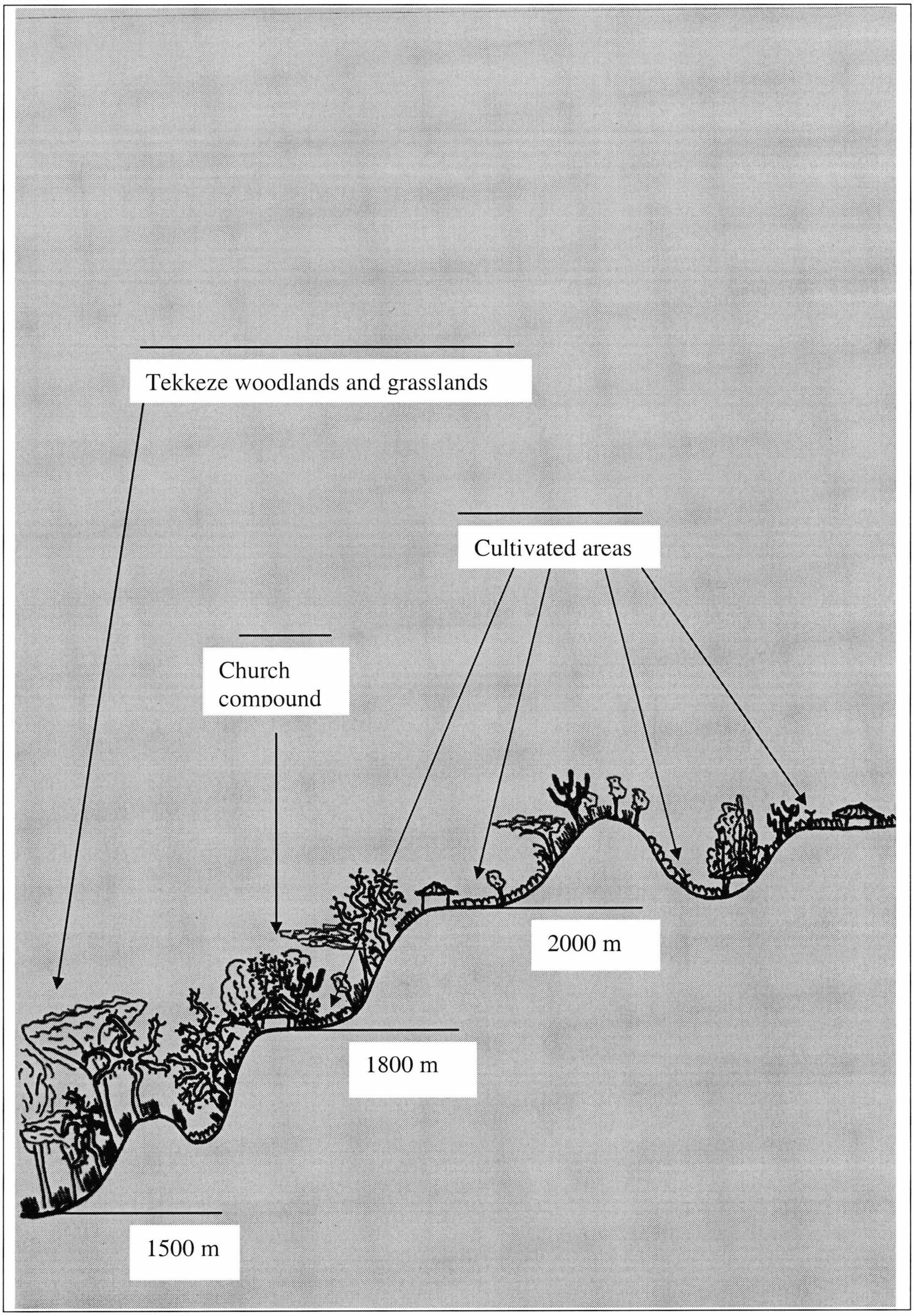
Kulkwal (Euphorbia ampliphylla), once very common in the intermediate altitude area of the community (2200-2600 m), is on the verge of extinction (see very low river density in Table 6.33) due to its frequent use in housing construction.

Tämbäläl (Jasminum abyssinicum) is virtually extinct from the lower altitude areas of Meskelo (2100-2400 m: villages of Gerimsig, Adiskenna, Workenna) due to excessive harvesting and to the spread of agriculture.

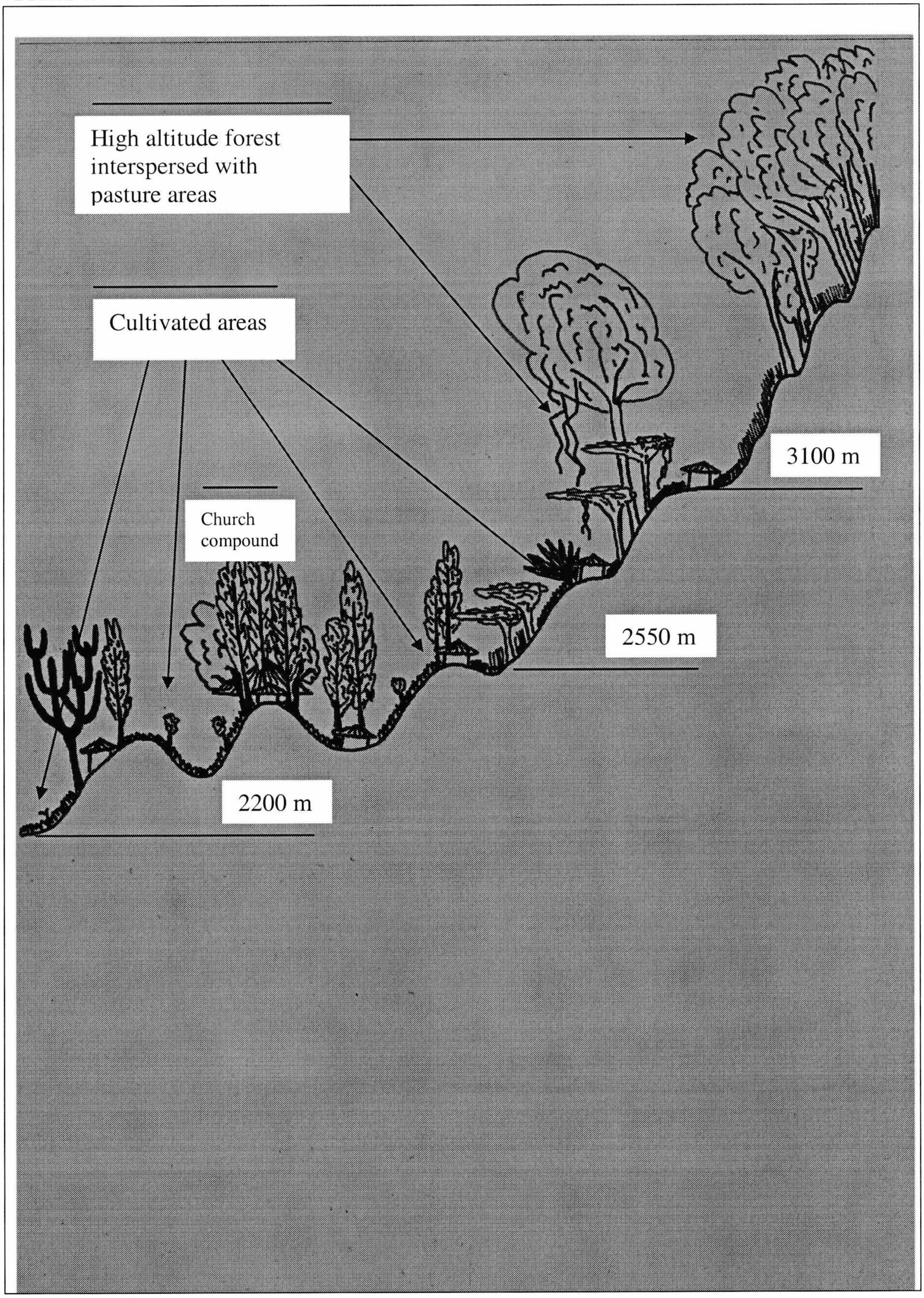
[32] 'Endangered' refers in this case to the rarity and dwindling populations of selected plant species in the communities under study and does not correspond to the broader and more complex CITES definition.

Transect: From Tsamla Giorgis to Meskelo Christos

PART 1



PART 2



High altitude forest interspersed with pasture areas
Cultivated areas
Church compound
3100 m
2550 m
2200 m

Kosso (Hagenia abyssinica) has seen its populations dwindle in Meskelo, due mainly to the inexorable spread of agricultural land. While no estimates of densities could be obtained, populations of the species appear to be fairly scattered. A hard fact remains. The tree was still growing in the village of Gebiu 30 years ago at the altitude of 2500 m. Nowadays, one has to climb to the village of Tarega at the altitude of 2800 to encounter the first specimen.

Täkät'äla (parasites of the Loranthaceae family, including the Tapinanthus genus) species are hardly seen in Meskelo anymore for the simple reason that their large tree hosts are disappearing. In the whole area, parasites of small tree/large bush species are now extremely rare since there are almost no places left where large bushes can have the time to grow, mature and host their parasite. This is particularly true for parasites of *zïgïta* (Calpurnea aurea), *tundjit* (Otostegia integrifolia) and *bubuša* (Senna singuinea).

Märänz (Akocanthera shimperi) trees have suffered heavily from water run-offs and the 1984 drought. Estimates of river densities clearly indicate that this tree is becoming a rare species in Meskelo.

Other rare species identified during the quantitative survey in Meskelo include the large tree *šinät* (Myrica salicifolia), the fragrant *täj sar* (Cymbopogon citratus) and *kubätabna* (Laggera spp.). The small sandalwood tree *k'äråt* (Osyris spp.) is almost extinct in the community.

SHIMELA:

As in Meskelo, *Dwa* and particularly *wïgïrt* have been over-harvested and have become very rare in the community. The 1984 drought episode also decimated populations of tree species with the result that *wäyra* (Olea europea var. africana), *wanza* (Cordia africana), have become very rare (see river densities for *wäyra* in Table 6.33). In the early 90s, the situation of the *wäyra* tree was so critical that many farmers had to either choose lesser woods or travel to neighbouring highland communities to acquire pieces of *wäyra* to make the central part of their swing-ploughs.

The *šiša* tree (Boscia spp.) is rare in the community because of altitude and habitat preferences. This species thrives on rocky, shallow soils only found north of the central ridge. Simultaneously, the lower reaches of the community on the northern side of the central ridge correspond to the upper limits of its altitude distribution. The *hamït'sa* vine (Cissus spp.) on the other hand is rarely found in Shimela (see Table 6.33) because of its predominantly lowland distribution. According to elders, populations of both species have not changed much since Imperial times.

Populations of *märänz* (Akocanthera shimperi) and *bäläs* (Ficus palmata) have been affected by the past drought and by water runoffs and are becoming rare in their river habitats.

In contrast to Meskelo, the situation of *kulkwal* (Euphorbia ampliphylla) is not worrying. Despite intensive harvesting around several villages, watershed densities for this species are still significant. This only suggests that the area must have been literally covered with *kulkwal* trees 30 years ago.

Tämbäläl (Jasminum abyssinicum) is becoming rare in the community because of the spread of agriculture and excessive harvesting.

TSAMLA:

Of the three communities surveyed, Tsamla is the one where population increase, agricultural expansion and harvesting have not significantly reduced the natural vegetation in general and the populations of species useful for botanical pest management in particular. Large tracts of woody grassland and Terminalia and Combretum woodlands are still relatively common.

There are some notable exceptions to this trend however. The main one concerns *batukwa* species (Commiphora spp). As mentioned above, the sap of this tree is used not only for botanical pest management but also to treat a range of skin conditions (scabies, eczema, fungus, etc). The medicinal value of this plant is such that it has been over-harvested in Tsamla. Once abundant 30 years ago, it is now much more difficult to find, or is only found on steep inaccessible escarpments difficult to access. Compared to other species of Commiphora, this species is of slower growth and does not reach the same size. Moreover, a harvesting technique that consists in pricking the trunk with a thorn or a needle to harvest the gluey sap causes harm to the tree if repeated too often. In the past, when population levels were high, the trees died after being entirely stripped of their bark to treat cattle and goats against flea and lice infestation.

In contrast to other communities, *dwa* is still harvested on near vertical cliffs in Tsamla. The stocks are insufficient to meet the demand of the Tsamla residents and the plant is becoming extremely rare and dangerous to harvest.

Populations of *märänz* are also reaching critically low levels (see river density in Table 6.33) due to the expansion of agriculture and to water run-offs.

6.4.5.2 - The spread of semi-cultivated and cultivated species

6.4.5.2.1 - Home-gardens

There are essentially three types of home-gardens in the area under study.

6.4.5.2.1.1 - Household home-gardens

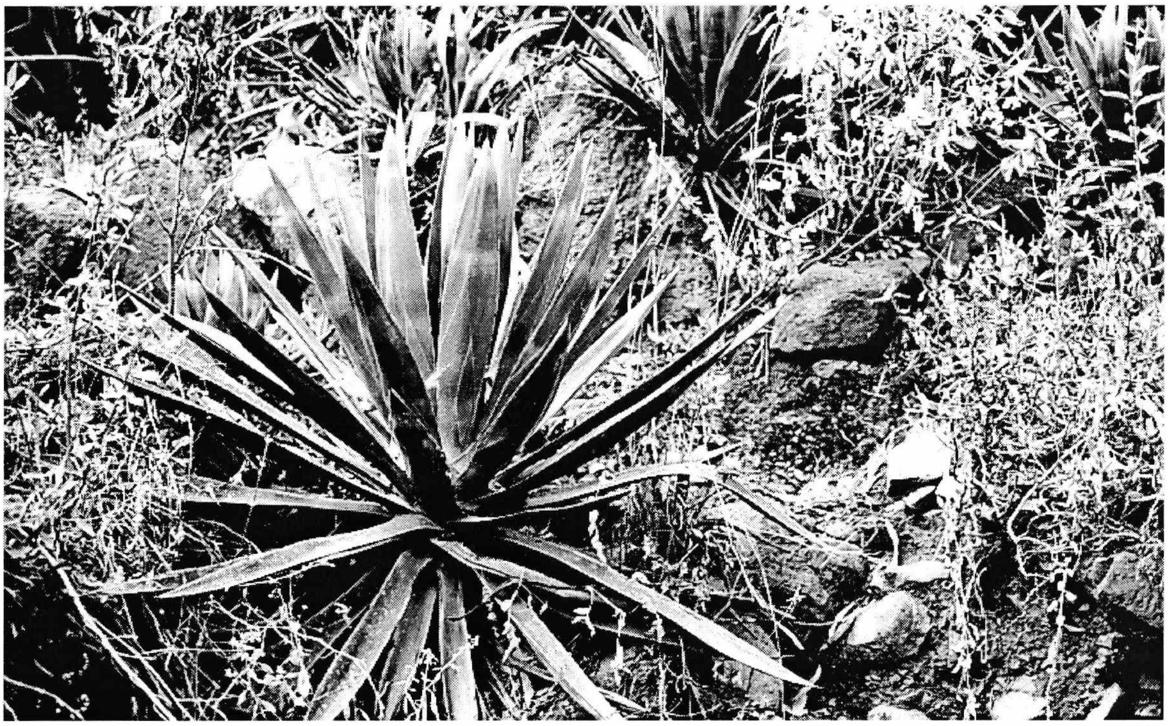
This first type of home-garden corresponds to the area surrounding the household and other buildings (grain stores, livestock barn, etc). The fencing of this area varies according to altitude and is of direct relevance to this research as it involves the planting of several species used for botanical pest management. In the highland communities of Bella and Meskelo, sisal plants are commonly used. In the mid-eighties, a new exogenous species of the genus Agave (Agave Americana, see photograph 6.4)) was introduced in Korem. It has since spread to most parts of Wag Hamra at a very fast rate, gradually replacing the local species, Agave sisalana (see photograph 6.5). For fencing purposes, farmers prefer the exogenous species as it grows much faster than the local one and reaches impressive sizes, making it a very effective natural fence, when planted at close distance. Its multiplication potential is also said to be superior to that of the local species.

Different fencing strategies are used in the midland areas of Shimela and Yekatit Dewol. Many farmers still use Agave species as a live fence but it is not uncommon below a certain altitude level, usually 2100-2200 m, to see farmers increasingly resort to the use of Euphorbiaceae species, notorious for the toxicity of their milky sap, *k'ïnč'ib* (Euphorbia tirucalli, see photograph 6.6) and *kulkwal* (Euphorbia ampliphylla) and their proven ability to withstand drought episodes. Moreover, *kulkwal* is also planted for the protection that it provides against by-passers possessing the evil eye, whether consciously or not. On the northern side of the Shimela ridge, farmers' fences are often made of the precious *batukwa* tree (Commiphora spp.). It appears clearly in this case that the fencing serves the double purpose of (loosely) protecting the garden and of providing the household with a very valuable and live medicinal store.

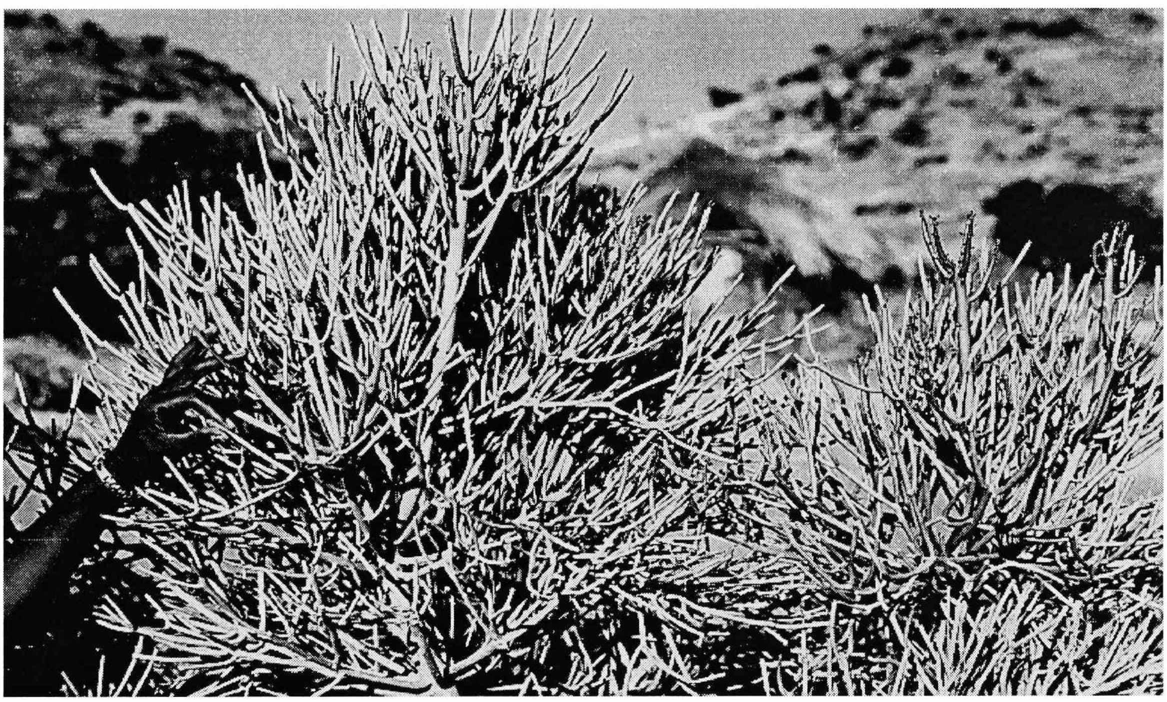
In the lowland areas of Tsamla and Yekatit Dewol, household home-gardens are not located around the household but at the back of it. Fences are roughly made of pieces of wood put together. For fear of rats, birds of prey and above all snakes, farmers do not plant any kind of tree near their house or as fences for their home-gardens. The use of sisal species as live fence is also rare.

Photograph 6.4: Agave americana, Bella Giorgis.

Photograph 6.5: Agave sisalana, Bella Giorgis



Photograph 6.6: Euphorbia tirucalli, Shimela Maryam



Concerning the species planted inside these gardens, several points are worth mentioning. Farmers in the highlands and midlands occasionally use them to plant food crops, spices and cash crop trees (Eucalyptus) if they have sufficient space (which is now becoming rare). In the lowlands, these gardens are larger in size and systematically planted with maize and occasionally spices. As mentioned above, there are very few trees in lowland gardens and in many villages there are no trees at all. Regardless of altitude, household gardens are always rich in nitrates because of animal and human excreta. This favours the growth of species such *amädmado* (Chenopodium spp.) and *astänagïrt* (Datura stramonium).

There are often several wild tree and large plant species growing inside highland gardens, less so in the midland community of Shimela because of the 1984 drought. Some clearly serve a medicinal/utilitarian purpose, such as *gulho* (Ricinus communis) and *yädäga ïmbuay* (Solanum spp.). The large trees, such as *wäyra* or some Acacia species, appear to have a more complex function. Beyond their utilitarian value to people (providing shade, source of remedy, etc), such large trees are anchors for the household. Although the fact could not be clearly confirmed in interviews, it is very likely that the presence of such large trees initially is one of the factors that determined the choice of the site by the settling farmer. Several decades later, large trees inside the compound of a household signal the presence of an old and therefore respectable family in the village. In some cases, they mark the homestead of a founding member of the community.

6.4.5.2.1.2 - River gardens

Many households have access to a second garden on the bank of a stream or river. They are usually narrower and smaller than the household gardens. Such gardens are only maintained at altitudes where soil moisture and water table levels remain sufficient for plants to survive during the dry season. As such, there are no gardens of this type at all below 1900-2000 m in Shimela and in the whole community of Tsamla. By comparison, they abound in highland Meskelo, where several streams never run dry throughout the year.

Farmers tend to grow cash crops on these plots. The fast growing eucalyptus has obviously been a favourite for quite a while but in recent years the growing demand in the area under study for aromatic plants and natural soap has created a strong incentive for farmers to establish river plantations of *addäs* (Myrtus communis, see Photograph 6.7) and *ïndod* (Phytolacca dodecandra), two species also commonly used for botanical pest management. This increased reliance on cultivated *ïndod* comes at an appropriate time since the species is becoming more difficult to find in the wild.

Photograph 6.7: Myrtus communis cultivated in a river garden, Meskelo Christos

6.4.5.2.2 - Church and *däbtära* gardens.

In the countryside of Wag as in most parts of the Christian highlands, churches of the Ethiopian Orthodox Church are always surrounded by vegetation. When a site is chosen for the establishment of a new church, a stone fence is erected and the natural vegetation is allowed to grow within the perimeter. In terms of natural resource management, the "planting" of a new church is the equivalent of a protective enclosure. It follows that the size of trees growing within the church compound is an indicative measure of the age of the church.

It is often inside or in the immediate vicinity of this small island of natural vegetation that *däbtäras* introduce and cultivate the medicinal plants of their trade. By this mechanism, new plants of direct relevance to this research were introduced in Shimela. The *kïnč'ib* species (Euphorbia tirucalli) was introduced for the first time in the community during the establishment of the Nichiro Kidane Mehret church on the northern side of the central ridge. This Euphorbiacae species, planted at regular intervals to form a hedge that complements the stone dike of the church, was selected for its easy multiplication, relatively fast growth and drought resistance characteristics. It is remarkable to observe how the species has spread to most other church compounds and to numerous individual household gardens over the last 50 years. Moreover, *däbtäras* can be credited with the successful introduction of *kalkalda* (Euphorbiaceae spp.) and *tobia* (Calotropis procera, see Photograph 6.8) in areas where they were never seen to grow before (Churches of Shimela Maryam and Tsamla Giorgis).

Photograph 6.8: 'Imported' Calotropis procera in Tsamla Giorgis, altitude: 2100m

6.4.5.3 General comments

Overall, and in terms of general availability of botanicals for pest management purposes, we can conclude that the inexorable decline of species in the wild over the last 30 years has only reached critical levels for a few species used for pest management purposes. For a majority of species, densities are such that farmers can always harvest a specimen without having to travel to distant areas. Several of the endangered or extinct species have market value and are still available to farmers at nearby markets (*dwa*, *wïgïrt*).

In absolute terms, and if the availability of plant species was the sole factor affecting the development of the use and knowledge of plant remedies for pest management amongst farmers, we could conclude that the near extinction of these species in the immediate environment of farmers is unlikely to have significantly impacted on their use and knowledge of plant remedies for pest management. However, having demonstrated that the use and knowledge of plant remedies is strongly tied to considerations of altitude and micro-territoriality (see Chapter 5) and considering how the introduction of synthetic substances in the area has begun to compete in different ways with traditional forms of pest management (see sections 6.4.2 and 6.4.3), we have to conclude that the slight decline of several plant species at community level comes at an inappropriate time, since it is a factor increasing the likelihood of a switch to chemical alternatives. As mentioned above, this is largely driven by context and local constraining factors (finance, time, nature of pest infestation, etc).

This downward trend in plant use and knowledge is partially offset by the increased cultivation of other marketable species, and the introduction by *däbtäras* of species that were previously considered exogenous.

6.5 - Knowledge transmission

All the various plant remedies spontaneously reported during the first part of the quantitative survey were sorted by pest type and according to the source of knowledge of the plant remedies. Since collecting these extra data already placed significant time constraints on the conduct of the survey, no additional questions were asked regarding the different ways in which the acquisition of the said knowledge could have taken place (hearsay, direct observation, etc). Possible sources of knowledge were separated into three broad categories: direct family (parents, grandparents, siblings), outside of the family (adults, children) and innovation. Further levels of detail were added to reflect potential gender biases (father, mother, non-family male or female person, parents (indiscriminate), outside people (indiscriminate).

The final compiled results pertaining to knowledge transmission are presented for each pest, for both variables and for two sets of respondents: children (age five to 15) and adults (age 15 and above). Aggregated figures measuring the percentages of horizontal and vertical transmission and gender patterns for each pest are presented in Tables 6.34 to 6.37.

6.5.1 -Vertical versus horizontal knowledge transmission

Table 6.34a: Detailed knowledge transmission patterns among children for RAW K

	ORIGIN OF KNOWLEDGE (NUMBER OF CASES)										
	FATHER	MOTHER	SIBLING	PARENTS	GRAND PARENTS	OUTS MALE	OUTS. FEMALE	CHILDREN	OTHER PEOPLE	SELF	Total
FLY	4	7	0	1	0	6	0	0	0	0	18
FLY ON WOUND	19	2	3	0	0	6	2	3	1	0	36
GROUND MAGGOTS	11	5	0	1	0	3	2	0	1	0	23
JIGGER FLEA	2	3	1	0	0	0	3	0	1	0	10
EAR TICK	4	2	0	0	0	2	1	0	1	0	10
BEDBUG	10	3	0	0	1	1	0	0	0	0	15
EAR PEST	1	3	0	0	0	4	0	0	1	0	9
SCABIES	4	0	1	0	0	4	3	0	0	0	12
BODY LICE	17	23	0	1	0	4	3	3	3	0	54
HEAD LICE	1	10	0	0	0	1	0	0	3	0	15
FLEA	4	8	0	0	0	2	3	0	0	0	17
CATTLE LICE	13	2	1	1	0	7	0	0	2	0	26
CATTLE FLEA	11	1	2	0	0	9	0	0	0	0	23
CHICKEN FLEA	2	14	0	0	0	0	4	0	0	0	20
CATTLE TICKS	6	0	0	0	0	2	0	0	0	0	8
MANGE MITES	2	0	0	0	0	1	0	0	1	0	4
WEEVIL	0	2	0	0	0	0	0	0	0	0	2
TEFF EATING ANT	1	1	0	0	0	0	0	0	0	0	2
FIELD TERMITE	1	0	0	0	0	0	0	0	0	0	1
HEAP TERMITE	76	1	1	2	0	4	0	0	0	0	84
TOTAL	189	87	9	6	1	56	21	6	14	0	389

Table 6.34b: Aggregated knowledge transmission patterns among children for RAW K

	ORIGIN OF KNOWLEDGE (%)					
	FAMILY	OUTSIDE		MALE	FEMALE	INDISCRIMINATE
FLY	67%	33%		56%	39%	6%
FLY ON WOUND	67%	33%		78%	11%	3%

GROUND MAGGOTS	74%	26%		61%	30%	9%
JIGGER FLEA	60%	40%		30%	60%	10%
EAR TICK	60%	40%		60%	30%	10%
BEDBUG	93%	7%		73%	20%	7%
EAR PEST	44%	56%		56%	33%	11%
SCABIES	42%	58%		75%	25%	0%
BODY LICE	76%	24%		39%	48%	7%
HEAD LICE	73%	27%		13%	67%	20%
FLEA	71%	29%		35%	65%	0%
CATTLE LICE	65%	35%		81%	8%	12%
CATTLE FLEA	61%	39%		96%	4%	0%
CHICKEN FLEA	80%	20%		10%	90%	0%
CATTLE TICKS	75%	25%		100%	0%	0%
MANGE MITES	50%	50%		75%	0%	25%
WEEVIL	100%	0%		0%	100%	0%
TEFF EATING ANT	100%	0%		50%	50%	0%
FIELD TERMITE	100%	0%		100%	0%	0%
HEAP TERMITE	95%	5%		96%	1%	2%
TOTAL	75%	25%		65%	28%	5%

Lateral knowledge transmission accounts for a significant portion of all ethnobotanical knowledge transmissions among children (Table 6.34b). For all the pest remedies taken as a whole, it amounts to a quarter of all transmissions. If one excludes the knowledge of termite remedies, whose transmission is the most vertical and conservative (95 %), average lateral transmission for all the remaining pests jumps to 31 %. This is a significant finding.

While the importance of child to child transmission does not emerge clearly from the findings, since the question was not specifically asked, direct observation in the five communities under study during more than a year strongly suggests that child to child interaction in the context of games and group interaction is an important mechanism of knowledge diffusion for plant remedies against common pests.

Very young children were observed to re-enact different adult household situations among themselves: the washing of clothes for body lice, the use of shampoos for hair lice, etc.

Moreover and unless explicitly forbidden to do so by adults, children are keen to play around with plants containing abundant sap such as the Aloe and Commiphora species, which they were seen to paste over their heads or on small wounds, including scabies wounds.

Young shepherds also carry out their duty in small groups. Strength in numbers facilitates the supervision of the herds and at the same time provides many opportunities for interactive games and group education activities. Although it could not be directly observed among young shepherds, there are good reasons to believe that minor pest infestations (ticks, lice or fleas) on animals provide the ideal context for the sharing and transmission of ethnobotanical knowledge from older to younger shepherds.

Such findings are commensurate with the conclusions of recent studies of the acquisition and transmission of subsistence knowledge in different cultures. The research of Maynard (1999) in Mexico and of Zarger (2002), in particular, among Maya children in Belize highlights the importance of informal and experiential means of sharing information in the context of work and play activities. Lancy argues that in subsistence-based societies, play and work activities are frequently intertwined (Lancy 1999). The magnitude of lateral knowledge transmission among children in Wag for the specific field of botanical pest management confirms and illustrates the observations made by Zarger concerning the broader field of subsistence activities. The magnitude of lateral communication for botanical pest management issues (31 %) among the Wag Hamra children is commensurate with measurements of non-vertical communication among Wichi children for wild foods in Argentina (Fitzpatrick 2004: 26).

On the other hand, the transmission of ethnobotanical knowledge for crop pests is almost exclusively vertical from father to son. This result makes sense considering that children at harvest time are most likely to work under the supervision of their parents on the family plots. It is the one season during the cropping calendar when children from neighbouring households see less of each other.

Table 6.35a: Detailed knowledge transmission patterns among adults for RAW K

	ORIGIN OF KNOWLEDGE (NUMBER OF CASES)										
	FATHER	MOTHER	SIBLING	PARENTS	GRAND PARENTS	OUTS MALE	OUTS FEMALE	CHILDREN	OTHER PEOPLE	SELF	Total
FLY	39	31	0	6	0	2	0	0	1	1	80
FLY ON WOUND	100	0	0	12	0	16	0	1	2	0	131
GROUND MAGGOTS	94	10	0	11	0	27	6	0	4	0	152
JIGGER FLEA	13	2	0	0	0	6	3	0	8	0	32
EAR TICK	36	0	0	2	0	12	1	0	9	0	60
BEDBUG	24	1	0	4	0	7	1	0	1	1	39
EAR PEST	9	1	0	0	0	6	1	0	4	0	21
SCABIES	16	3	0	3	0	4	0	0	1	1	28
BODY LICE	119	15	0	20	2	7	3	0	1	0	167
HEAD LICE	3	8	0	0	0	1	2	0	2	0	16
FLEA	21	32	0	4	0	4	2	0	0	1	64
CATTLE LICE	75	0	0	10	1	27	1	0	3	0	117
CATTLE FLEA	82	3	0	4	1	9	0	0	0	0	99
CHICKEN FLEA	22	102	0	6	0	3	9	0	1	0	143
CATTLE TICKS	16	4	0	2	0	6	0	0	2	1	31
MANGE MITES	5	0	0	0	0	4	1	0	0	4	14
WEEVIL	11	1	0	0	0	10	1	0	0	0	23
TEFF EATING ANT	33	0	0	4	0	7	0	0	1	0	45
FIELD TERMITE	16	0	0	0	0	1	0	0	0	0	17
HEAP TERMITE	205	1	0	4	0	3	0	0	0	0	213
TOTAL	939	214	0	92	4	162	31	1	40	9	1492

Table 6.35b: Aggregated knowledge transmission patterns among adults for RAW K

	ORIGIN OF KNOWLEDGE (%)					
	FAMILY	OUTSIDE		MALE	FEMALE	INDISCRIMINATE
FLY	96%	4%		51%	39%	9%
FLY ON WOUND	85%	15%		89%	0%	11%
GROUND MAGGOTS	76%	24%		80%	11%	10%

JIGGER FLEA	47%	53%		59%	16%	25%
EAR TICK	63%	37%		80%	2%	18%
BEDBUG	77%	23%		79%	5%	13%
EAR PEST	48%	52%		71%	10%	19%
SCABIES	82%	18%		71%	11%	14%
BODY LICE	93%	7%		75%	11%	14%
HEAD LICE	69%	31%		25%	63%	13%
FLEA	91%	9%		39%	53%	6%
CATTLE LICE	74%	26%		87%	1%	12%
CATTLE FLEA	91%	9%		92%	3%	5%
CHICKEN FLEA	91%	9%		17%	78%	5%
CATTLE TICKS	74%	26%		71%	13%	13%
MANGE MITES	64%	36%		64%	7%	0%
WEEVIL	52%	48%		91%	9%	0%
TEFF EATING ANT	82%	18%		89%	0%	11%
FIELD TERMITE	94%	6%		100%	0%	0%
HEAP TERMITE	99%	1%		98%	0%	2%
TOTAL	84%	16%		74%	16%	9%

Concerning adults in Wag, overall knowledge transmission patterns are very similar to those observed in the case of their children, but with two marked differences. First, overall knowledge transmission is more vertical for adults than for children (Table 6.35). If one excludes the very conservative figures for termite remedy knowledge transmission, lateral knowledge transmission for adults in Wag amounts to 18 %, which is less than the 31 %, calculated for lateral communication among children. These results of vertical knowledge transmission are commensurate with the findings of Hewlett and Cavalli-Sforza (1986) who calculated an average 82 % vertical transmission for subsistence skills among Aka people in Zaire.

Secondly, between children and adults, lateral transmission figures plummet for fly repellents in the air and on wounds, household fleas, scabies, body lice, cattle fleas and chicken lice while the vertical transmission trend observed on crop pests is increased. A notable exception to this trend is the case of the jigger flea, where lateral transmission exceeds vertical transmission. In the light of the localised distribution of jigger fleas and of the corresponding ethnobotanical knowledge of remedies, this finding hardly comes as a surprise. People who do not live in areas suitable for jigger fleas will not inherit any knowledge from their parents and can therefore only access knowledge of jigger flea remedies from outsiders.

Several arguments come to mind to explain this difference in transmission pattern between children and adults. In cognitive terms, as adults become older, they are more likely to merge mentally the source of their knowledge into an idealised "elderly" source. This is best rendered in Amharic by the expression *abatačïn*, which means both "our parents" (literal sense) and "our ancestors" in the broadest sense (people from the previous generation, both family and non family members). This is also apparent in the fact that the proportion of indiscriminate sources of knowledge, gender wise, i.e. "parents" or "other people", is twice as important for adults as it is for children (Tables 6.34 and 6.35). Similarly and concerning very common household remedies for very common pests (precisely the pests that show a marked decline in lateral transmission from child to adult), adults are likely to forget that they acquired the knowledge of such remedies from adult neighbours or other children since these plant remedies were and are still used by many households in the village in an open and visible way. To remember and acknowledge that such common knowledge was first acquired from neighbours during childhood is difficult and would amount for a grown-up person to saying that his/her own household and his/her own parents were not "normal" or representative of the past "idealised" generation.

Nonetheless, and beyond the cognitive blurring effects associated with age, and ideal cultural models of learning, lateral knowledge transmission among adults is an important phenomenon that helps us to understand how migrant adult people end-up being the bearers of higher levels of ethnobotanical knowledge of pest management than non-migrant people.

Gugliemino *et al* (1995) and Hewlett and Cavalli-Sforza (1986) have stated that vertical or intergenerational mechanisms of knowledge transmission are conservative or stabilising in character. Guglielmino *et al* (1995) independently confirmed this hypothesis by analysing ethnographic data from Africa. They found that the most conserved cultural characteristics are familial. Grandparent to grandchildren vertical transmission is thought to be even more conservative as knowledge jumps two generations (Cavalli-Sforza 2000). Because this form of transmission is conservative and is observed over the time span of a generation, cultural change is believed to occur at a slow pace (Hewlett and Cavalli-Sforza 1986, Cavalli-Sforza 2000).

In contrast, horizontal modes of transmission building on lateral communication are more dynamic (Mundy and Compton 1995: 120) or contagious (Hewlett and Cavalli-Sforza 1986: 923) in the sense of bringing about change. However, one-to-many horizontal transmission is believed to have the potential to bring about a much swifter change than a one-to-one horizontal transmission (Hewlett and Cavalli-Sforza 1986, Cavalli-Sforza 2000).

Thus emerged the two hypotheses that vertical mechanisms of transmission tend to increase intra-cultural variability while horizontal mechanisms tend to decrease intra-cultural variability. Consequently, the study of the prevalence of different transmission mechanisms according to the mathematical model developed by Cavalli-Sforza and Feldman (1981) can help predict the degree of intra-cultural variability within cultural domains (Hewlett and Cavalli-Sforza 1986).

To some extent, the superior knowledge exhibited by migrant farmers in Wag partially contradicts the above assertion that lateral knowledge transmission usually results in a decrease of intra-cultural variability.

In the context of Wag Hamra, where altitude is a key arbiter of diversity of botanical species, and implicitly of ethnobotanical knowledge variations (see findings in Chapter 5), the lateral transmission processes that enable short distance migrants to increase significantly their ethnobotanical knowledge also contribute to increasing rather than decreasing intra-cultural diversity. One of the reasons why intra-cultural variability is increased rather than decreased as a result of lateral communication is that the new knowledge acquired by migrants is rarely tested and passed on to anyone (including children) and therefore remains sterile. The erratic distribution of plants due to altitude gradients and a highly versatile topography, the existence of strong cultural barriers related to perceptions of altitude and the contexts and knowledge transmission mechanisms that determine plant use (see following paragraph on use and knowledge), are all factors that converge to hinder the diffusion and "contagion" (to use the Hewlett and Cavalli-Sforza

(1986) terminology) of laterally-transmitted ethnobotanical knowledge acquired by migrant people in Wag.

One of the other notable differences with the case of the Aka people presented by Hewlett and Cavalli-Sforza (1986) is that a majority of Wag farmers are sedentary, whereas the Akas of Zaire could almost be compared to "forest nomads" and therefore appear to be exposed to the same environment and plant species of the forest.

6.5.2 -Gender patterns in the transmission process

It appears clearly that the transmission of plant remedy knowledge for most pests reflects several gender biases. Most children report having acquired their knowledge of remedies against flies (on wounds), ground maggots, ear ticks, bedbugs, scabies, all pests attacking large livestock animals (lice, fleas, ticks and mange mites), and all crop pests (ants, termites) from men, or at least male persons. In contrast, most children have acquired their knowledge of plant remedies for head lice and chicken fleas from women. For other common household pests (flies and fleas) and body lice, there is a form of balance between men and women in the origin of the ethnobotanical knowledge. Results for jigger flea and weevils should be treated with caution as they are based on few reported cases only.

The analysis of the origin of the knowledge held by adults confirms these gender patterns in the knowledge transmission process (Table 6.34b and 6.35b).

Overall, the results point to a strong gender division in the transmission process that mirrors quite precisely the gender biases observed for the use of plant remedies to manage pests (see chapter 5). It is primarily those who use plant remedies against specific pests who pass on their knowledge to children. We can therefore indirectly deduce that direct observation and experiential learning are key knowledge transmission mechanisms. These findings are in line with the conclusion of Zarger's study (2002: 598) that "...the acquisition and transmission of TEK is largely observational and experiential."

6.5.3 - Use versus knowledge of plant remedies

The comparison of transmission figures between USE and RAW K, both for adults and children, is most instructive in that it reveals that vertical transmission is very pronounced for plant users (only 5 % lateral communication for adult plant users see Table 6.37). In other words, people who acquired knowledge of plant remedies for pest management from family members are more likely to put their knowledge into practice than people who have acquired the same knowledge but from non-family sources.

Although it could not be confirmed during the interviews, an unspoken and invisible factor that could explain why plant use is related to the source of the knowledge and the importance of family sources is the ways in which lateral knowledge transmission occurs among adults in Wag. In the light of the relative secrecy that surrounds household issues in Wag, adult peer to peer knowledge transmission of plant remedies for pest management probably takes place more in the form of verbal communication than in the form of direct observation or experiential learning. The latter communication mechanisms seem more characteristic of knowledge transmission for children. The unspoken rule, then, would be that individuals are more likely to apply a remedy if they have seen how it is prepared and administered, and more importantly if they have had the opportunity to witness the extent to which it is effective against a certain pest. Such conditions are more likely to be met within than outside of the household.

Differential modes of knowledge transmission between children and adults would therefore explain why children are less conservative in terms of plant use and do not hesitate to experiment with plant remedies not seen or heard of in their own families (lateral communication of 18 % for children plant use see Table 6.36)

This is a significant finding that also partially explains the sterility of some of the knowledge held by migrant people in Wag. For instance, if people familiar with a particular plant and plant use find out or hear during their migration that the same plant can be used for a different purpose, it is unlikely that they will apply this new knowledge once back in their original community. All will depend on the circumstances in which they have acquired their new knowledge (hearsay, direct observation, etc). This also explains why the new ethnobotanical knowledge of pest management currently being generated by the Ministry of Agriculture in partnership with farmers in communities not too distant from Meskelo, Bella and Shimela is not being tested and replicated independently by farmers in these communities.

Table 6.36a: Detailed knowledge transmission patterns among children for USE

	ORIGIN OF KNOWLEDGE (NUMBER OF CASES)										
	FATHER	MOTHER	SIBLING	PARENTS	GRAND PARENTS	OUTS MALE	OUTS FEMALE	CHILDREN	OTHER PEOPLE	SELF	Total
FLY	4	6	0	1	0	6	0	0	0	0	17
FLY ON WOUND	17	2	2	0	0	5	2	3	1	0	32
GROUND MAGGOTS	8	2	0	1	0	1	1	0	1	0	14
JIGGER FLEA	1	2	1	0	0	0	1	0	0	0	5
EAR TICK	2	0	0	0	0	0	0	0	0	0	2
BEDBUG	6	0	0	0	0	0	0	0	0	0	6
EAR PEST	1	2	0	0	0	0	0	0	0	0	3
SCABIES	3	0	0	0	0	0	0	0	0	0	3
BODY LICE	15	21	0	2	0	2	0	3	2	0	45
HEAD LICE	0	8	0	0	0	0	0	0	0	0	8
FLEA	2	2	0	0	0	0	0	0	0	0	4
CATTLE LICE	6	2	0	0	0	3	0	0	0	0	11
CATTLE FLEA	7	1	0	0	0	3	0	0	0	0	11
CHICKEN FLEA	2	7	0	0	0	0	0	0	0	0	9
CATTLE TICKS	0	0	0	0	0	1	0	0	0	0	1
MANGE MITES	1	0	0	0	0	0	0	0	0	0	1
WEEVIL	0	0	0	0	0	0	0	0	0	0	0
TEFF EATING ANT	1	0	0	0	0	0	0	0	0	0	1
FIELD TERMITE	0	0	0	0	0	0	0	0	0	0	0
HEAP TERMITE	11	0	0	0	0	1	0	0	0	0	12
TOTAL	87	55	3	4	0	22	4	6	4	0	185

Table 6.36b: Aggregated knowledge transmission patterns among children for USE

	ORIGIN OF KNOWLEDGE (%)					
	FAMILY	OUTSIDE		MALE	FEMALE	INDISCRIMINATE
FLY	65%	35%		59%	35%	6%
FLY ON WOUND	66%	34%		75%	13%	3%
GROUND MAGGOTS	79%	21%		64%	21%	14%
JIGGER FLEA	80%	20%		40%	60%	0%
EAR TICK	100%	0%		100%	0%	0%
BEDBUG	100%	0%		100%	0%	0%
EAR PEST	100%	0%		33%	67%	0%
SCABIES	100%	0%		100%	0%	0%
BODY LICE	84%	16%		38%	47%	9%

HEAD LICE	100%	0%		0%	100%	0%
FLEA	100%	0%		50%	50%	0%
CATTLE LICE	73%	27%		82%	18%	0%
CATTLE FLEA	73%	27%		91%	9%	0%
CHICKEN FLEA	100%	0%		22%	78%	0%
CATTLE TICKS	0%	100%		100%	0%	0%
MANGE MITES	100%	0%		100%	0%	0%
WEEVIL	0%	0%		0%	0%	0%
TEFF EATING ANT	100%	0%		100%	0%	0%
FIELD TERMITE	0%	0%		0%	0%	0%
HEAP TERMITE	92%	8%		100%	0%	0%
TOTAL	81%	19%		61%	32%	4%

Table 6.37a: Detailed knowledge transmission patterns among adults for USE

	ORIGIN OF KNOWLEDGE (NUMBER OF CASES)										
	FATHER	MOTHER	SIBLING	PARENTS	GRAND PARENTS	OUTS MALE	OUTS FEMALE	CHILDREN	OTHER PEOPLE	SELF	Total
FLY	39	28	0	6	0	1	0	0	1	1	76
FLY ON WOUND	91	0	0	12	0	9	0	1	2	0	115
GROUND MAGGOTS	79	8	0	9	0	7	2	0	1	0	106
JIGGER FLEA	10	0	0	0	0	1	3	0	2	0	16
EAR TICK	32	0	0	1	0	1	0	0	1	0	35
BEDBUG	23	1	0	4	0	2	0	0	0	1	31
EAR PEST	6	0	0	0	0	0	0	0	0	0	6
SCABIES	22	3	0	3	0	1	0	0	0	1	30
BODY LICE	117	15	0	20	2	5	2	0	0	0	161
HEAD LICE	3	8	0	0	0	1	1	0	1	0	14
FLEA	20	21	0	4	0	2	0	0	0	1	48
CATTLE LICE	66	0	0	10	1	8	0	0	0	0	85
CATTLE FLEA	69	2	0	4	1	3	0	0	0	0	79
CHICKEN FLEA	21	77	0	6	0	2	1	0	0	0	107
CATTLE TICKS	11	3	0	2	0	2	0	0	1	1	20
MANGE MITES	4	0	0	0	0	0	0	0	0	4	8
WEEVIL	11	0	0	0	0	4	1	0	0	0	16
TEFF EATING ANT	27	0	0	4	0	0	0	0	0	0	31
FIELD TERMITE	15	0	0	0	0	0	0	0	0	0	15
HEAP TERMITE	129	0	0	4	0	0	0	0	0	0	133
TOTAL	795	166	0	89	4	49	10	1	9	9	1132

Table 6.37b: Aggregated knowledge transmission patterns among adults for USE

	ORIGIN OF KNOWLEDGE (%)					
	FAMILY	OUTSIDE		MALE	FEMALE	INDISCRIMINATE
FLY	97%	3%		53%	37%	9%
FLY ON WOUND	90%	10%		87%	0%	12%
GROUND MAGGOTS	91%	9%		81%	9%	9%
JIGGER FLEA	63%	38%		69%	19%	13%
EAR TICK	94%	6%		94%	0%	6%
BEDBUG	94%	6%		81%	3%	13%
EAR PEST	100%	0%		100%	0%	0%
SCABIES	97%	3%		77%	10%	10%
BODY LICE	96%	4%		76%	11%	14%
HEAD LICE	79%	21%		29%	64%	7%
FLEA	96%	4%		46%	44%	8%
CATTLE LICE	91%	9%		87%	0%	13%
CATTLE FLEA	96%	4%		91%	3%	6%
CHICKEN FLEA	97%	3%		21%	73%	6%
CATTLE TICKS	85%	15%		65%	15%	15%
MANGE MITES	100%	0%		50%	0%	0%
WEEVIL	69%	31%		94%	6%	0%
TEFF EATING ANT	100%	0%		87%	0%	13%
FIELD TERMITE	100%	0%		100%	0%	0%
HEAP TERMITE	100%	0%		97%	0%	3%
TOTAL	93%	6%		75%	16%	9%

CHAPTER 7

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LONG TERM CHANGE AND CONTINUA OF PLANT USE

7.1 - Background

While the forces and dynamics of ethnobiological knowledge change discussed in the previous chapter can be measured and analysed over a subject's lifetime, they give us no indication as to the existence of broader and long-term patterns of change in plant knowledge and use. In the context of the former Abyssinia, and of the area of Wag Hamra in particular, this is especially important since the area has remained relatively isolated from the outside world for several centuries. It is only in recent decades that the rural areas of Wag have become exposed to "non-Abyssinian" concepts, values, ideas and techniques. Prior to the Italian invasion in the late thirties, the rhythm of rural life in Wag remained tied to domestic, feudal and religious affairs as well as to natural phenomena (drought episodes, hale, large scale pest infestations, etc). The few foreign travellers to visit the northern highlands of Ethiopia in the 17^{th}, 18^{th}, 19^{th} and early 20^{th} centuries were often struck by the Old Testament atmosphere and quality of life that emanated from these predominantly rural areas. In a sense, then, the area is ideal for trying to decipher long-term patterns of change in plant knowledge and use since the geographical isolation of its people has allowed ethnobiological knowledge to evolve relatively unaffected by outside influences.[33]

As mentioned in the introductory chapter, multipurpose and multi-contextual plant use were chosen as entry points to try to understand the dynamics of long-term change in ethnobotanical knowledge generally and in the ethnobotany of pest management in particular.

[33] The knowledge of the *däbtära* healers obeys different rules of change as it is conditioned by the ambition and willingness to travel to distant areas of the student *däbtära*s. Modern scholars have recognised the influence of Greek, Indian and Arabic medical concepts and theories in the practice and medical knowledge of the *däbtära*s (Strelcyn 1968, Mercier 1979c).

In the broader field of ethnobotany, the generalisation and de-contextualisation that characterise most research efforts in the field of economic botany are responsible for descriptions of plant use, which often highlight and even describe in great detail multipurpose plant use (Peters and Pardo-Tejeda 1982, Bretting 1984, Anderson 1986, Whistler 1988, Milliken and Albert 1997, Luoga *et al* 2000, Van Andel 2000, Prendergast and Pearman 2001, Outlaw *et al* 2002). Descriptions of de-contextualised and multiple plant use related to pest management are found in Yang and Tang 1988, Matzigkeit 1990, Guarrera 1999 and Stoll 2000. However, studies which combine the description of multiple plant use with attempts to analyse and decipher the mechanisms (influence of context, diachronic factors, etc) that ultimately result in multiple plant use are scarce. Noteworthy in this respect are the hints provided by Ellen (1979a), the recent work of Campos and Ehringhaus (2003) on the dynamics of multipurpose plant use and above all the pioneering comparative work undertaken by Etkin and Ross (1982) with the Hausa people of Northern Nigeria.

In his ethnozoological study of Nuaulu classification systems, Ellen (1993) stressed the relationship between the context (and its numerous dimensions) in which animals are identified and the overall dynamics of classification among the Nuaulu people of Indonesia. Moreover, he noted the existence of areas of fuzziness at the boundaries demarcating different semantic fields and suggested that several semantic fields could be integrated due to the marginal overlap of their contents. This temporal concept of integration led him to raise the important question of the logical and historical primacy of different semantic fields and the processes which created new ones. Although more focused on the dynamics and complexities of ethnozoological classification systems rather than the dynamics of ethnobotanical knowledge and use, Ellen's observations are noteworthy as he is among the first ethno-biologists to have suggested the existence of long term and patterned forces of change.

By independently and concurrently investigating the local diet with farmers and the medical system prevailing in the same area with farmers and traditional healers, Etkin and Ross (1982) measured a significant overlap in the ethnobotanical knowledge of the Hausa people in Northern Nigeria. They observed that more than half of the plants used as a source of food (wild, semi-cultivated or cultivated) were simultaneously being used in the traditional pharmacopoeia, mainly to treat gastro-intestinal disorders. From these data, they introduced the concept of "diverse dimensions of plant utilisation" and of the necessity in ethno-medicine to consider multidimensional and multi-contextual use of plants. Concerning their own field study on diet and medicine, they stressed the importance of combining and integrating the study of both fields in order to carry out coherent analyses (Etkin and Ross 1982, Etkin 1988).

This first and striking reported case of a patterned duality of uses triggered a number of studies on the subject in different geographical areas (Fleuret 1986, Iwu 1986, Johns 1990, Ogle *et al* 2003). Gradually, the study of multidimensional and multi-contextual use of plants evolved to become synonymous with the analysis of *continua of plant use* (Johns 1990, Etkin 1994). In his chemical ecology model, Johns (1990), in particular, broadened Etkin's initial food-medicine continuum by adding the two dimensions of use of plants as condiments and as poisons. He gave the example of Epazote (Chenopodium ambrosoides) as being a good example of the chemical continuum from poison to medicine to food in Central America. Although not intent on focusing on this concept, Golob (1999) also refers indirectly to the existence of a continuum between medicinal plants, spices and plants used for pest management purposes in grain stores (mainly weevil repellents).

7.2 - Some definitions

Although the concept of "continuum of plant use" began to be used in ethnobiology in the nineties, it was never rigorously defined. Intuitively, the term "continuum" carries a meaning of "relatedness" between two different entities. Strictly speaking, continuum stands for:

> "Something that changes in character gradually or in very slight stages without any clear dividing points". (Cambridge Online Dictionary)

> "A continuous sequence in which adjacent elements are not perceptibly different from each other but the extremes are quite distinct". (Online Compact Oxford English dictionary)

It is therefore possible to adjust this definition to fit the plant use dimension. I propose the following complementary statements to define the concept of continuum of plant use:

1. There is a continuum of plant use between condition A and condition B if plant remedies used for condition A are more likely to be used also for condition B than plant remedies that are not used for condition A (and vice versa).

2. There is a continuum of plant use between condition A and condition B when plant remedies are indiscriminately used for condition A and condition B and when only context allows one to make a distinction between both types of use.

3. There is a continuum of plant use when a significant number of plants share similar characteristics of multipurpose plant use, in terms of plant part, of mode of application and eventually of adjuvant.

Concerning Etkin's pioneering work on the wild food – gastrointestinal disorders continuum, it is only context that allows one to distinguish between the use of a plant as a nutritious medicine or a medicinal food (or nutraceutical). According to these definitions, the wild food-domesticated food continuum for Andean tubers presented by Johns (1990) is not a continuum of plant use. Strictly speaking, what he describes is a continuum of plant domestication.

Exploring continua of plant use therefore amounts to prospecting for coherent and patterned overlaps between various types or categories of plant use. In this respect, the overlap observed by Etkin could be described as a "gross" overlap since it only concerns plant species in general and does not take into account similarities and discontinuities in the plant parts used for the preparation of the remedies. A closer examination (see Etkin and Ross 1982: 1562) of the plants forming the continuum shows that in some cases plants have been included as having dual use when the leaves were used as wild food and when the root was used to treat a specific gastro-intestinal disorder. Arguably, an overlap between two categories of plant use involving the same remedy and the use of the same plant part carries more weight than an overlap built solely on the similarity of the plant used.

In Etkin's case, there is also the issue of the source of her information. Information on wild food was clearly considered as common and public knowledge. In contrast, a fraction of the ethnobotanical knowledge on gastrointestinal remedies was specifically held by the traditional healers only, outside of the reach or knowledge of laymen farmers. This simple fact does not raise doubts about the validity of the continuum. Rather it raises a number of questions regarding its origins and gradual build up.

7.3 - Searching for continua of plant use

To try and identify continua of plant use involving plants used in pest management in Wag, data pertaining to other categories of plant use on both animals and human beings were included in the design of the quantitative survey. Their choice was based on preliminary data collected during the semi-structured interviews with elderly informants in the five communities that hinted at the possible existence of continua of plant use between pest management and these other categories of plant use. They include:

Skin rashes/scales: (*č'ïrt* or *agwagot*) This skin condition is common among young children in Wag and farmers resort to various household remedies to treat it. The use of specific plant remedies appears to be more widespread than the use of non botanic remedies.

Ringworm: (*kwakuša*): Same comments as for *agwagot* except that this skin disease attacks only the scalps of children.

Wounds: When farmers injure themselves by accident and consider that the injury is not the result of a *däbtära* spell or of the intervention of an devilish spirit or of a *zar* spirit, they will resort to a number of household botanical remedies to treat the wounds.

Burns: Traditionally, burn wounds are often perceived as being caused by devils (association with fire and hell). In such cases, simple household remedies will not be effective and the afflicted person must quickly consult a *däbtära* or a priest.

Donkey pack wound: The donkey is the pack animal *par excellence* in the northern highlands of Ethiopia. Wealthy farmers usually own mules but they are nowadays much scarcer than in the past. In the Ethiopian Christian Orthodox view, and according to the Mosaic law, the donkey is a notoriously "unclean" animal. It chews the cud but has clear hoofs. This partly explains why many farmers do not bother to look after their animals properly. In some cases, they exhaust them or overburden them with loads. This often results in severe "pack" wounds where the back of the donkey is abraded raw. Some farmers will then simply let their animals roam around idle until their wounds heal. Others, more attentive to the health of their animals, will immediately apply specific botanic remedies. It is interesting to note that lowland farmers and Agaw farmers in general are much more respectful of their animals than their midland and highland neighbours. Pack wounds are very rare in the lowland areas.

Warts (*k'intarot*): The most common form of wart is commonly treated with botanical household remedies in Wag. A second type (called locally the "donkey wart") requires the specialised intervention of the *däbtära*.

Hide shaving: After slaughtering sheep, goats or livestock, farmers apply a specific plant treatment to the hide in order to remove the hair.

Herbal soap for clothes: As mentioned in previous chapters, most farmers use plant extracts to wash their clothes.

Bee repellents and/or stimulants: To harvest their hives farmers burn specific substances to smoke out the bees. Such smokes act as repellents when administered in mild doses. In large doses, certain smokes can utterly repel bees to the extent that they definitively desert the hive. Other types of smoke, when administered in mild doses, have a combined repellent and stimulant effect on bees and are used at specific times of the year to increase the nectar/pollen harvesting activities of the bees.

Extreme bee repellents: Certain plants, when burned, produce a smoke that is intolerable to bees. Such plants are often used by farmers to harvest wild honey. If they are used in the vicinity of a domestic hive, the bees definitively desert the hive.

The various botanical remedies for pest management as well as other forms of treatments and remedies reported during the qualitative and quantitative survey were sorted and re-arranged into three broad categories:

1- Plant remedies that involved the burning of a plant part to produce smoke

2- Plant remedies that involved the laying on the ground of a plant part

3- Plant remedies that involved either the rubbing, pasting or washing of a surface with a plant part or extract

All the plant remedies and treatments were regrouped and compiled for each pest and for each type of non-pest condition. A simple comparison was then performed on all the possible combinations of plant use between all the different pests (testing for the existence of pest to pest continua) and between all the pest and the non-pest conditions (testing for the existence of pest to non pest continua). In contrast with the search for "gross" continua (common plants), the comparison focused on the precise plant remedies used and a match was declared on two remedies when the plant part (leaves, wood, flower, sap, roots, bark, bulb) and the adjuvant (water, ghee, cattle urine or honey) used matched perfectly. For instance, a plant x leaf + water remedy was considered distinct from the same plant x leaf + urine remedy.

In theory, levels of overlap between two categories of use, A and B, are measured in percentages. The percentage of overlap for use A is therefore equal to the number of shared remedies divided by the total number of remedies used for A (and similarly for use B). A continuum of plant use can thus be described from both poles of the continuum. In Etkin and Ross's example, 53 of the 107 plants used to treat gastrointestinal disorders happen to be consumed as wild food in different circumstances. From this we calculate a nearly 50 % overlap for the gastro-intestinal remedy pole. Unfortunately, the corresponding percentage cannot be calculated for the wild food pole since Etkin and Ross do not mention the total number of wild foods that she has identified.

However, this unique percentage figure is sufficient to provide an approximate but intuitive estimation of the strength of the continuum between wild food and gastro-intestinal disorders. While there is no absolute reference against which to compare this magnitude of overlap, we can reasonably consider that beyond 50%, an overlap becomes very significant and is a sure indicator of a strong continuum of plant use. Arbitrarily, I have set the 70 % overlap level as a bench mark for very strong continua and the 50 % - 70 % window of overlap as an indicator of strong continua. Any combined overlap (both percentage figures for each pole of the tested continuum) that fails to reach the 50 % benchmark can be said to be the sign of a weak or non-existent continuum (the lower the percentage the weaker the continuum).

The other factor to take into account when measuring the strength of a continuum is the total number of remedies for each category of plant use. A 50 % overlap for a category of plant use that only totals two remedies carries much less weight than the 50 % overlap in Etkin's sample where plants used for gastrointestinal disorders total more than a 100 distinct species.

7.4 - Results of the tests

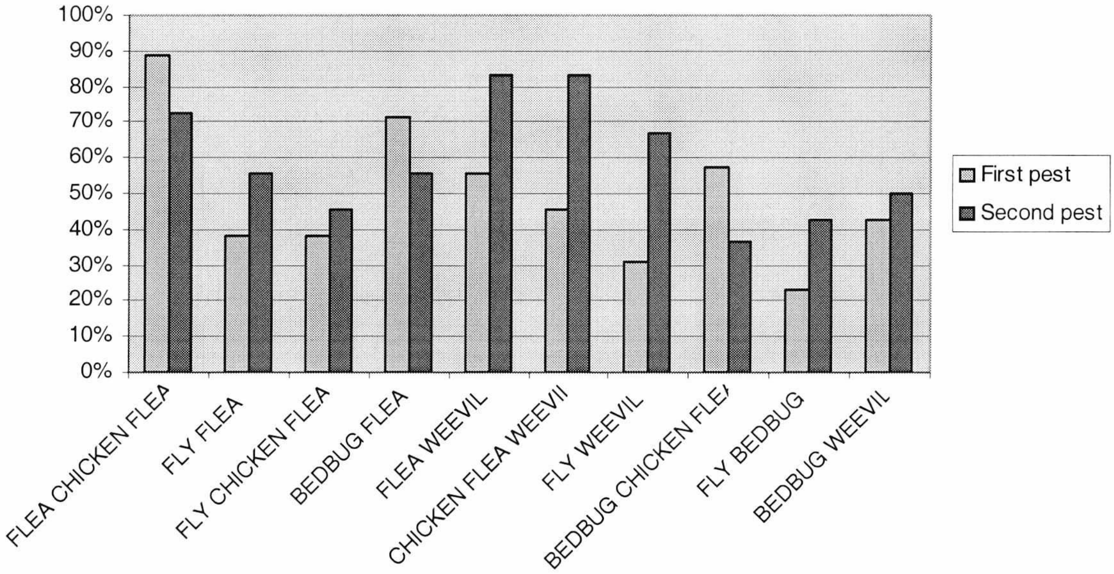
7.4.1 - Smoke remedies

The overlap percentages for all the possible combinations of plant use in the form of smoke are presented in Annex 7.1.

7.4.1.1 - Pest to pest continua

Four very strong and four strong continua emerge clearly from the data (see Annex 7.1 and Figure 7.1). They all involve pests commonly found in the household: flies, fleas, bedbugs, chicken fleas and weevils. The continuum of plant use between human fleas and chicken fleas is extremely strong with overlap figures of 89 % and 73 % respectively, involving up to 11 distinct plant remedies. Another striking finding is that, of the six possible permutations between fleas, chicken fleas, bedbugs and weevils, four are very strong continua and the remaining two are strong continua, suggesting that plant remedies for any of the four pests are highly interchangeable.

FIGURE 7.1: PEST-PEST CONTINUA
SMOKE MEDIUM



There are several, not necessarily mutually exclusive but rather complementary, ways in which to interpret these findings.

To explain coherently this significant convergence of plant use against pests inside the household, it is first logical to assume that people who have used particular plant smoke remedies inside the household against a specific pest can decide out of sheer curiosity to try the same smoke remedy against another household pest, only to find that the remedy is also effective. This behaviour could be described as "pro-active" innovation, or innovation by trial.

A second realistic interpretation is that people observe the secondary effects of a specific remedy on the other pests inside the household. For example, it is not unrealistic to imagine a farmer that fumigates his house against chicken fleas and observes a few days later that the human flea and bedbug populations inside his household have also decreased. This in turn encourages him at a later stage to test the same plant smoke on bedbugs or fleas, only to find it effective against these pests. This type of behaviour could be described as "passive" innovation, or innovation by observation of secondary effects.

Finally, Wag farmers, particularly men, exhibit a significant degree of 'looseness' in the naming and identification of small parasitic insects. This may partially reflect a cognitive chaining process whereby informants interchange names of insects due to perceived similarities in behaviour and/or morphology and in some cases ecology (preferred habitat, host, etc). Other factors related to cultural perceptions of altitude, manliness and gender responsibilities or to the Ethiopian expression of the concept of "flou artistique" may explain to a large extent the high degree of interchangeability in pest names observed between fleas and chicken fleas and between bedbugs and fleas (see Chapter 4 for more details). We can therefore hypothesise that people who use pest names interchangeably are also likely to do the same with plant remedies for the same pests. This ethnoentomological looseness factor would then explain some of the observed continua. The mention of two smoke remedies against ground maggots (see Annex 7.1), also used to treat bedbugs and fleas, could be another illustration of this looseness factor as, in the ethnoentomological identification/naming process, farmers in Wag often interchange this pest with fleas and bedbugs.

The specific smoking technique used by farmers to fumigate certain plants (*märänz*, *tinjut* in particular) sheds more light on the existence of these continua and tends to support the passive innovation argument. For instance, when farmers decide that flea infestation has become unbearable in the household, they harvest large quantities of the required plant fumigants and organise the fumigation in such a way that the plants are left to fumigate without burning for several hours inside the household. The technique requires close monitoring to prevent the smouldering plant bunches from catching fire and burning the entire house. Understandably, this type of fumigation will have an impact on fleas, chicken fleas, bedbugs, flies and even weevils if some of the grain stores are located inside the household.

Other smoking techniques that require the burning of limited quantities of wood for a very short period of time tend to support more the pro-active innovation argument.

From an etic and ethnopharmacological perspective, it is difficult to go beyond stating the obvious. Very strong and strong continua of plant use between pests appear not only through human intervention but also because the concerned pests share similar characteristics and patterns of sensitivity (weakness or resistance) to molecules and active principles contained in the plant smokes.

7.4.1.2 - Pest to non-pest continua

All the overlap figures on all the possible combinations are presented in Annex 7.1. The range of non-pest treatments was widened to include the following categories of plant use:

Plant smokes used during coffee ceremonies: The traditional Ethiopian coffee ceremony is performed every day in most households throughout most of the country. In Wag, during working days, the ceremony is short and more likely to involve just household members, whereas during holy days, the ceremonies are performed with less haste and are good opportunities for socialising with near-by neighbours and friends. During the ceremony, fragrant dried plants are fumigated on embers. While the pleasant smell contributes to relaxing the mood of the people gathered, it also helps to seal the intimacy of the household where the ceremony is taking place. See Goettsch (1991) for a brief description of similar uses of aromatic plants in other regions of Ethiopia.

Pot smokes: Clay pots used to prepare beer or to collect milk are regularly fumigated with specific plants. The fumigation is intended to disinfect and purify the product (particularly milk) and to add flavour to it. In the case of beer preparation, the treatment can increase the potency and intoxication power of the beverage.

Zar smokes: Coffee ceremonies are an integral part of *zar* ceremonies. On these occasions, the master of ceremonies chooses fumigants that are pleasant to the *zar* spirit whose visit and help are solicited. In addition, the people who are to be possessed by this *zar* spirit are made to inhale the fumigation at very close range. The inhalation process helps to trigger the possession dance.

The other smoke treatments (*šäläme*[34], *alämoč'*[35], etc) are of a spiritual nature. Such household remedies are only meant to complement other more sophisticated forms of treatment provided by priests or *däbtära*s.

[34] household fumigation treatment for patients suffering from wasting diseases inflicted by spirits. Plants fumigated are often aromatic.

[35] wasting disease caused by spirits, possibly *zars*.

Three very strong and six strong continua of plant smoke emerge from the calculations (see Annex 7.1 and Figures 7.2 to 7.6).

Bee-repellence forms continua with four distinctive pests: flies, fleas, chicken fleas and weevils. Since honey harvesting and the use of bee repellent smokes takes place outside of the household, it is tempting to believe that these continua are the result of pro-active rather than passive forces of innovation. However, the person who performs the smoking out of the bees is so immersed in smoke that it is also possible that the smoke can have a visible impact on flies and fleas. If the smoking is carried out in the vicinity of grain stores, as it usually is, it can also have a visible and tangible secondary effect on weevil populations.

FIGURE 7.2: FLY-NON PEST CONTINUA SMOKE MEDIUM

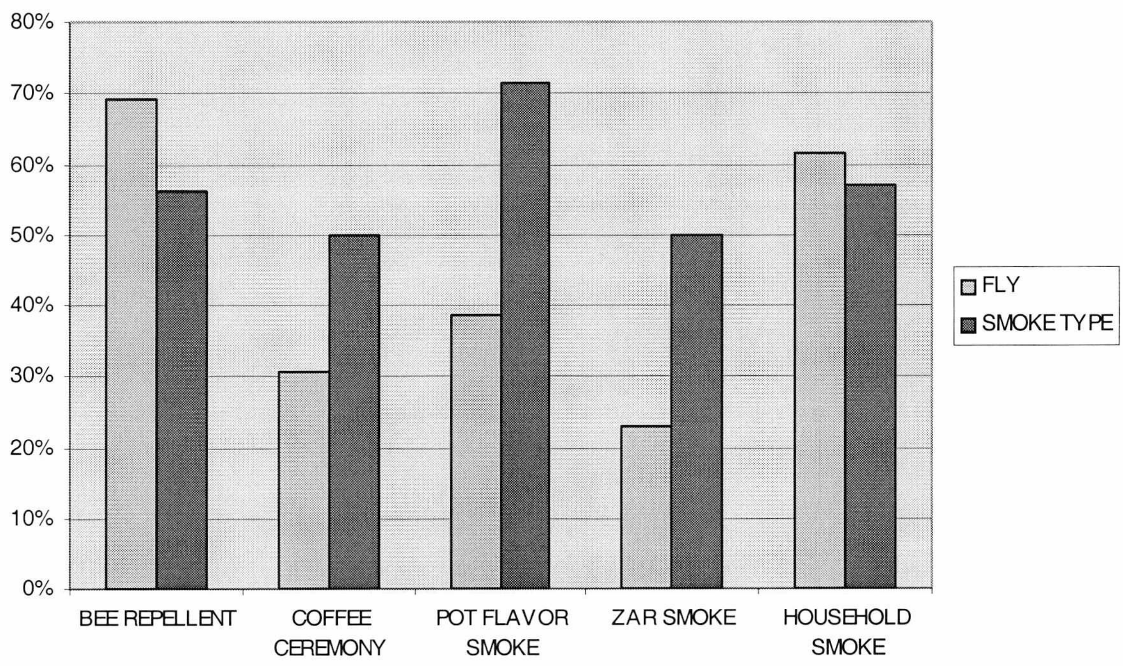


FIGURE 7.3: CHICKEN FLEA- NON PEST CONTINUA
SMOKE MEDIUM

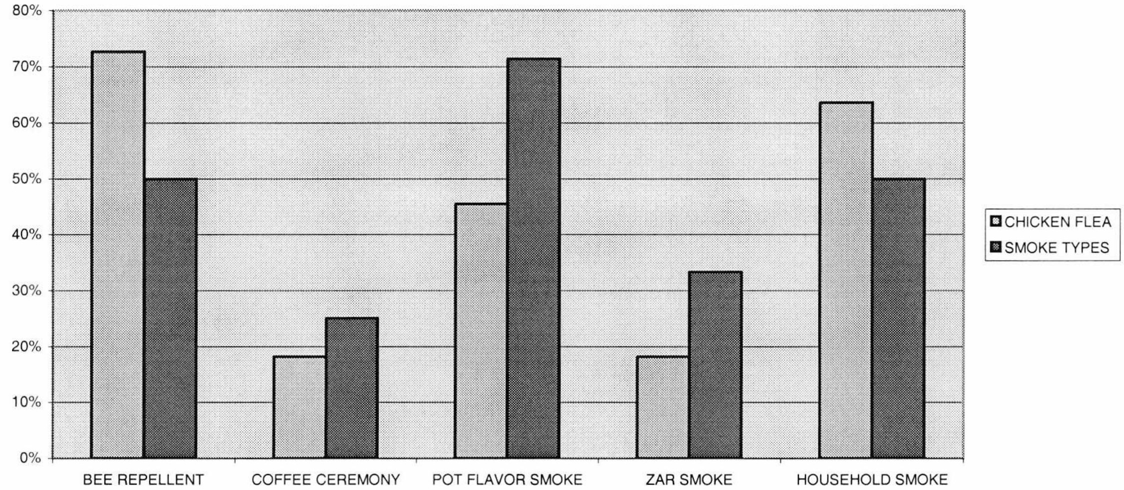


FIGURE 7.4: FLEA - NON PEST CONTINUA
SMOKE MEDIUM

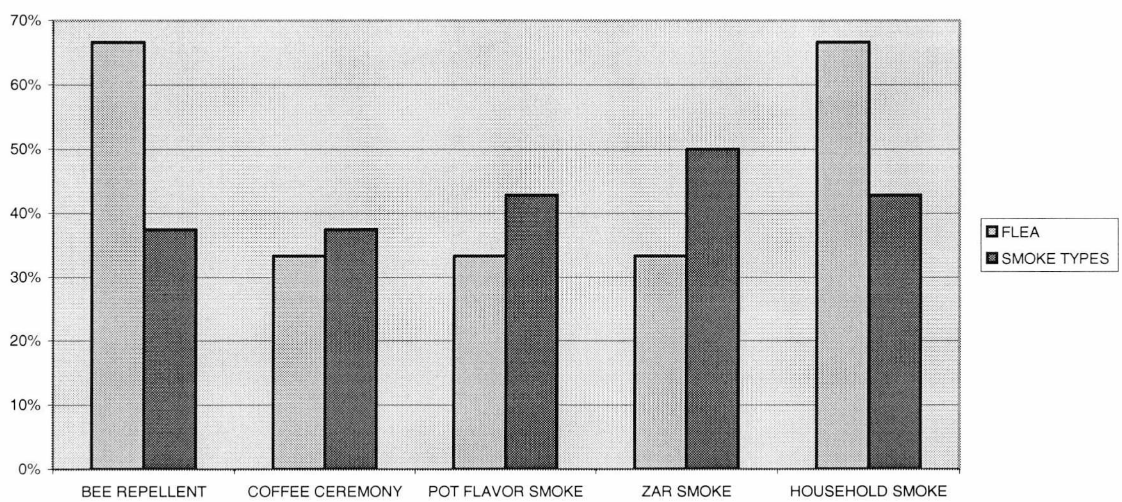


FIGURE 7.5: WEEVIL - NON PEST CONTINUA SMOKE MEDIUM

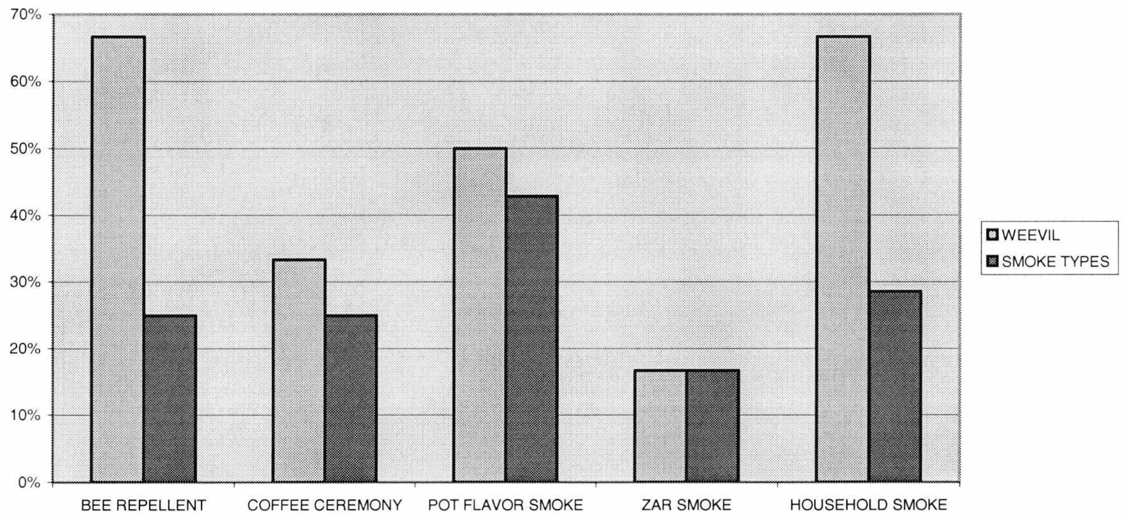
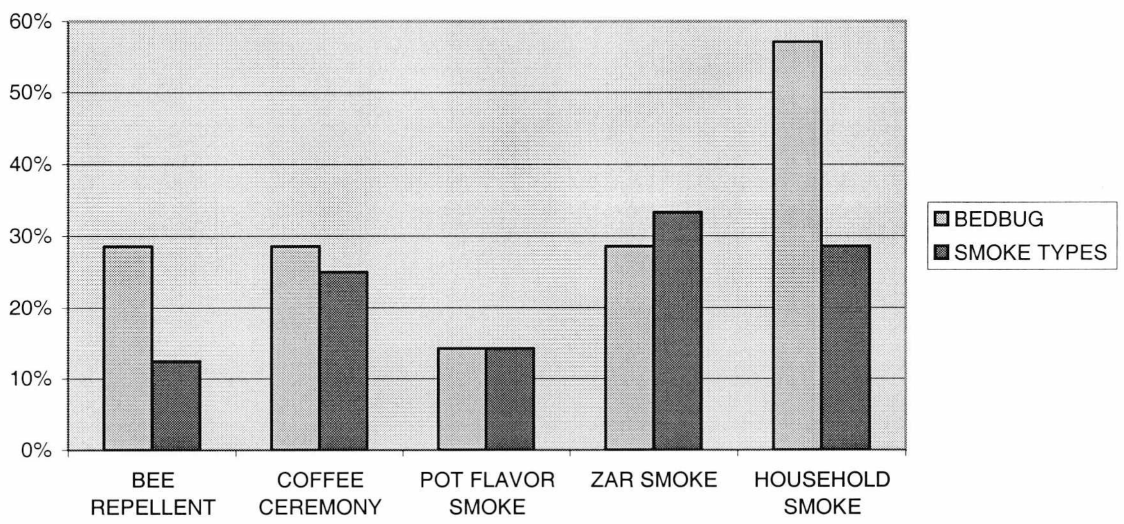


FIGURE 7.6: BEDBUG - NON PEST CONTINUA SMOKE MEDIUM



Concerning extreme bee repellents, the findings seemed at first confusing. Many plant smokes described as intolerable to bees by some farmers were used by others as simple bee repellents to harvest their domestic hives. The ambiguity was eventually cleared-up. There are two categories of extreme repellents. In the first category we find plants that have a simple repellent effect when fumigated in small doses and for short periods of time (Olea Africana var.europea or Terminalia browni for example). If the fumigation is prolonged, then bees will completely desert the hives. On the other hand, there are a number of plants whose smoke is intolerable to bees regardless of the volume and duration of the fumigation (Grewia spp. or Boscia sp. for example). These plants are the real "extreme" bee repellents. None of these plants are used as fumigants to treat any other kind of pest. There are therefore no continua of plant use between extreme bee repellents and household pests.

There is a distinctive continuum of plant use between fly repellents and coffee ceremony smokes. It seems plausible to assume that passive innovation by observation of the secondary effects of certain plant smokes is a strong factor underlying the build-up of this continuum. People simply noted that certain pleasant coffee ceremony fumigants were effective in repelling flies inside the household.

Women preparing their milk and beer pots may have made and continue to make similar observations on the potency of the secondary effects of the plant smokes used. Thus would be explained the existence of very strong continua of plant use between pot smoking and several pests (flies and chicken fleas, see Annex 7.1). Without the passive innovation factor, it is virtually impossible to explain the existence of such strong overlap figures.

There is finally some significant degree of overlap between fly and flea repellents and plants traditionally used in *zar* ceremonies. In the light of the close correspondence that exists between plants used in coffee and *zar* ceremonies, these overlaps are probably indirect reflections of the overlaps observed between plant remedies used to repel these pests and coffee ceremony fumigants.

On an aggregated basis, the continua of plant use between all the household pests and bee repellents and common household smokes (coffee celebration, *zar* ceremonies and pot smoking) are very strong (see the high percentages of 71 and 75 % in Annex 7.1). This is a very significant finding. ***Of all the various plant smokes available in Wag Hamra, the***

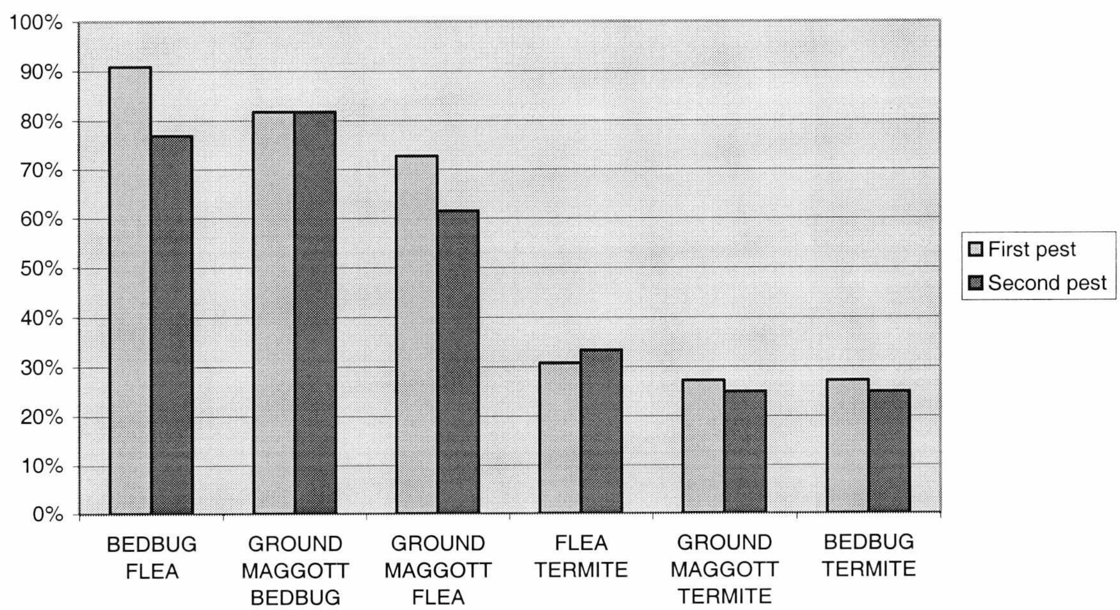
large majority that people use in their daily activities in and around the household are the same ones that people use to repel common household pests.

7.4.2 - Plants laid on the ground.

7.4.2.1 - Pest to pest continua

Three very strong continua emerge from all the possible combinations (see Annex 7.2 and Figure 7.7). They represent the three permutations of the flea-bedbug-ground maggot triad. The three factors put forward for the plant smoke pest to pest continua are also valid in this case. In particular, the three pests are the same three household pests for which men in Wag often interchange names (see Chapter 4). It is again suggested that the ethno-entomological looseness observed in the naming process is partially imported or translated into the ethnobotany of pest management of these pests. Common remedies used for any one of the three pests are likely to be said to be used against any of the other two remaining pests since there is no clear cognitive boundary between the three pests in people's minds.

FIGURE 7.7: PEST TO PEST CONTINUA FOR FLOOR REMEDIES



7.4.2.2 - Pest to non-pest continuum

7.4.2.2.1 - The termite stick-evil eye continuum

In the five communities of Wag under study, farmers cut large branches of certain trees or the trunks of small trees, peel their bark off and place them in the middle of the fields they wish to protect from the evil eye. The same practise was observed from the highlands of Meskelo all the way down to the lowlands of Tsamla. Further investigations with farmers revealed that the white colour of the peeled trunk or branch is what attracts the destructive stare of the evil eye bearer, deflecting it from the surrounding crops. See Chapter 4 for more details on the subject.

Concurrently, it was found that at lower altitudes (approximately below 2300 m) some farmers also have a habit of planting similar peeled branches or trunks of the same tree species to attract termites, especially on certain types of soil where termites are known to abound and in fields of *teff*, deemed more susceptible to termite attacks than other crops. The termites converge on the stick, attack it and do not cause any harm to the surrounding crop. Once the stick is completely colonised, it can be removed, burned and replaced by another one. When interviewed on the subject, most farmers are adamant that there is no causal relationship between the evil eye and the colonisation of a piece of wood by field termites. They simply observe that the sticks fulfil the dual purpose of deflecting the evil eye from the crops and of attracting termites.

The overlap figures confirm the existence of an extremely strong continuum between field termites and evil eye protection on crops (80 % overlap on both sides of the continuum, see Annnex 7.2). In fact, if one excluded from the analysis the answers provided by highland farmers, the continuum would be absolute (100 % overlapping on both sides of the continuum). This correlation of the strength of the continuum with altitude is a simple reflection of the fact that *teff* cultivation and termite prevalence are inversely correlated with altitude.

7.4.2.2.2 - Possible traces of other continua

It was noted towards the end of the quantitative survey that certain "floor" plants used to trap or repel household pests (fleas and bedbugs in particular) were also used as natural mattresses or cushions. The overlap is complete on the cushion side (see Annex 7.2). However, given the few plants identified as cushions or mattresses, it is difficult to conclude that there exists a firm continuum between flea and bedbug control and natural cushions and mattresses. A more thorough investigation is required on the subject before any conclusion can be reached.

7.4.3 - Plant extracts applied directly to a surface (washing, rubbing, as a paste)

7.4.3.1 - Pest to pest continua

This mode of application of plant remedies for pest management purposes has given rise to an impressive range of continua (see Annex 7.3 for all the possible comparisons and Figure 7.8 and 7.9 for a summary of the strongest continua). A close scrutiny of the various strong and very strong continua suggests the existence of two categories of continua (marked with the symbol a and b respectively in Annex 7.3). Continua of the a type involve the use of plant remedies on the same type of host (human or animal). For instance, the jigger flea-scabies and ear tick-head lice continua involve pests and plant remedies applied on the human body. The other four continua that emerge in category a are exclusively related to pests affecting large livestock animals, namely cattle, sheep and goats. We can hypothesise that these six continua are the result of the influence of the three forces that have already been mentioned for other pest to pest continua (see above): pro-active and passive innovation and looseness in the naming process.

FIGURE 7.8: PEST TO PEST CONTINUA RUBBING / WASHING

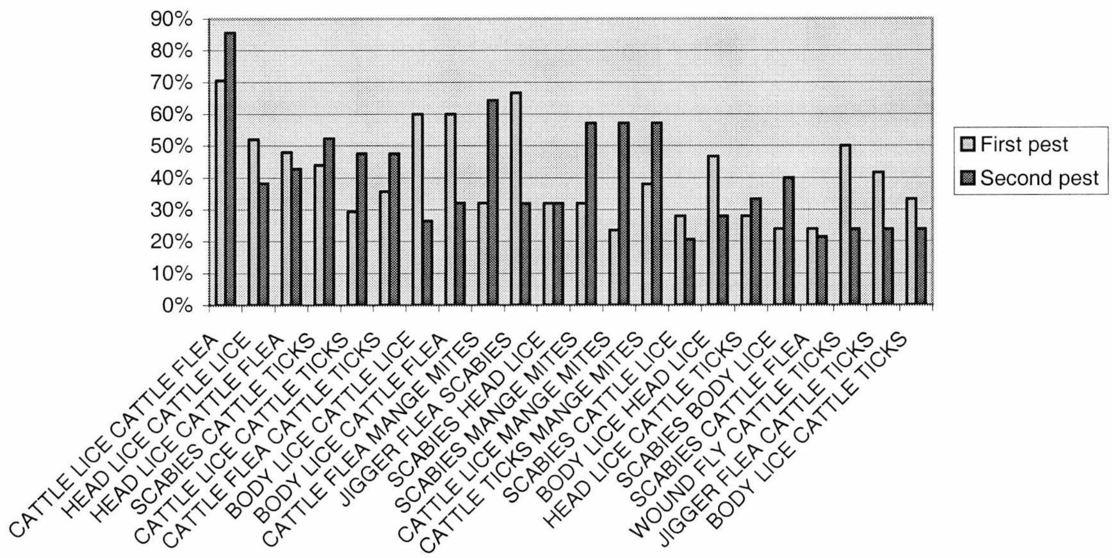
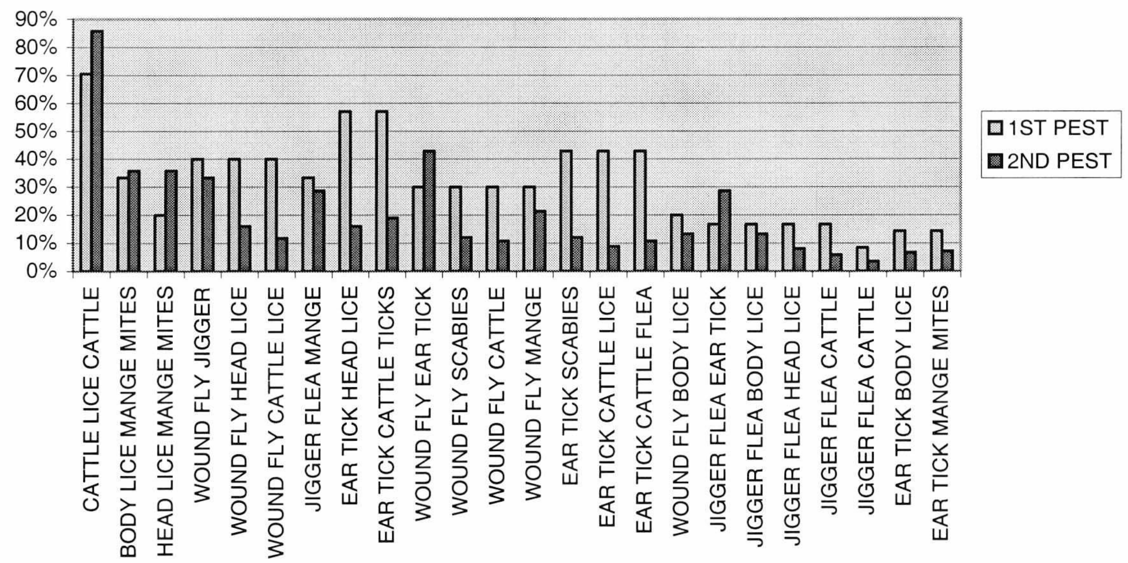


FIGURE 7.9: PEST TO PEST CONTINUA (CONTINUED)
RUBBING / WASHING MEDIUM



Given the similarity of the hosts involved, there are good reasons to believe that the passive innovation factor has played a significant role. The ear tick – head lice stands out in this respect. It makes sense to imagine that in the course of the preparation and application in and around the ear of a tick repellent plant solution a visible effect could be observed on head lice in the surrounding hair. Regarding livestock, most plant remedies consist of rubbing or washing large portions of the animal coat, providing ample opportunities for the observation of the plant extract on other pests (scabies, ticks, fleas, lice).

There are also good reasons to believe that the looseness in labelling observed on the pair livestock lice –livestock fleas (see Chapter 4) has further contributed to strengthening the continuum of plant use between both pests. Both pests are very small and have a slow but debilitating effect on young animals. In farmers' views, they are negligible but irritating pests. The looseness in naming small livestock pests mirrors a looseness in attitudes towards household pests that bother human beings.

The pest to pest continua of the b category (see Annex 7.3) are of a different kind as they link pests affecting human beings to pests that thrive on animals. This very difference in host implies that passive innovation did not contribute to the establishment of such continua of plant use. It rather suggests that active or pro-active innovation was the main factor responsible for such unlikely relations. However, a review of these various b continua emphasizes that the path to active innovation was straightforward in many cases. Often people appear to have transposed remedies from a pest affecting human beings to a similar type of pest affecting livestock (or vice versa). The ear tick – cattle tick, scabies – mange mites, head lice – livestock lice and body lice – livestock lice continua are concrete examples of such bridges in use between remedies for humans and for livestock.

The results compiled in Annex 7.3 also show that the plant remedies used to rub the inside of grain stores to repel weevils are almost never used to treat other human or livestock pests (zero overlap percentages on both sides of all the possible continua except for the livestock lice – weevil couple). It is difficult to explain this generalised absence of overlap in use.

7.4.3.2 - Pest to non-pest continua

For a visualisation of the comparative strengths of the various continua for each pest, see figures 7.10 to 7.19.

FIGURE 7.10: WOUND FLY-NON PEST CONTINUA RUBBING / WASHING MEDIUM

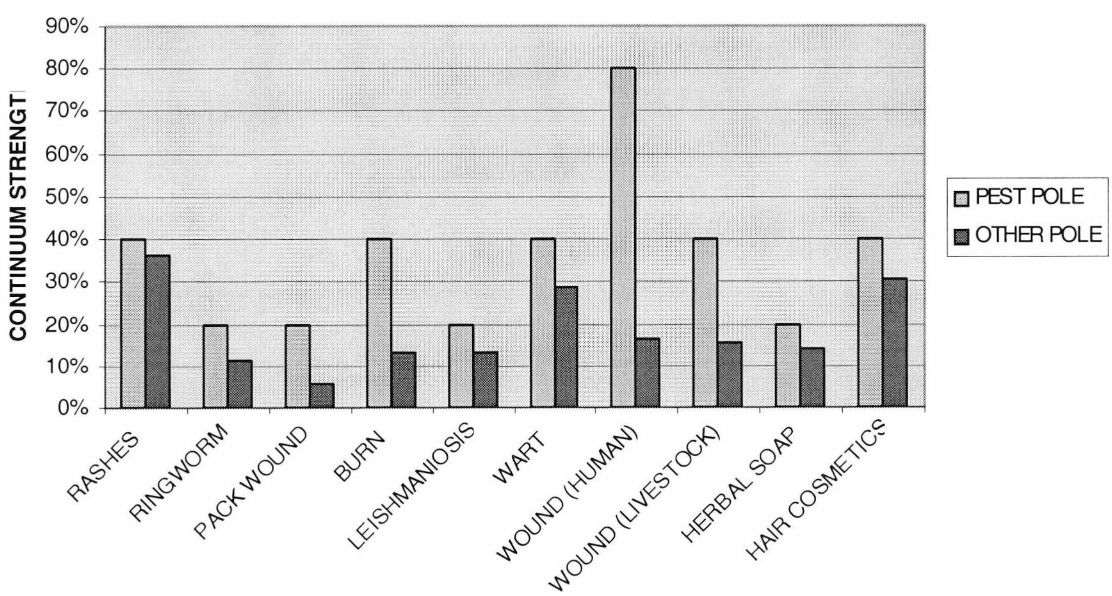


FIGURE 7.11: JIGGER FLEA-NON PEST CONTINUA RUBBING / WASHING MEDIUM

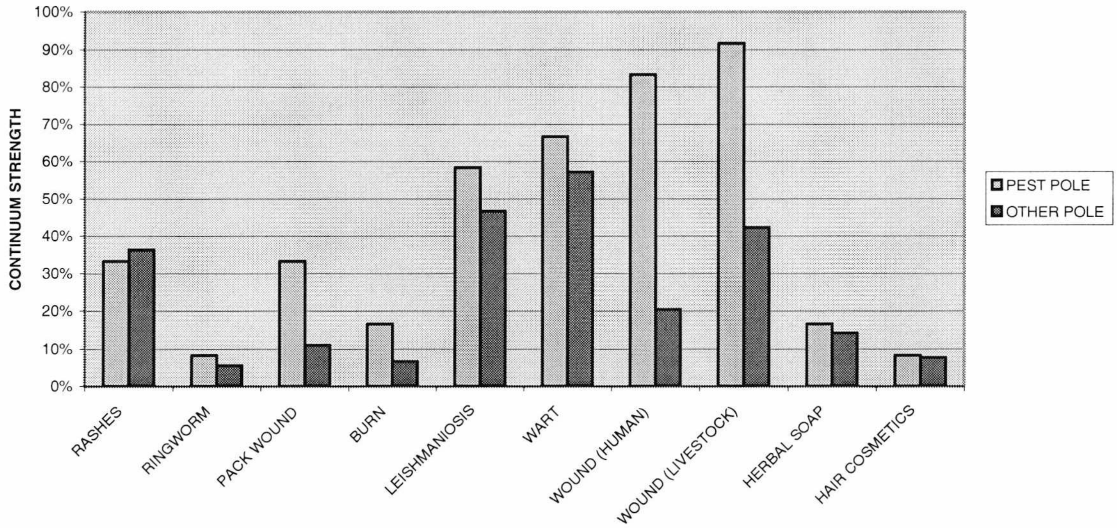


FIGURE 7.12: EAR TICK-NON PEST CONTINUA RUBBING / WASHING MEDIUM

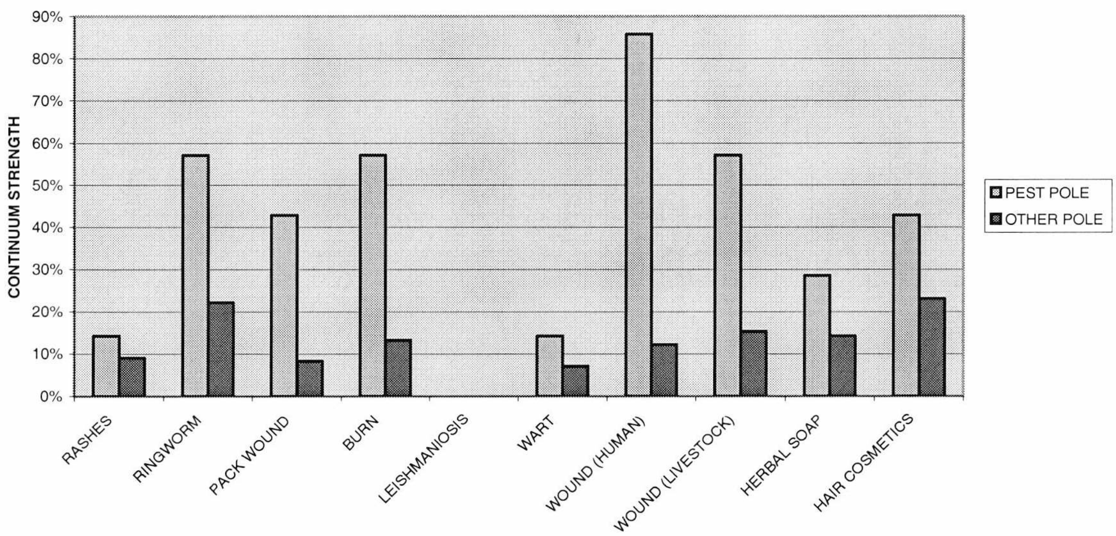


FIGURE 7.13: SCABIES-NON PEST CONTINUA
RUBBING / WASHING MEDIUM

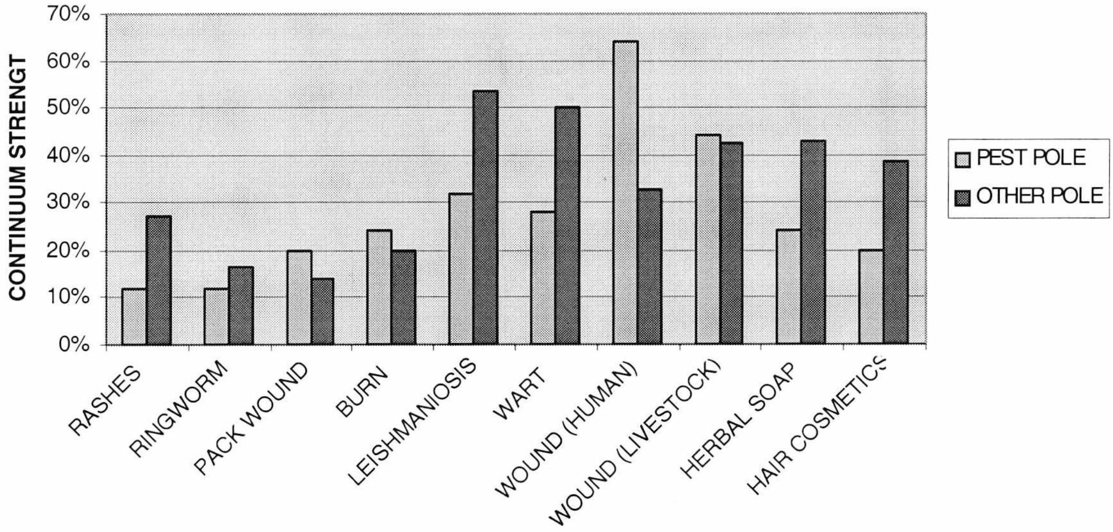


FIGURE 7.14: BODY LICE-NON PEST CONTINUA
RUBBING / WASHING MEDIUM

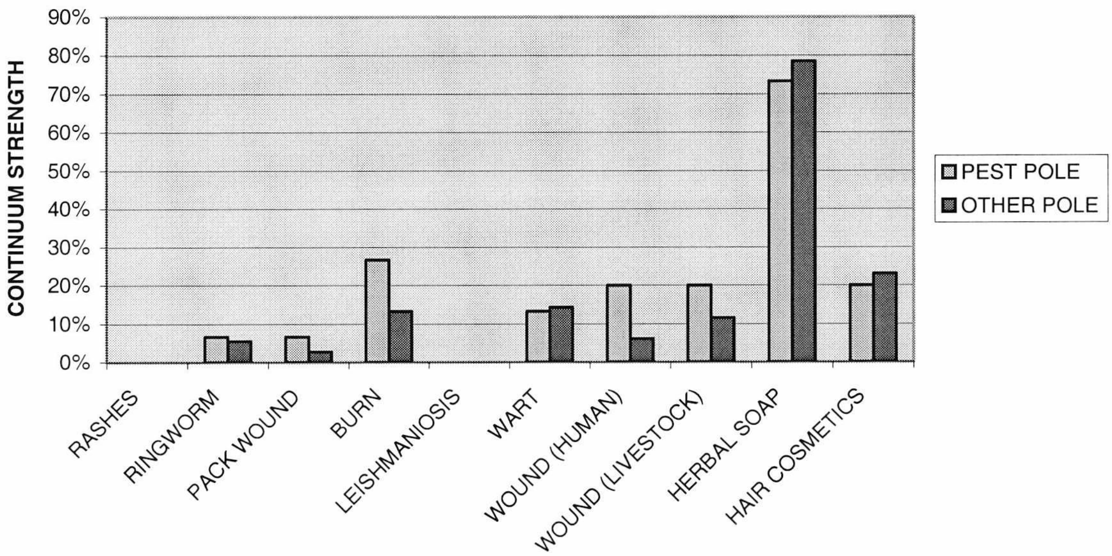


FIGURE 7.15: HEAD LICE-NON PEST CONTINUA RUBBING / WASHING MEDIUM

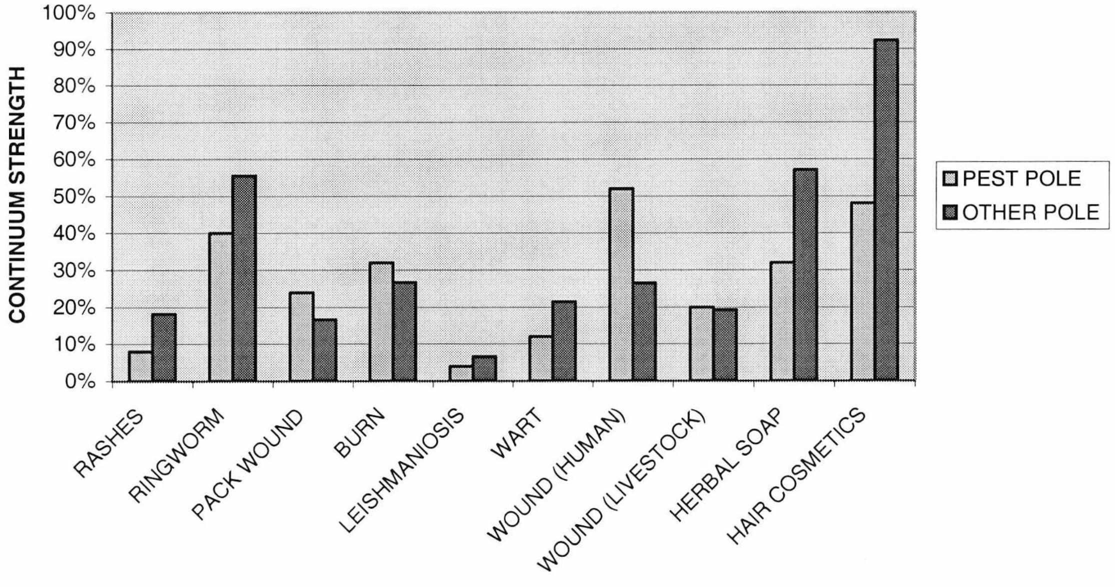
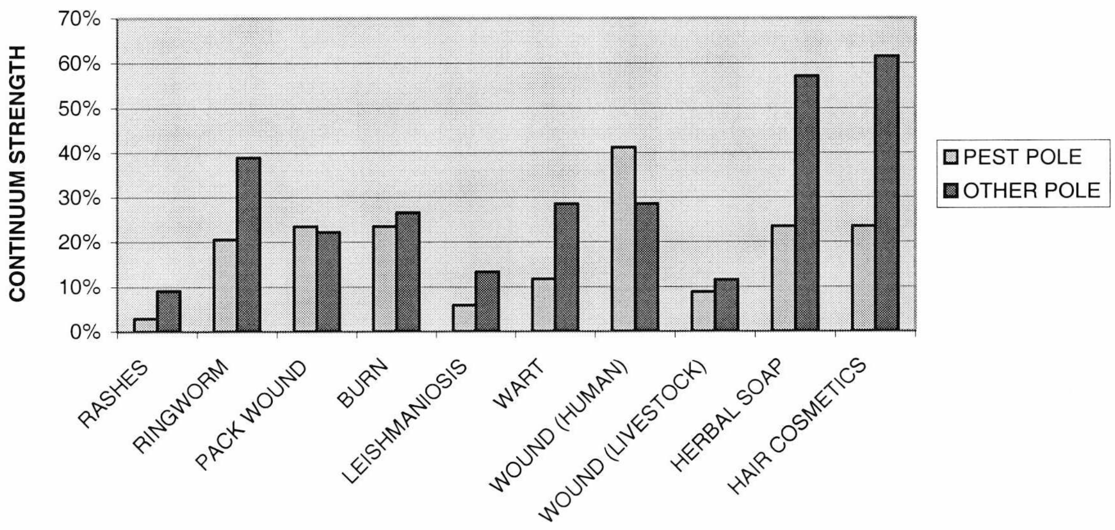


FIGURE 7.16: LIVESTOCK LICE-NON PEST CONTINUA RUBBING / WASHING MEDIUM



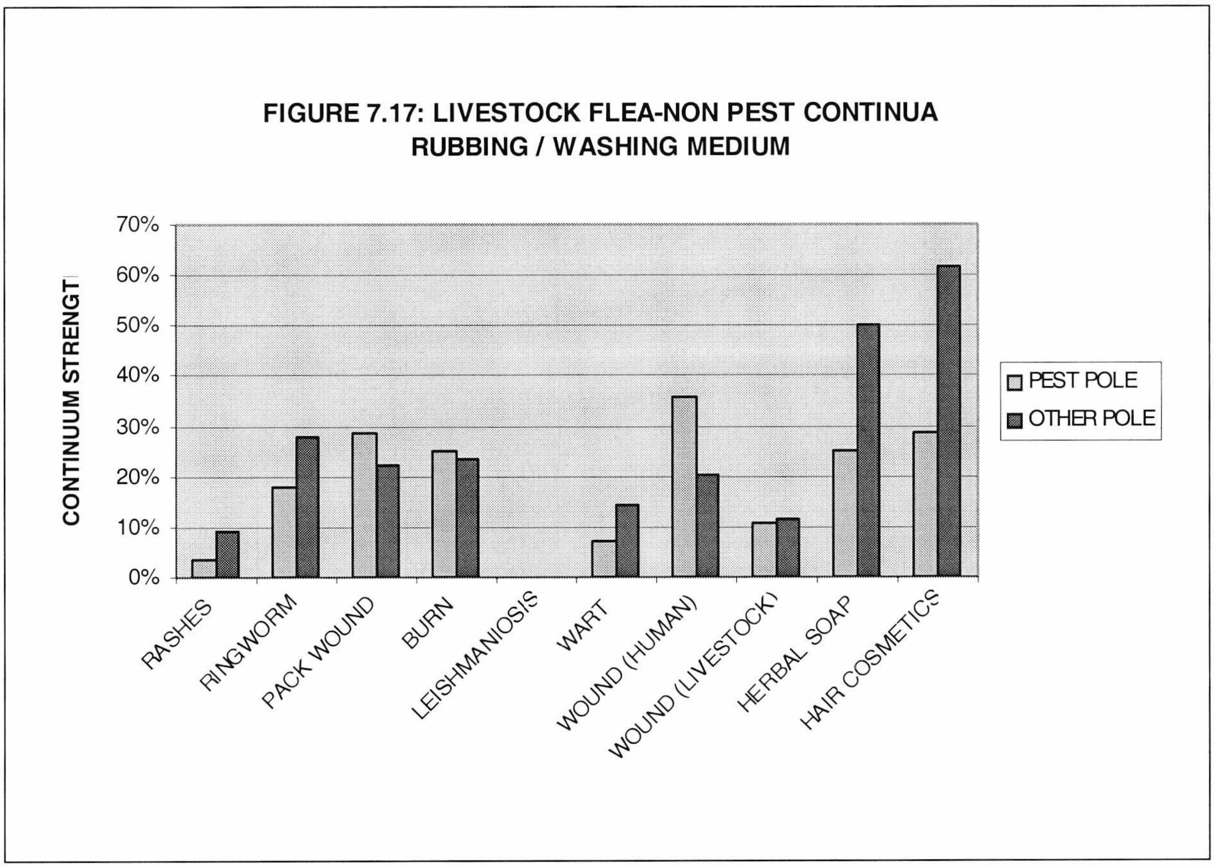


FIGURE 7.17: LIVESTOCK FLEA-NON PEST CONTINUA
RUBBING / WASHING MEDIUM
CONTINUUM STRENGT
70%
60%
50%
40%
30%
20%
10%
0%
RASHES
RINGWORM
PACK WOUND
BURN
LEISHMANIOSIS
WART
WOUND (HUMAN)
WOUND (LIVESTOCK)
HERBAL SOAP
HAIR COSMETICS
PEST POLE
OTHER POLE

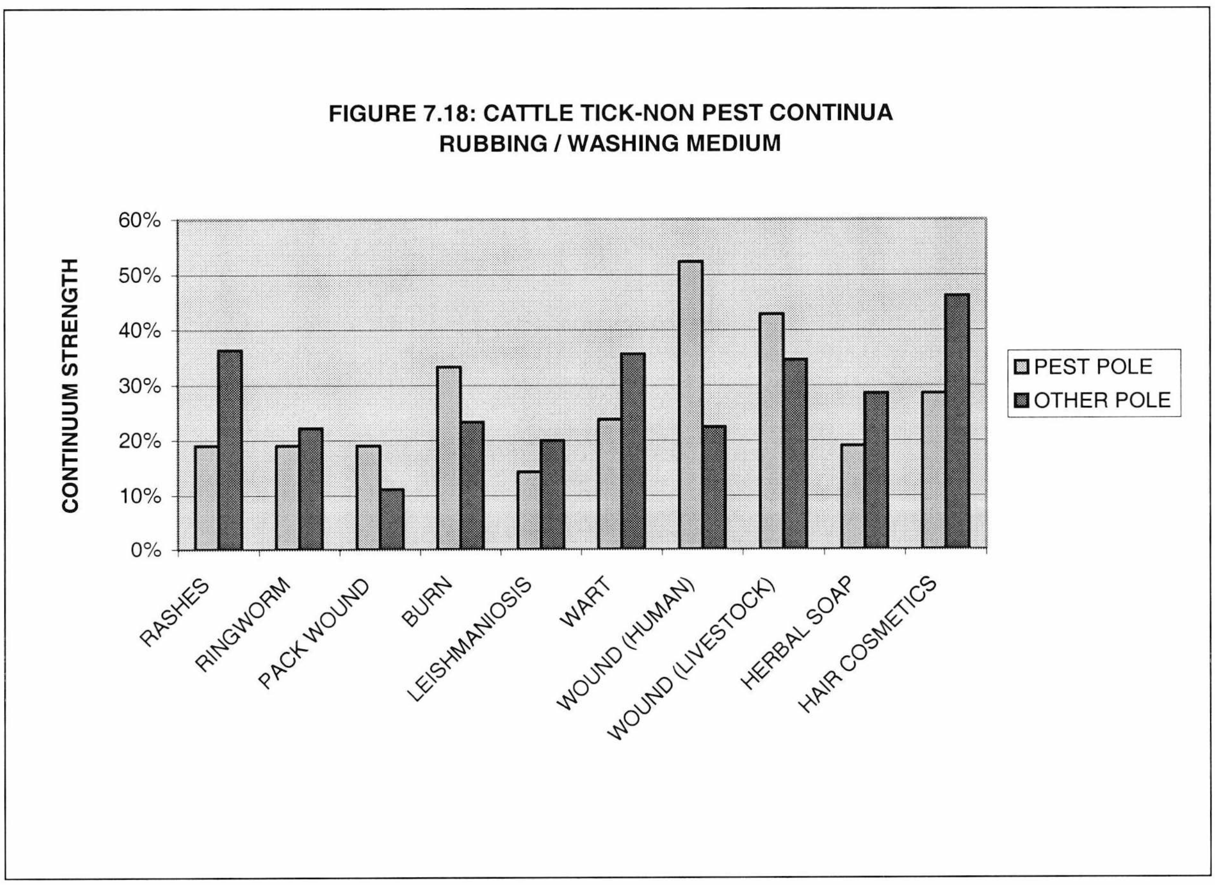
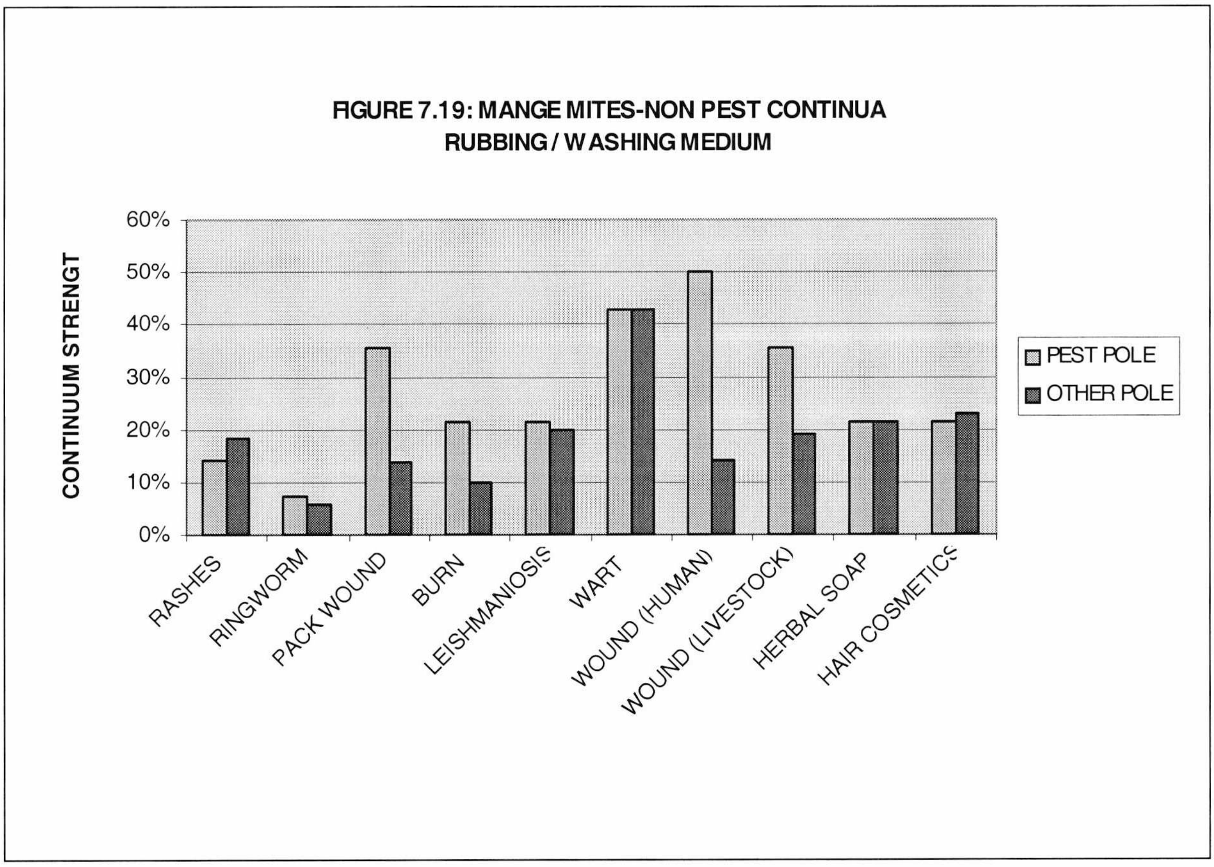


FIGURE 7.18: CATTLE TICK-NON PEST CONTINUA
RUBBING / WASHING MEDIUM
CONTINUUM STRENGTH
60%
50%
40%
30%
20%
10%
0%
RASHES
RINGWORM
PACK WOUND
BURN
LEISHMANIOSIS
WART
WOUND (HUMAN)
WOUND (LIVESTOCK)
HERBAL SOAP
HAIR COSMETICS
PEST POLE
OTHER POLE



Pest – rashes

There are no significant continua of plant use between any of the pests and rashes. This state of affairs seems to be largely due to the widespread and preferred use of hot exudates from specific tree species (Acacia spp. and Croton macrostachyus) to treat this skin condition.

Pest - ringworm

Two clear and strong continua emerge from the overlap figures for head lice – ringworm and ear tick – ringworm. Considering the similarities observed concerning the locus of application for these examples of plant use, the human scalp, it is reasonable to assume that passive innovation by observation of the secondary effects of plant remedies for one of the conditions is largely responsible for the existence of such continua.

Pest - donkey pack wound

There are no significant overlaps in plant use between any pest, even livestock pests, and remedies used to treat donkey pack wound. The highest overlap figures are obtained with livestock lice and fleas (eight remedies in common, see Annex 7.3) but in terms of percentage of overlap, they do not exceed 30 %.

Pest – human wound injuries

Very strong continua of plant use exist between jigger fleas, fly repellents on wounds and ear ticks respectively and human wounds.

The fly repellent – wound continuum is very striking as it is the strongest to date to suggest the importance of the passive innovation factor in the build up and maintenance of continua of plant use.

The very strong ear tick – wound is much more intriguing and difficult to decipher at first. To invoke active or passive forces of innovation and the observation of secondary effects makes little sense since the treatment of wounds appears to be very remote from the removal of ear ticks. Neither is there any ethnoentomological belief or looseness in naming to explain this degree of relatedness in the remedies. To understand the overlap, then, it is necessary to bear in mind that the treatment of ticks by farmers in Wag obeys two distinct imperatives: the removal of the tick, and the healing of the tick bite, that is known in many cases to suppurate if left untreated. As mentioned in Chapter 5, farmers have learned to use plant remedies against ticks that first cause the ticks to fall and die and second that ensure the healing of the tick wound. Thus is coherently explained the convergence of plant use between ear ticks and wounds. The inside of the ear cavity is not a place where wounds can be left untreated. The same precautionary principle explains the strong cattle tick – wound continuum (sensitivity of the udder to infections).

The jigger flea – wound continuum is somewhat more predictable. As mentioned in Chapter 5, jigger flea remedies are not meant to kill or repel the pest but to sterilise the wounds by eliminating any residue that the pest may have left inside the cavity that it burrowed. Jigger flea remedies are simply wound remedies of a certain type and it is logical that they should overlap with remedies used for the treatment of simple wounds.

Other strong continua include the scabies – wound, mange – mites – wound and the head lice – wound pairs. The first continuum is interesting as it confirms the emic perception that farmers in Wag have of scabies. Since they commonly categorise this skin condition as a wound (more precisely as a wound that spreads), it is not entirely surprising to see that they use mainly wound remedies to treat it. This is yet another case where a continuum of plant use involving a certain pest is in fact the transposition of ethnoentomological beliefs and classification.

Pest – cutaneous leishmaniosis

Cutaneous leishmaniosis forms a strong continuum of plant use with scabies and fly repellents on wounds. The comments made for the scabies – wound and fly repellent - wound continua apply here as well. The impact of passive innovation seems prevalent for the latter while the former is another expression of the emic perception of scabies in Wag Hamra outlined in the previous parafigure.

Pest – warts

There are only two notable continua involving warts: scabies – wart and jigger flea – wart. The two innovation factors (passive and active) appear to be at play in both cases.

Pest – natural soap continuum

The body lice – natural soap continuum is among the strongest that emerged during the whole research period (Annex 7.3). This is also one of the clearest examples where a specific plant treatment has visible and tangible secondary effects. Most natural soaps used in Wag, when applied to clothes, have a strong repellent/insecticidal effect on body lice.

Active innovation is the most likely factor responsible for the strong head lice – natural soap, livestock lice – natural soap and livestock flea – natural soap continua. During the course of history, farmers may have tested their insecticidal soaps on the coat of their animals and found them to be effective.

It is the same observation of the secondary effects of the application of natural hair shampoos on head lice that is responsible for the existence of the very strong head lice – natural shampoo continuum (see Annex 7.3 and Figure 7.15). Again, active experimentation is the only plausible explanation for the existence of very strong cross species continua (livestock lice – natural shampoo, livestock flea – natural shampoo).

7.5 - Summary of key trends

7.5.1 - Pest to pest continua

All the strong to very strong pest-pest continua that appear in the data (annexes 7.1, 7.2 and 7.3) can be divided into two broad types:

1-Continua of plant use between pests infesting the same host in the same area:

2-Continua of plant use between related pests infesting different hosts

Implicitly, the existence of both types of continua reflects the difference between passive and active innovation processes outlined above.

The strongest continua are found in the first type and also correspond to pests for which a high degree of inter-changeability and looseness in the naming process was observed qualitatively during semi-structured interviews with knowledgeable informants, namely: flea-chicken flea, bedbug-flea, ground maggot-bedbug, ground maggot-flea and cattle lice-cattle flea (see Chapter 4 and Annexes 7.1, 7.2 and 7.3 for a comparison between the observed interchangeability in the naming process and the very strong pest to pest continua). What this finding therefore suggests is a transposition of an ethnoentomological phenomenon into the area of plant knowledge.

Regarding the second type, the existence of strong continua of plant use for similar pests affecting both human beings and livestock (ear tick-cattle tick, body lice-cattle lice and scabies-mange mites, see Annexes 7.1, 7.2 and 7.3) appears to be yet another confirmation, in the specific field of pest management, of the strong links and bridges that exist between traditional ethnoveterinary and traditional human medicine.

The existence of such bridges and overlap between remedies for gastro-intestinal and magico-religious diseases has already been noted for other parts of the highlands of Ethiopia (Yuan-Chang 1978, Mesfin and Obsa 1994, Wirtu *et al* 1999).

As mentioned previously, the extent of the overlap is largely dependent on the availability of the plant remedies both in terms of quantity and seasonality. The higher volumes of plant parts/extracts required to treat animals hinder the extent of the overlap between remedies used for animal and human pests.

7.5.2 - Pest to non-pest continua

Within the smoke medium, the strongest and most consistent continua are formed between the various pest and bee repellents and pot smokes (see Annex 7.1).

Regarding the washing medium, two distinct patterns emerge. First, for many pests, strong to very strong continua of plant use have been established with one or more skin conditions, all regrouped under the generic "skin problem" (see Annex 7.3 for details and Figure 7.20). The wound fly-skin problem, jigger flea-skin problem, ear tick-skin problem and scabies-skin problem continua are particularly significant in this respect.

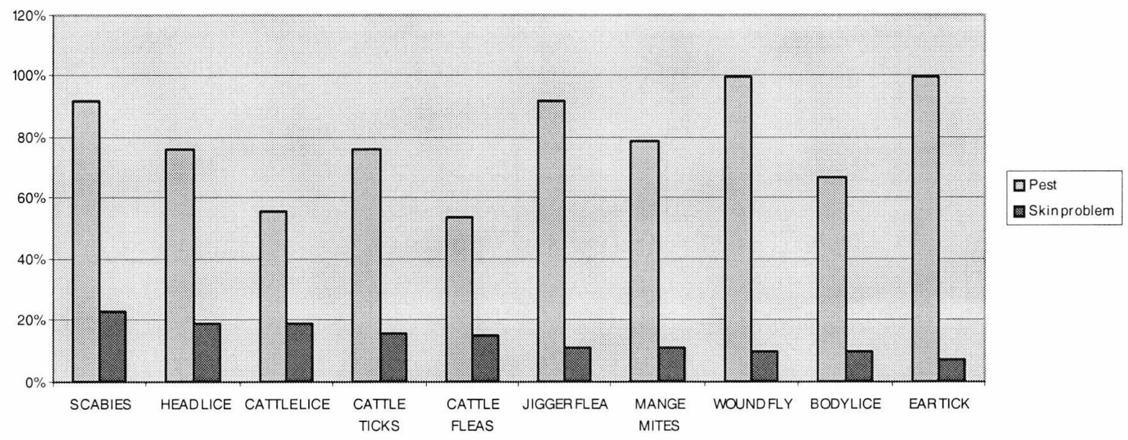
For another group of pests, we observe a combined strong degree of relatedness with wound remedies and a very strong degree of overlap with herbal soap and cosmetics (see summary of continua for body lice, head lice, cattle lice and fleas in Figures 7.14, 7.15, 7.16 and 7.17).

7.6 - Additional comments

7.6.1 - Direction and oscillations in a continuum of plant use

The fact that a continuum of plant use is characterised by two measures of overlap taken from both poles of the continuum can give the false impression that the continuum is biased towards one pole. The impression is false because the relative importance of both overlap figures is dependent on the number of remedies. Hence, the aggregated skin problem-pest continuum figures contained in Figure 7.20 give the impression that the continuum is grossly oriented towards the pest pole.

FIGURE 7.20: PEST-SKIN PROBLEM CONTINUA RUBBING / WASHING MEDIUM



In reality, the situation is different. For example, for the wound fly-skin problem continuum, the overlap measured reaches 10 plant remedies. The wound fly category totalled the same 10 plant remedies (hence the 100% overlap) while the wound category totalled 86 plants remedies, hence the apparently very weak overlap on this side of the continuum.

This type of apparent distortion or inbalance lying at the heart of several continua can be misleading as it intuitively leads us to believe that overlap in plant use has developed in one direction only, from one specific pole of the continuum to the other.

In reality, we have no evidence to assert that a continuum was created in a particular order. The very definition of a continuum, i.e. the impossibility of accurately distinguishing between the influence of its poles, contradicts this assumption. In Wag Hamra, as anywhere else, the birth of a continuum of plant use in a given culture is lost in history. Once a continuum of plant use is established - life context, the relative prevalence of pests/skin conditions, the availability of plants and the competition with other remedies, etc - are all potential factors that can influence oscillations between its poles. In optimal circumstances (stability in plant availability, pest incidence, etc), a continuum of plant use has therefore the potential to recreate itself perpetually.

As attractive as the concept may be, it is impossible at this stage to claim the equivalent of a genealogy of ethnobotanical knowledge based on the current and apparent imbalances of certain continua of plant use. The continua simply allow us to make guesses about the branches of the knowledge tree of the people of Wag Hamra (Figure 7.21). Such branches of related knowledge, created over long periods of time, are nothing less than the result of long-term, dynamic and changing knowledge processes.

7.6.2 - Continua of plant use and knowledge increase: the case of patterned innovation

The formation, build up and simple existence of the various continua outlined above suggests that ethnobotanical innovation must have been less than random at some point. We can safely assume that after an initial stage where random empirical discovery of the effects of plant remedies must have been the norm, innovation is likely to have been shaped by distinct forces such as experimentation based on similarities (morphological similarities between plants or pests, similarities in the area of application of the remedies, e.g. hair, etc) or on the observation of the secondary effects of the same plant remedies. As a result of these complex historical processes, we find that nowadays a number of plant remedies are used for similar combinations of ailments, indicating that innovation appears to have followed and at the same time created clear patterns, i.e. continua.

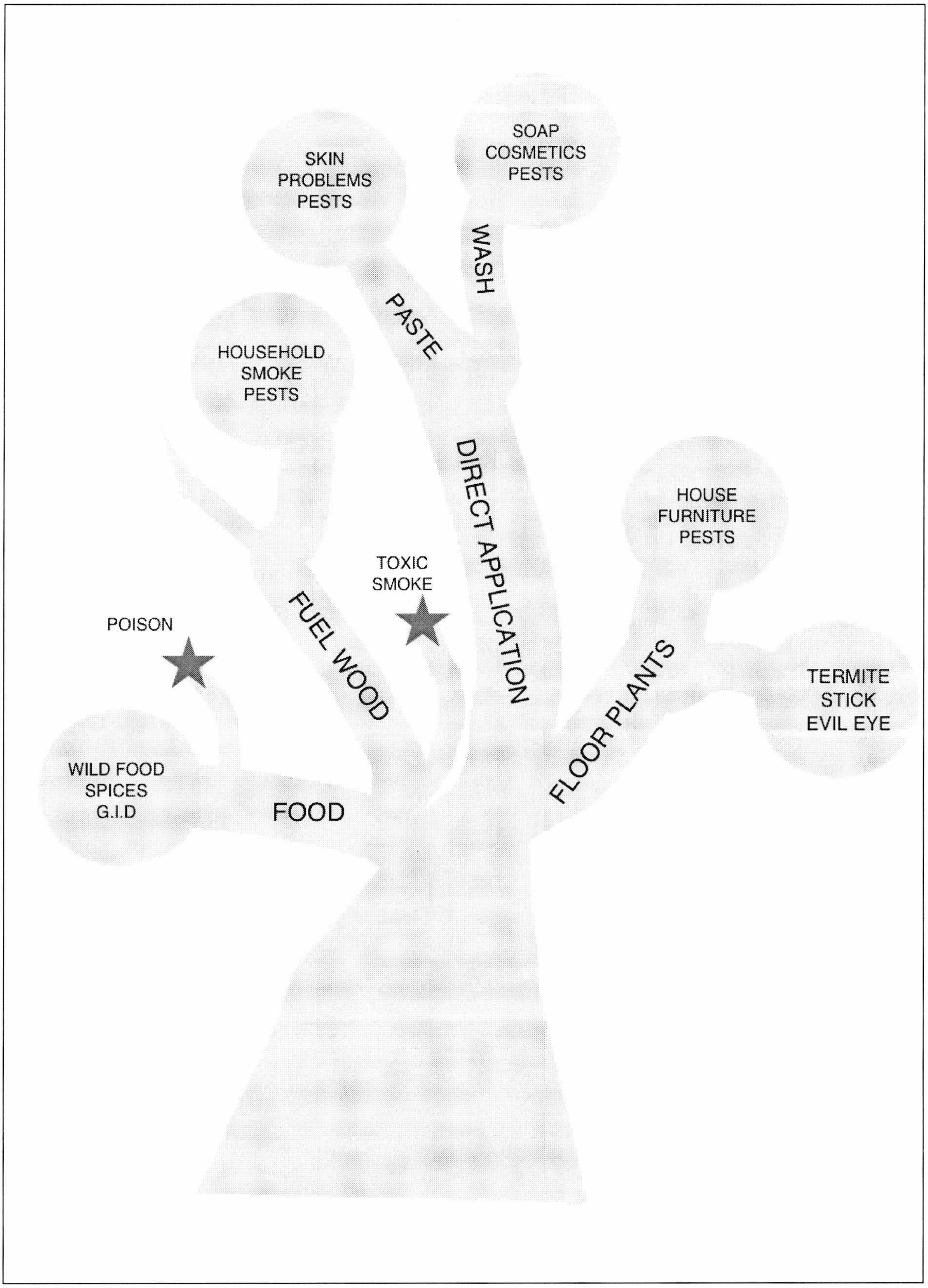
From an ethnopharmacological angle, the existence of continua of plant use can be seen as the selection of particular plants and remedies based on the potency and multiple effects of their secondary metabolites.

Two factors strongly support the theory that ethnobotanical innovation in Wag Hamra has occurred according to specific patterns and has ultimately resulted in the creation of continua of plant use: one-off remedies and the introduction of synthetic soap over the last 30 years.

7.6.2.1 - One-off remedies

Elements of plant knowledge that appear only once in the course of ethnobiological investigations have often proved to be the source of contentious debates. Opponents of omniscient hearer-speaker based approaches argued that no single individual could be said to carry the entire classificatory knowledge of his culture.

Figure 7.21: Visualisation of the differentiation of ethnobotanical knowledge through time in Wag Hamra



On the other hand, advocates of the cultural consensus model simply rejected one-off cultural knowledge by considering that knowledge that was unique, or not shared, was not representative of a given culture. In some ethnopharmacological circles and as an extension of the cultural consensus theory, shared knowledge of remedies became an indicator of pharmacological efficacy (Trotter and Logan 1986, Friedman *et al* 1986).

In another application of the cultural consensus theory in ethnobiology, the cultural consensus analysis model, one-off ethnobotanical knowledge is purely and simply discarded from the analysis. On this see the studies on diachronic knowledge variation in Zent 2001 and Heckler 2002.

Aunger's (1994) model, on the other hand, is an attempt to "determine the relative importance of different sources of variability in primary ethnographic data", or, in other words, to identify any form of knowledge variation "as either cognitive, contextual, or simply noise". His Reflexive Analytical approach is meant to allow the ethnographer to determine whether "there is substantive intracultural variability in beliefs, and whether particular responses are reliable". Although he does not state it explicitly, Aunger (1999) clearly considers low frequency knowledge to be a manifestation of intracultural variability.

In the present case, after having eliminated the obvious mistakes during the interviewing process, we can therefore assume that one-off remedies are a mixture of cognitive approximations, straight mistakes, innovations or apparent idiosyncrasies. A comparative analysis was performed on the remedy overlaps for the various identified continua to see if the one-off remedies had a depressive or stimulating impact on the strength of the continua. The analysis was carried out separately on the pest-pest and pest-non pest continua (Table 7.1).

Table 7.1: Impact of one-off remedies on continuum strength

Type of continuum	Positive effect (n cases)	Nil effect (n cases)	Negative effect (n cases)	Total (n cases)
Pest to pest smoke	42	19	11	72
Pest to pest ground	5	5	2	12
Pest to pest washing	92	80	38	210
Pest to other smoke	58	20	20	98
Pest to other ground	1	1	2	4
Pest to other washing	209	112	73	394
	(%)	(%)	(%)	(%)
Pest to pest smoke	58	27	15	100
Pest to pest ground	42	42	16	100
Pest to pest washing	44	38	18	100
Pest to other smoke	59	20,5	20,5	100
Pest to other ground	25	25	50	100
Pest to other washing	53	28,5	18,5	100

It emerges clearly and strikingly that in all cases, the inclusion of the one–off remedies contributes to strengthening the continua much more often than to weakening them. We can therefore conclude that one-off remedies including innovations tend to consolidate existing patterns. In fact, whichever way we consider one-off remedies, we can conclude that there is a pattern in the cognitive approximations, in the mistakes or in the innovations. If we consider that one-off remedies are essentially the manifestation of innovation, then it appears clearly that the theory of continua of plant use brings new depth and perspective to the study of diachronic knowledge by providing a view on long-term processes and by satisfactorily including a category of knowledge that was often neglected and in some cases considered embarassing.

7.6.2.2 - The impact of synthetic soap

Synthetic soap was first introduced to the markets of Wag Hamra more than 30 years ago. It was initially advertised for two specific uses: personal hygiene and the washing of clothes. 30 years later, the same substance was commonly reported in my survey as being used by many farmers for an impressive variety of uses: control of warts, ringworm, burns, head lice, body lice, cattle lice, cattle fleas and mange mites. This diversification of uses beyond the original purpose of the soap bar is very telling in many different respects: it speaks of innovation and it speaks of innovation along specific lines. ***The remarkable fact is that the innovation in soap use follows existing patterns and continua of plant use***. Thus, if we added the use of soap to existing continua we would measure an increase in overlap and therefore a strengthening of the existing continua. This example indirectly highlights how innovation brings pattern and is still patterned following the lines of existing continua of plant use in the area under study.

7.6.3 - Continua of plant use and the merging of uses

The fact that many continua of plant use exist in the area under study and that nearly two thirds of the plant remedies recorded during this study belong to the multipurpose rather than to the single purpose category is also a very simple but powerful finding (Table 7.2).

Table 7.2: Breakdown of remedies according to their degree of multitpurposity

Types of remedies	**Number of remedies**
Number of single purpose remedies	**93**
Number of remedies with two uses	**58**
Number of remedies with three uses	**32**
Number of remedies with four uses	**17**
Number of remedies with five uses	**8**
Number of remedies with six uses	**13**
Number of remedies with seven uses	**7**
Number of remedies with eight uses	**6**
Number of remedies with nine uses	**3**
Number of remedies with more than ten uses	**21**
Number of single purpose remedies	**93**
Number of multipurpose remedies	**165**

It forces us to review the multipurpose character of plant use in a completely different light. It tells us basically that people in Wag have selectively retained remedies not only because they are effective but also because they serve multiple and different purposes. This would tend to indicate that, over time, people have come to adjust their plant use to ensure that they maximise the number of multipurpose plants and remedies, whilst minimising the use of single-purpose plants and remedies.

Going back to the first continuum identified by Etkin and Ross (1982), this means that the debate on whether plants that are part of this continuum of plant use are medicinal foods or nutritious medicines is an artificial one. The evidence on the ground collected in the highlands of Ethiopia largely suggests that people retain certain forms of plant use because the plant potentially serves at least a dual purpose. It is both a food and a remedy or it is both a soap and a pesticide for example. The following continuum with termite sticks identified in Wag Hamra best exemplifies this merging of different uses. To explain how termite sticks are also used to repel the evil eye, it is suggested that:

- Either farmers first used white peeled trees to deflect the impact of the evil eye and having observed the positive effect that certain types of woods had on termites restricted their choice to white pieces of wood easily attacked by termites.

- Or farmers first used specific woods to attract termites at certain places in the field and further adapted this practice by choosing only white woods when the need to protect their crops from the evil eye arose.

From a pharmacological perspective, this search for multipurpose remedies is in stark contrast to the prevailing western views in pharmacology and medication where the secondary effects of the treatment are perceived negatively.

7.6.4 - Continua of plant use and knowledge loss: the multi-layered cumulative effect

After considering the forces that shape the build-up of continua of plant use, it is equally instructive to focus on the degenerative forces that can weaken existing continua. In Wag Hamra, it appears that the loss of certain portions of knowledge would have powerful consequences due to the multipurpose character of certain remedies and their contribution to many different continua of plant use. Moreover, it is suggested that by directly weakening continua of plant use, a decrease in plant use and knowledge would have an indirect and hidden cumulative effect on the same continua by reducing the overall use of the remaining plant remedies that form them. It is believed that if every addition of a plant with multiple uses contributes to strengthening a continuum then, by the same token, the disappearance of a plant or a plant remedy can potentially have a negatively amplified effect on the strength of the continuum.

CHAPTER 8

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CONCLUSION

8.1 - Botanical pest management in Wag Hamra: a tangible reality

My original assumption that pest management represented a substantial source of ethnobotanical knowledge in Wag Hamra has been confirmed through this research to a very significant degree. The detailed study and analysis of plant use and knowledge in five communities of the area under study has helped to reveal the complexity, diversity and the richness of ethnobiological knowledge pertaining to the management of pests held by farmers.

Beyond the number of remedies or plants reported as still being used for pest management (several hundreds with consensual depth in a few communities), it is the many different ways in which plant parts and extracts and adjuvants are used to combat pests that truly hints at the magnitude and historical depth of this body of ethnobotanical knowledge in the area under study.

The most common mode of use is direct application of a plant part or extract on the skin of human beings or the hide of livestock. Specifically, this can take the form of washing or scrubbing when the plant preparation is applied on the hair or the coat to treat fleas and lice. Water and livestock urine are favourite complementary ingredients for the preparation of these pest management remedies. For other insect pests such as the minute mites responsible for the spread of scabies, ear ticks on humans and cattle ticks, jigger fleas and to repel flies on wounds, farmers are keen to use plant extracts prepared in the form of pastes or juices that can be easily smeared. A favourite adjuvant in such cases is ghee.

For household pests (ground maggots, bedbugs, fleas, flies, weevils) and for other species of fleas attacking chicken and livestock, farmers prefer to use plant fumigants. Farmers very knowledgeable about this technique will fumigate several plants in combination or wait for specific woody species to decay before fumigating their rotten wood.

Another inventive technique used in Wag is the laying of plants on the ground to deal with common household pests (bedbugs, ground maggot, fleas) and to discourage field termites. Farmers have also learned to use plants as glue traps. When harvested at the correct time of the year and applied properly on the floor or on the walls, certain plants will release minute quantities of gluey sap sufficiently sticky to capture the lightweight insects. The downside of this technique is that it is seasonal and quite labour intensive. New plant stacks have to be harvested every one or two days since they tend to dry up and loose their stickiness very quickly.

Equally surprising is the use of plants on the ground that are chosen for the smoothness and softness of their bark and their resemblance to human flesh. According to farmers, ground maggots, known to inflict vicious bites at night, are tricked into believing that they are biting a human arm. In the process, they poison themselves with the sap of the plant. "Ground" plants laid under the heaps of freshly harvested stalks have more of a repellent effect, both chemical and physical.

There is finally the very inventive technique developed to combat field termites in the field prior to the harvest. Farmers attract termites by planting woody poles of certain tree species known to be particularly vulnerable to termite infestation in the centre of the field. The termites converge on the wood, colonise it and neglect the surrounding crop.

The results of this research are also important as they contribute to restoring a form of balance in the field of ethnobiological studies in northern Ethiopia. To date, and with the notable exception of Strelcyn (1973), Lemordant (1971, 1984), Wilson and Gebre-Maryam (1979), Vetter (1997) and Asfaw and Tadesse (2001), much of the research has focused on the ethnobiological and/or esoteric knowledge of the literate magico-religious healers, the fabled *däbtära*, whose knowledge has often been accessed and analysed in its written form. For a rare excursion into the oral subtleties of the *däbtära* world see Mercier 1988. By contrast, the ethnobiological knowledge of the laymen, the simple farmers who make up the largest portion of the population in the Amhara and Tigray regions, has received comparatively little attention. In fact, reading between the lines, one too often gets the impression that the knowledge of the laymen, too easily labelled as simple household knowledge, was hardly worthy of consideration, let alone of analysis. The findings of the present research then amply demonstrates that household knowledge related to the field of botanical pest management is anything but simple. It also indirectly hints at the potential magnitude of "household knowledge" in the highlands of Ethiopia for other sub-fields of ethnobotany.

This observed complexity surrounding the field of botanical pest management in the area under study stems from the intermeshing of at least three broad and closely related sub-fields of ethnobiology.

8.2 - The ethnoentomology of pests

The first entry point into this maze is the unique ethnoentomological relationship that has developed between people and insect pests over the centuries in Wag. In particular, unusually large pest infestations, most often of crops, have become for farmers the symbol of the expression of the Almighty God's wrath in retribution for sins committed. Throughout the history of the northern highlands of Ethiopia (including the area of Wag), large locusts and army worm infestations of "biblical" proportions have always occurred in times of acute food shortage following drought and/or disease episodes. This repeated coincidence has largely contributed to re-enforcing the specific ethnoentomological perception that people have of large scale insect pest infestations. On the other hand, other insects enjoy an ambivalent status among the inhabitants of Wag Hamra. For instance, most household pests benefit from the protection of certain Orthodox Christian saints. During the celebration day of these saints, it is forbidden to harm the insects. The rest of the time, they can be dealt with as normal pests. Other household pests, such as spiders and bumble bees, bring either good tidings or are the carriers of bad omens depending on the context in which they are found or seen. The jigger flea stands apart from the other pests, being as it is a subject of inspiration in traditional sayings and for poets.

Regarding the cognitive processes that govern the identification, naming and categorisation of pests, the current study has contributed to highlighting clear emic-etic contrasts as well as a high degree of flexibility and looseness in the naming and identification of numerous pests affecting both human beings and livestock. The latter phenomenon appears to be linked somehow to a cognitive process referred to as chaining (see Posey 2004 for a more precise definition), whereby super-ordinate categories are made of insects loosely grouped together due to their perceived similarities in morphology, behaviour or use. In the context of Wag Hamra, it has been found that socio-cultural values and beliefs such as ideals of masculinity, deliberate ignorance due to relative perceptions of altitude and traditional "vagueness" are factors largely responsible for the amplification of this phenomenon.

From a purely geographical perspective, the ethnoentomology of pests in Wag Hamra is governed mainly by altitude. Altitude is the main factor that governs the distribution of most insects identified as pests. With the exception of a few household pests, the distribution of most pests is inversely correlated with altitude. This relative predominance and diversity of insect pests found at lower altitudes also serve to re-enforce the relative altitude perceptions that farmers have of their neighbours living at different altitudes. In some extreme cases (fleas for example), specific pests have become cultural and altitude markers of identity. We can therefore conclude that in many ways, the ethnoentomology of pests indirectly contributes to maintaining existing cultural divides in Wag Hamra.

8.3 - The ethnobotany of pest management

A second and apparently more straightforward ethnobiological approach to accessing the complexity of botanical pest management is the ethnobotany of plant remedies used to deal with pests themselves.

To begin with, the ethnobotany of pest management was apprehended first within the larger framework of pest management. This study has helped to highlight the fact that farmers do not systematically resort to plant remedies to deal with insect pests. Thus, most crop pests are perceived as being sent by God, and therefore the best remedies are seen to be spiritual (prayers, repentance, use of Holy water). More recently, the introduction of chemical pesticides and the trials undertaken by the Ministry of Agriculture in partnership with farmers to test and generate completely new plant remedies for crop pest management have begun to interact with ancient beliefs related to crop pests. For many other pests, farmers' decisions and choices to use plant remedies for pest management is often a trade-off between the perceived severity of the pest infestation, the existence of other remedies easier to apply, the first-hand availability of suitable plants to prepare the remedies and time constraints. Many plant treatments for pest management have to be repeated several days in a row to be effective and a farmer will think twice before embarking on a several hour trek just to find a special plant. In most cases, it appears that context plays a significant role in farmers' decisions and that the use of plant remedies is therefore by no means systematic. The importance of physical or mechanical remedies in particular (cleaning of household, exposure of the grain to the sun for weevils, hand picking of fleas, bedbugs and lice, cutting of ticks, etc) should not be underestimated.

Moreover, it appears in many cases that the decision to use plant treatments instead of less sophisticated forms of treatments often hinges on the characteristics of the infestation. In particular, farmers will tend to use plant remedies immediately to deal with pest infestations that threaten directly or indirectly children (head lice, scabies), young animals (fleas on calves, kids, small chicken, ticks on udders of lactating cows) or seedlings (*teff* eating ants, field termites). In comparison, pest infestations on grown up subjects are deemed less serious and do not require an immediate intervention.

Trends previously identified in the naming of plants in the Highlands of Ethiopia (Mercier 1979b, Lemordant 1984) were also noted during the course of this study in Wag. Farmers commonly use animal metaphors and also integrate altitude, colour and size referents in plant names. The mention of hyena and baboon metaphors in particular is quite common in the area under study. Two other plant names worthy of consideration are *yädorogäday* (Stereospermum spp.) and *towant'äla* (Commicarpus spp.). The former literally means "that which kills chickens", an allusion to the toxicity of this plant and particularly of its ashes for poultry. The latter is unusual, at least on the basis of the ethnobotanical literature available, and is of direct relevance to the study of botanical pest management in Wag. It literally means "the remedy for bedbugs". The only other mention of a direct pest referent in a plant name is mentioned by Edwards (1976) in neighbouring Gonder (*mïst' aybälaš* lit. 'The termite does not attack it').

The study of plant names in Wag Hamra also highlights the importance of the Agaw people and language in the area. Although the five communities where people were interviewed have been "Amharised" for several decades, if not centuries, the Agaw language (Agawigna) and ethnic references continue to abound in the naming of plants, thereby increasing the diversity and complexity of the ethnobotanical knowledge base in the area. *Towant'äla,* for example, is a very old Agawigna loan word now commonly accepted in the Amharic vocabulary. In contrast, other Agaw referents are more often used to underline the difference between species considered as local and exogenous species, the Agaw ethnic factor being the marker for what is considered indigenous to the Wag area.

From a broader and cross-ethnic perspective, the cultural relationship that unites people and the plants surrounding them in Wag differs little from what has already been observed in other areas of the highlands of Ethiopia. There is first an unspoken but very strong bond between large slow maturing trees and human wisdom. This is a reflection of the hierarchy of age and respect that is one of the core values of rural society in Wag. It is also accepted that the use of plants is one of the dimensions of life that separates a true Orthodox Christian from the ambivalent figure of the magico-religious healer or *däbtära*. There is also a socially accepted division of the plant kingdom in Wag into plants that men should know (often large and / or useful trees) and plants that women ought to be familiar with (usually small plants found in the vicinity of the household, of streams, plants often small, fragrant, inconspicuous).

8.3.1 - Synchronic patterns

Gender is a very strong factor determining the patterned distribution of ethnobotanical knowledge of pest management in Wag Hamra. The first clear pattern to emerge from the statistical analysis concerns plant knowledge. When asked to identify a corpus of just over 50 plants, adult men and boys scored significantly better than adult women and girls. Further refinements to the analysis highlighted the importance of early gender differentiation in lifestyle to explain the knowledge divide between both genders. In particular, the importance of shepherding activities far from the household ensured that boys acquired more ethnobotanical knowledge than girls from an early age.

In terms of plant use, the results of the tests have shown clear and significant biases. Men are primary plant users for livestock pests and crop pests whereas it is mainly women who use plants to deal with infestations of chicken fleas and head lice. It appears that such findings present a clear illustration of the ways in which the division of tasks and responsibilities within the household finds its application in the field of pest management. Livestock and crop production activities are the main responsibility of men while poultry is an exclusive female activity. The gender bias with regard to head lice is of another type. It illustrates how men and women deal with this pest in different ways. Men will usually shave their hair when faced with a lice infestation whereas women prefer to use plant and ghee preparations.

The results for other household and body pests (weevils, flies, bedbugs, fleas, ground maggot) are much less clear cut, perhaps reflecting the existence of flexible and/or joint responsibilities within the household or when household and personal hygiene matters are at stake.

The statistical analysis of ethnobotanical knowledge of pest management confirms the existence of specific gender barriers already outlined for plant use. The specific circumstances in which treatment is carried out for most livestock and crop pests, by the riverside or in the field respectively, explain to a large extent the weak or below average knowledge transmission from men to women for these pests. However, the comparative analysis of prompted knowledge versus unprompted knowledge hints at the existence of two categories of knowledge for both men and women: what men and women really know and what they ought to know according to prevailing cultural and social norms. For instance, men, unprompted, will not bother to report knowledge of remedies for chicken fleas or head lice, two activities traditionally associated almost exclusively with women. But, when prompted, they display equal levels of knowledge with women. Women, on the other hand, when interviewed alone, will report, unprompted, equal levels of knowledge with men for most crop and livestock pests. In the case of household pests, the absence of gender knowledge barriers is in line with patterns already identified in plant use.

A second important gender dimension identified during this study is the average number of remedies known by men and women. It was found that in most cases, men know more remedies than women for specific pests. The ratio can reach two to one for livestock pests. In fact, there is not one single pest for which women know on average significantly more remedies than men.

Gender is, therefore, a very strong factor underlying both the use of plant as remedies for pest management and the distribution of ethnobotanical knowledge of pest management in Wag Hamra. This finding was confirmed and re-enforced during this study by the demonstration that the transmission of this knowledge is carried out according to the same gender division lines.

Simple plant knowledge appears also to be largely shaped by the immediate environmental and topographical surroundings. Based on two projections, it was possible to demonstrate that for more than two thirds of the population, 70 % of plants identified grow within the immediate vicinity of household in terms of altitude. Moreover, for more than four fifths of the population, more than 90% of plants identified grow within a 300 meter altitude band surrounding the household. The extreme ruggedness as well as the altitude and topographic versatility observable in the area under study therefore suggests that variability in plant knowledge is very high in Wag. It depends on the very versatile distribution of plant species which is itself dependent on altitude. Proportionally, people who live either at very high altitudes in the communities of Meskelo and Bella or who live in the extreme lowlands of the Tekkeze watershed (Tsamla community) are more likely to be familiar with plants not found in their immediate life environment than people who live in the intermediate altitude communities of Shimela or Yekatit Dewol. Lowlanders appear even less conservative than their highland peers in this respect. Similar results were obtained after excluding from the analysis the few plants used for pest management and marketed locally.

Other statistical tests have helped to highlight altitude as a natural use barrier for several pests whose distribution follows clear altitude gradients (ground maggot, ear tick, field termites, weevils). Predictably, farmers in Wag use plant remedies against these pests only if they occur in their life environment at their altitude of residence. However, no correlations were found for the jigger flea, cattle ticks and the household flea, three pest species with marked altitude preferences. For the jigger flea, the explanation is straightforward: the pest follows not only an altitude gradient but also a soil gradient (with a preference for shallow rocky soils). A test involving only the altitude dimension therefore fails to capture the complexity of its distribution. Concerning cattle ticks, the apparent absence of correlation is largely due to the extended mobility that characterises livestock herds in Wag. Cattle normally residing above the altitude range of ticks will often make incursions into "lower" pasture areas, become exposed to tick attacks and therefore receive treatment from their owners. Finally, one possible reason for the absence of correlation for household fleas is the imprecision that characterises the identification and naming of chicken fleas and household fleas at lower altitudes, where household fleas are rare. On the whole, these results illustrate the fact that altitude in some cases indirectly influences the use of plant remedies for pest management.

Qualitatively, a compilation of the various botanical remedies used to combat household fleas and weevils outlines clearly how the diversity and complexity of plant use is directly correlated with the distribution gradients of both pests. For the household flea, the greatest diversity of remedies is found at highland altitudes whereas for weevils it is found in the lowlands. This finding also confirms the strength of the relationship between plant use and altitude.

A remarkable finding of this study is that a staggering 95 % of remedies that people use and are familiar with are based on parts or extracts of plants that can be found in the immediate vicinity of the household of farmers, that is, within a 600 meter altitude band centred on the household. This implies that farmers never travel very far to find plant remedies for pest management purposes and also suggests that context is a very important factor driving the choice of plant remedies. It appears that farmers will rarely set out exclusively to find a plant remedy for pest management. Rather, on their way to the river or to the field, they will come across a plant species that suits their immediate needs at a particular moment. Alternatively, if thinking of a specific remedy and plant located in a not too distant area, they will adjust their plan of work or daily activities to ensure that they come by the plant or tree at some point. Fetching wood, water, herding animals, travelling to a field or to the nearby market are all important activities during which the harvesting and preparation of botanical remedies for pest management can take place.

As in the case of plant knowledge, this tight relationship between topography, altitude, plant distribution and the localised knowledge of plant remedies is responsible for the very high degree of variability in the ethnobotanical knowledge of pest management in Wag Hamra. In other words, the erratic distribution of plant species often translates into a succession and juxtaposition of small areas at community level with different knowledge of botanical pest management. This is why farmers from different areas of the same community can be familiar with completely different sets of plant remedies for pest management.

Specialised knowledge is the third significant factor to influence the synchronic distribution and patterning of ethnobotanical knowledge of pest management in Wag Hamra. Although categories of healers in the traditional sector in the area under study in Wag are much less clearly defined than what other scholars have suggested or observed in other parts of the highlands of Ethiopia, it appears that with regards to issues of botanical pest management, local plant experts and *däbtära*s are the most knowledgeable at community level, for very different reasons. The local plant expert accumulates knowledge of household remedies and is usually the first person a farmer in need of ethnobotanical advice will turn to. He is also very familiar with the multiple uses of plants available locally and will not hesitate to test new remedies for common pests.

On the other hand, the *däbtära* holds more knowledge than the layman because of the specificities of his trade. His superior knowledge of pest management remedies stems from his superior knowledge of local plants in general, from his knowledge of household remedies and plants from distant areas and from his unique knowledge of *däbtära* remedies that can combine the empirical with the spiritual and/or esoteric, particularly for pests such as ear pests, scabies or crop pests. Lay healers in Wag Hamra stand in sharp contrast with local plant experts and *däbtära*s and seem less knowledgeable on issues of botanical pest management even when they are the bearers of specific and much sought after ethnoveterinary knowledge for example. In fact, their whole attitude towards ethnobotanical knowledge and transmission largely confirms previous findings in other areas of the Highlands (Young 1970). Because the maintenance of their trade and of their activity as healers of specific diseases or conditions is so dependent on the retention of their ethnobotanical knowledge and the secrecy surrounding their remedies, they are very reluctant to share any form of information even for relatively benign ethnobotanical matters such as pest management. In comparison, it is the wealth of ethnobotanical knowledge held by local plant experts and the relative benign character of pest problems for seasoned *däbtära*s as well as their general attitude towards knowledge that makes them less reluctant to share and/or increase their own knowledge.

8.3.2 - Diachronic perspectives

The complexity of the ethnobotany of pest management in Wag Hamra is further enhanced by a number of diachronic phenomena. The first and most important is time indirectly measured in terms of age.

It was found that plant knowledge of plants used in pest management in Wag is positively and linearly correlated with age and that most of this knowledge is acquired before the age of 20. This finding is in line with similar studies carried out in other populations (Stross

1973, Heckler 2002, Fitzpatrick 2004). Concurrently, plant use and knowledge of plant remedies for pest management purposes in Wag show the same degree of correlation with age. This reflects first the increasing responsibilities that young boys and girls acquire with age, including the responsibilities of looking after livestock, crops or household related matters. Secondly, it is an indicator in the specific domain of pest management of broader processes of cumulative experiential learning. The absence of linearity found in the correlation between ethnobotanical knowledge and age during adulthood is more difficult to interpret since it is potentially the outcome of the interaction of conflicting or complementary forces of biological degeneracy, diachronic forces of change (introduction of chemicals, evolution of natural resources) and disruptive historical factors (war, famine).

This pattern of cumulative experiential learning was not apparent for three pests: jigger fleas, scabies and bedbugs. For jigger fleas, this is best explained by the fact that the distribution of the pest follows two ecological gradients (altitude and soil type). If the interviews had been focused in an area where jigger fleas abound, it is most likely that the statistical analysis would have highlighted a correlation of ethnobotanical knowledge with age similar to the one noted for most pests. For scabies, one possible explanation is that the use of plants and particularly of saps to treat this skin condition appears to be limited to children who in any case constitute the age group that is most vulnerable to this skin condition. In the case of bedbugs, it is reasonable to assume that the introduction of chemical pesticides in the area (first DDT in the seventies and liquid pesticides in the nineties) has favoured the emergence of an "all chemical" philosophy of life among farmers in Wag, particularly when chemical pesticides have proved to be much easier to handle and much more effective than plant remedies in eradicating this pest. This would explain why many adult farmers did not even bother to mention the plant remedies during the survey and the apparent knowledge degeneracy observed in old age for this pest.

A more detailed analysis of the transmission of ethnobotanical knowledge in the area under study has also revealed a very important trend: lateral knowledge transmission among children is not negligible and amounts on average to nearly a third of all ethnobotanical knowledge transmissions of pest management remedies. For some pests, this proportion can reach nearly 50 %. In the socio-cultural context of Wag, this type of knowledge transfer tends to occur predominantly during group activities involving other children either in the form of play and games around the household or in the form of more productive activities such as shepherding for boys or fetching water or fuel wood for young girls. These findings in the specific field of botanical pest management confirm similar trends observed in different cultures in the broader field of subsistence activities (Lancy 1999, Zarger 2002, Fitzpatrick 2004). On the other hand, vertical knowledge transmission appears to be the norm for pests and for situations such as crop production activities in the fields where the interaction is mainly between adults and children of a same family rather than between children of different families. The overall higher figures of vertical transmission recorded with adults are best explained by 'cognitive merging' whereby the bulk of the ethnobotanical knowledge acquired during childhood, in time, becomes associated with the knowledge of an "idealised" or "generic" elder from the previous generation.

Concerning knowledge transmission, a second crucial finding of this research is that knowledge of plant remedies for pest management purposes acquired from family members is more likely to be put into practice, that is, replicated or reproduced, than knowledge acquired from extra-familial sources. Only 5 % and 18 % respectively of adult and children users of plant remedies for pest management had acquired this knowledge from extra-familial sources. Taken from a different angle, the findings show that only a third of the knowledge acquired laterally is put into practice or replicated by children. This implies that vertical knowledge transmission significantly contributes to the reproduction and maintenance of ethnobotanical knowledge of pest management and that any disruption of vertical knowledge transmission phenomena is bound to have a profound impact on the survival of this category of knowledge. This finding also indirectly suggests that experiential learning or learning by doing / seeing, which is the most common form of knowledge transmission inside the family, is a critical mechanism for the dynamics of ethnobotanical knowledge of pest management.

Lateral knowledge transmission underlies the higher levels of ethnobotanical knowledge of pest management recorded for women who relocate to distant communities after their wedding and for men who spend several months away from their villages and communities in search of seasonal labour opportunities. Women and men from either category first acquire ethnobotanical knowledge deeply anchored in their places and communities of birth, essentially through conservative and vertical transmission mechanisms. During the course of their migrations, their exposure to different biological and socio-cultural environments at different altitudes adds to their initial store of ethnobotanical knowledge through lateral knowledge transmission.

However, a remarkable feature of this increased knowledge is its sterility or failure to reproduce. Children of migrant adults do not exhibit higher levels of knowledge of pest management than the children of parents who have never migrated for very simple reasons, such as the impossibility for adults to demonstrate the use of certain plant remedies in the absence of specific pests or plant species in the nearby environment. The problem can be further compounded by specific gender barriers. This demonstrated failure to pass on knowledge to the next generation within the same family circle illustrates again the influence of the mode of knowledge transmission on the reproduction and maintenance of knowledge. It also suggests that what makes vertical knowledge transmission so effective and so powerful in the reproduction of knowledge is the combination of the source of the knowledge, the family circle and the mode of transmission, learning by seeing/doing. The case of migrating adults tells us that knowledge is effectively reproduced only when both conditions are met.

The area of Wag Hamra has witnessed a number of visible and significant changes over the last 30 years that are of direct relevance to this research. Foremost are the gradual attempts by the Ethiopian government to modernise, or at least increase the interaction of the traditional rural societies with modern services and concepts (spread of formal education, modernisation of the health and agricultural sectors through the building of clinics and the provision of synthetic remedies and pesticides). Concurrently, this area of the northern highlands of Ethiopia has seen its population and the resulting pressure on land and natural resources sharply increase during the same period.

The statistical analysis carried out as part of this project has helped to unveil the significance of the impact of the introduction of synthetic substances on traditional botanical pest management in Wag Hamra. In the case of soap bars, commonly sold at weekly markets since the seventies, the switch phenomenon deserves to be highlighted. Basically, it was found that following the introduction of soap, users of plant remedies for pest management are the first to have tested and adopted soap as an alternative remedy against the same pests. In some cases (scabies and head lice mainly), the switch has proved to be very erosive for traditional forms of botanical pest management to the extent that plant use against these pests has become rare nowadays. For other pests (cattle lice, cattle fleas, body lice), the switch has not resulted in a disappearance but in a firm maintenance of plant use, demonstrating the co-existence of traditional and soap remedies in the overall household pest management strategy of farmers. More qualitative investigations have revealed that farmers' decision to use soap can be a trade-off between financial constraints (the cost of purchasing soap), the availability of plant remedies and the perceived quality of the treatment (some botanical treatments are more time consuming but are perceived as producing better results). This emphasises once more the importance of context in the choice of plant remedies but also introduces the new idea of the complementarity in space and time between traditional botanical pest management and the use of soap. Overall, and despite the erosion in plant use for certain pests, the introduction of soap is too recent to have significantly impacted on levels of ethnobotanical knowledge of pest management.

Concerning the introduction of chemical pesticides, the findings of this research are slightly different. On the one hand, there is no doubt that the regular promotion of crop pesticides and veterinary acaricides by the Ministry of Agriculture has contributed to the spread of their use in the area under study. Nowadays, a vast majority are aware of their superior efficacy against crop and livestock pests. For instance, the construction of veterinary clinics in the last decade has had a major impact on the surrounding populations concerning the use and knowledge of modern acaricides to treat livestock lice, fleas, ticks or mange mites. The concurrent deployment of outreach systems has ensured that this impact has been felt uniformly throughout the study area, irrespective of the distance of the villages from the clinics.

On the other hand, the interaction with traditional botanical remedies has not produced exactly the same type of switch as the one observed in the case of the introduction of soap. Plant users have clearly become chemical pesticide users, particularly for cattle lice, cattle ticks and fleas, mange mites and bedbugs. There is no doubt that the switch that occurred has exerted erosive to very erosive pressures on the traditional use of plant remedies for the treatment of these pests. For mange mites, the erosion has been nearly total, owing partly to the fact that no satisfactory plant remedies were available for this pest.

This overall erosion pattern largely corresponds to the spread and development of an all-chemical philosophy observed among certain farmers in Wag. Some have become so impressed by the speed and efficacy of chemical pesticides that they entirely reject their past ethnobotanical knowledge of remedies for pest management, deemed in retrospect slow to act, at times unreliable and most of all time-consuming to prepare (repeated harvesting plus preparation). This surprisingly swift change in the attitudes of some Wag farmers should be understood as the cumulative effect of the double introduction at a 30 year interval of DDT, in the seventies, and more recently of liquid pesticides (malathion in particular). The recent efforts undertaken by the Ethiopian government to increase formal education in the rural areas of Wag is having a similar type of impact on children. It was found during this research that children who attend school are more likely to be familiar with modern chemical treatments than children who have never attended school. The relationship between schooling and levels of ethnobotanical knowledge of pest management among children was found to be much less obvious.

However, to make a parallel with the case of soap, the complementarity that was observed in time and space between soap and plant use does not exist for chemical pesticides and plant remedies. The major difference lies in the uneven availability of crop pesticides (also used against bedbugs) and the relatively higher costs associated with the use of chemical acaricides. Moreover, some farmers have begun to question the efficacy of chemical pesticides in the light of their increasingly evident toxicity to animals, bees and occasionally human beings. The combination of these factors explains why despite the spread of the all-chemical philosophy, the impact of the introduction of chemicals is slightly blurred, and why chemical use has not totally replaced plant use in space and time. To the contrary, in several instances it was found that plant use is more recent than pesticide use. Overall, the introduction of chemical pesticides is too recent and in some cases paradoxical to have significantly impacted on levels of ethnobotanical knowledge of pest management.

The impact of the introduction of synthetic substances in Wag cannot be apprehended without simultaneously considering the changing character of natural resources over the same period. Increased population pressure, over-harvesting, the encroachment of agricultural land into pasture areas and semi-marginal to marginal area and soil and water erosion have all converged to re-model existing landscapes in the area under study.

Compared to 30 years ago, there are very few areas left with sizeable tracts of natural vegetation. They are restricted to the immediate vicinity of the rare remaining field hedges, to streams and rivers, to a few protected forest areas in the very high altitude areas, to the woody grasslands of the Tekkezze watershed and to very steep and inaccessible cliffs and gorges in the intermediate altitude zones.

The populations of most plant species recorded as being used for pest management purposes during this study have declined, in some cases very significantly, over the last three decades. This trend does not appear to have had a visible impact on the levels of ethnobotanical knowledge of pest management of the inhabitants of the area. However, when considered coincidently with the introduction of synthetic substances, there is no doubt that the timing of this reduced availability of many plant species is very unfortunate and may be partly responsible for the erosive switch described above and the reduction in the use of plant remedies for certain forms of pest management. The decrease in the availability of ghee at household level over the same period is another factor that may have had the same type of hidden impact on plant use.

In a socio-cultural environment where the choice of plant remedies is largely contextual, large variations in the immediate or relative availability of plants can have powerful consequences. Consequently, as a result of this reduced use of plant remedies for certain pests, and given the importance of the "extinction of experience" in terms of knowledge transmission for the next generation, ***a notable decrease in the knowledge of botanical pest management remedies is expected in the coming decade(s)***.

But, this negative trend in the natural resources sector should be contrasted with the marked expansion of cultivation in home-gardens (usually alongside rivers and streams) of several species commonly used in pest management (Phytolacca dodecandra, Myrtus communis), particularly in the highlands. In addition, plant species introduced by *däbtära* or simple farmers during the last decades have also contributed to partially offsetting this downward trend and to raising the potential for the emergence of new ethnobotanical knowledge of pest management in Wag.

However, a critical appraisal of the situation taking into account the influence of altitude and existing water resources reveals overall bleak perspectives for the future. Given their water resources, the highland areas of Bella and Meskelo offer the best opportunities for the strengthening of home-gardens and the cultivation of species but at the same time, they form part of the altitude belt where pest problems are the least significant in the whole of Wag Hamra. Ironically, it is precisely in the midland and lowland areas where pest management issues are much more severe that the rate of decline in key plant species used for pest management is increasing and where the scope for increasing home-garden cultivation is very weak and in some cases nil, due to the paucity of water resources at these altitudes. The lowland community of Tsamla is the worst case scenario. Plant populations in the wild are fast shrinking and no river gardens can be established because of very low water levels during the dry season. To make matters worse, farmers are reluctant to plant bush or tree species in the vicinity of their houses or villages because of the risks of attracting snakes and birds of prey.

8.4 - Continua of plant use

A major finding of this project is that the ethnobotany of pest management in Wag Hamra can be apprehended from very unexpected directions and sources, that is, from other seemingly unrelated sub-fields of ethnobotany. This is the third and final major entry point into the complexity of botanical pest management.

The existence of such bridges between the ethnobotany of pest management and other sub-fields of ethnobotany was revealed by measuring overlaps in plant remedies between specific forms of pest management and other ethnobotanical activities of everyday life in Wag Hamra. Very high figures of overlap demonstrated the relatedness and inter-changeability of plant remedies between various poles of plant use. In other words, they highlighted the existence through space and time of continua of plant use. Within the specific socio-cultural context of Wag Hamra, those continua that have botanical pest management as one of their poles, establish patterns by connecting with three poles of plant use: plant smokes used in and around the household (bee-keeping, pot smoking and flavouring, coffee ceremony), plant cosmetics (natural soaps, perfumes, hair treatment) and the broader field of ethnomedicine that encompasses the use of plants for the treatment of skin/wound conditions (wound treatment, ringworm, leishmaniosis, rashes, burn). Another kind of continuum was found to involve field termite attractants and evil eye protectants.

While some of these continua are the reflection of emic-etic contrasts in the ethnoentomological field (scabies versus wounds for example), all of them appear to have been shaped by various forces of innovation, whereby the observation of the secondary effects of plant treatments obviously played a critical role in expanding the scope and application of existing plant uses. The time scale necessary for such innovations to emerge and disseminate within the population suggests that a continuum of plant use is an indicator or marker of much deeper and lengthier processes of change in ethnobiological knowledge. In many ways, then, the specific continua outlined in Chapter 7 portray the skeleton of a genealogy of ethnobotanical knowledge in Wag Hamra, even though the historical sequence in which different ideas and uses emerged remains inaccessible. There are no clear means for us to assert whether, for example, the use of wound repellents predates the use of plants to treat wounds or whether the use of natural shampoos is a consequence or a cause of the use of the same plants to treat head lice.

8.5 - General comments

8.5.1 - The historical Agaw-Amhara relationship

Throughout this research, the ethnic factor and Agaw-Amhara interaction, which has been a cultural characteristic of the northern highlands of Ethiopia since the fall of the Zagwe dynasty, have loomed large over a number of the analyses. From a purely historical perspective, the persistence of this issue is an indirect indicator of the survival of the Agaw culture after many centuries of cultural and in some cases military onslaught from their Amhara neighbours.

The most salient aspects of the history of this interaction are very easy to read. States and processes of integration, co-existence and opposition that have characterised in turn the history of the relationship between both ethnic groups in the highlands of Ethiopia can all be observed, mainly in the ethnobotanical knowledge of the people living in the area. Even nowadays, this ethnic factor is still responsible for tangible and measurable cognitive divides in areas where one would have assumed the "Amharisation" process to be complete. In an area where people appear to form a homogenous group somewhere in between the two cultural poles of Agaw and Amhara, linguistically, religiously and in the mundane organisation of life and in the details of life, the distribution of ethnobotanical knowledge reveals a fault line that might be described as 'cultural schizophrenia'. In the intermediate community of Shimela Maryam, nothing can otherwise describe and explain the deliberate ignorance or omission by farmers of several plant species that are conspicuous both physically and in terms of the diversity of their uses in everyday life.

If anything, the salience and visibility of the history of the Agaw-Amhara interaction in the ethnobiology of the area under study proves again the relevance of being rigorous in the analysis and study of mundane technological aspects of ethnobiology and household knowledge of the layman.

The current predominance of the Agaw-Amhara ethnic interaction should not make us forget the larger historical picture and the antiquity of the interaction between the Semitic populations from the South Arabian peninsula and the indigenous Cushitic populations of the highlands of Ethiopia. This process is believed to have begun nearly three millennia ago and has without doubt played its role in strengthening and expanding local plant beliefs and practices. The ancientness of human productive activities (Ehret 1979), combined with the fact that Ethiopia is considered a centre of biological diversity, could explain to some extent the diversity and wealth of knowledge of pest management recorded during this research.

8.5.2 - The importance in ethnobiology of focussing on the "fuzzy" frontiers

There has been ample demonstration in this thesis of both the existence of bridges and the need to focus research and analysis on what relates one ethnobiological subject or field to another. Ethnoentomological phenomena have proved to be often translated into the ethnobotanical field. For instance, the existence of clear emic-etic contrasts and of cognitive chaining processes help to explain the continua of plant use observed between several pests.

The very concept of 'continuum' and the fact that many forms of pest management are related to other spheres of ethnobotanical knowledge through continua of plant use strongly suggests the necessity of focussing not only on what separates but also on what unites apparently unrelated fields of ethnobotany. It certainly highlights the need to be on the lookout for such cognitive bridges and at the same time raises questions regarding the risks entailed in narrowing down too much the focus of research in ethnobiology.

It also raises very serious questions about current trends aimed at homogenising and simplifying use categories. In this regard, it would seem that Hays'(1974) efforts to minutely record all the various plant uses in Ndumba ethnobotany were steps in the right direction to apprehend the complexity resulting from the fluidity and dynamism of knowledge. Since the dynamics of knowledge has become a core subject of research in ethnobiology, understanding the boundaries, or the absence of what we perceive in an etic manner as boundaries, appears to be critical for properly studying ethnobiological knowledge. Continua of plant use certainly appear to be relevant and useful tools in this respect, not only because they help to reveal bridges between fields but also because they hint at long term processes and phenomena of knowledge change and differentiation that also contribute to characterising a given culture. It is very likely for instance that a similar analysis on continua of plant use undertaken in a different cultural setting in Asia or Southern America would underline the pre-eminence and junction of different poles of plant use, commensurate with the biological, social and cultural fabric of the society where they would be studied.

Finally, the focus on fuzziness and "frontier" areas appears to be a necessity for apprehending ethnobiological realities in a country and culture such as the highlands of Ethiopia where rigidity and precision are not particularly valued and where cultural ambiguity and paradoxes abound.

8.5.3 - The many dimensions of intra-cultural variability in the ethnobotany of pest management in Wag Hamra

In portraying the complexity of intra-cultural diversity in Wag as it specifically relates to the field of botanical pest management, that is, in trying to disaentangle the distributed aspects from the high consensual dimensions that make up the whole of ethnobotanical knowledge of pest management in Wag, one is confronted with the arduous task of combining the analysis of synchronic with diachronic patterns and with the necessity of including considerations of scale.

First, there are several strong factors or patterns such as gender or altitude that govern the distribution of ethnobotanical knowledge of pest management. However, within these patterns of distribution, there is a particular scale below which cultural consensus is at its highest and therefore, where intra-cultural diversity is at its lowest. From the data collected during this research, and based on the finding that members of a household are familiar with remedies based on the use of plants that grow within their immediate environment, that is, approximately within a 600 meter band of altitude around the household, it is reasonable to assume that the area within which cultural consensus on ethnobotanical matters is optimal corresponds to a village or to a cluster of several villages located at the same altitude and at the centre of a micro-watershed. Areas below and above the village provide sufficient range for pasture, fields, the collection of wood and water. Interaction and lateral knowledge transmission phenomena are such in Wag communities, particularly among children during play and shepherding activities, that from an early stage, knowledge consensus is probably very high inside any given village. In contrast, neighbouring micro-watersheds and villages will present different altitude and soil variations resulting in potentially different patterns of plant diversity, knowledge and consensus.

Thus emerges an overall picture of a myriad of small blocks of optimal consensual knowledge that are a reflection of the ruggedness of the landscape and of the high variability in plant distribution that characterises Wag Hamra and of the sense of micro-territoriality that characterises rural societies in this area. Natural barriers between these blocks of consensus and micro-watersheds are large streams or rivers, ridges and gorges. Intra-cultural variability for botanical pest management is thus best represented by segregating the results by gender and within each gender by representing it as a mosaic of small consensual patches that do not exceed 10-20 km^2 and that mirror the erratic topography of the area.

Hewlett and Cavalli-Sforza (1986) claimed that increased lateral knowledge transmission resulted in a decrease of intra-cultural diversity. Concerning the present study, this was certainly demonstrated with the introduction of chemical pesticides that are now used and known to be effective in pest management by an overwhelming majority of households. Extensive lateral communication among children has had the same result at the village level. However, in the case of ethnobotanical knowledge acquired during the course of migrations (male or female), this principle does not appear to apply for the simple reason that the knowledge acquired laterally is sterile, i.e. not passed on to anybody, including children. Migration has therefore the net effect of increasing rather than decreasing intra-cultural variability in what constitutes a notable exception to the principle put forward by Hewlet and Cavalli-Sforza (1986).

On the whole, altitude is a super-factor that determines the size, shape and depth of intra-cultural diversity in Wag Hamra. It governs the distribution of biological organisms and is responsible for its extreme variability over relatively small-sized areas. It is also known to govern the cultural perceptions that people have of themselves and of their neighbours, and is highly instrumental in establishing hidden social hierarchies and in driving cognitive processes that negate the biological reality on the ground. It is precisely this powerful combination of physical and cultural perceptions that best explains the distribution of ethnobotanical knowledge and its apparent oddities in the area. In fact, the strong correlation of pest and plant distribution with altitude, combined with the cultural perceptions of relative altitude that local inhabitants in Wag have, ensure that consensus on most cultural matters, including mundane ethnobotanical uses of plant remedies for pest management is constantly shattered and re-constructed at each altitude level.

The necessity to focus on the village level to find satisfactory levels of ethnobiological consensus amongst people of the same gender and the constant influence of the variability of altitude raise, of course, serious questions regarding the relevance of a cultural model constructed on the concept of consensus in a rugged mountain environment. In such circumstances, it is difficult to agree with Boster (1985) that consensus or agreement reflects knowledge of a cultural model. In Wag Hamra, farmers from three different portions of a large watershed living within half a days walk from each other's village may agree on the benefits of using plants to treat certain pests, but would be at a loss to explain why they use completely different plant remedies and why in many cases they are not even aware of the existence of plants growing only 10 kilometres away from their own villages.

In the specific field of ethnobiology, the cultural consensus analysis developed by Romney *et al* (1986), that stipulates that only knowledge with consensual or historical depth is worthy of consideration and analysis, since it is a real and acceptable indicator of the culture being studied, has already come under heavy criticism by Aunger (1999). Other ethnobiologists (Zent 2001, Heckler 2002) have restricted the scope of its application by considering that the model works best in small populations and cannot handle specialised knowledge very well. My findings strongly suggest that the cultural consensus analysis would have great difficulty in handling the extreme variability of ethnobotanical knowledge in a rugged mountain environment where altitude is a key variable and that the application of the model ought to be restricted to areas with low degrees and amplitude of altitude variation. This implicitly reduces the scope of application of this model even further and more importantly eliminates a number of areas in the world, otherwise famous for the antiquity and richness of their culture and the complexity of their ethnobiological knowledge and beliefs (Himalayas, Andean mountain ranges, South Arabian ranges, to name but a few).

Accordingly, the extreme variability that characterises the ethnobotanical knowledge of pest management in Wag should also lead one to consider with greater caution the theory and model of Trotter and Logan (1986) concerning the efficacy of traditional remedies. Depending on the choice of sample households, their altitude and location, the choice of this methodology for ethnopharmacological purposes could lead to very surprising if not conflicting and in the end unreliable results in an area like Wag Hamra.

One of the fundamentally weak points of most models and theories brought forward in ethnobiology to theorise and decipher intra-cultural diversity in any given population is the treatment that is made of one-off mentions of ethnobiological knowledge and of low frequency knowledge in general, whether they are idiosyncrasies, mistakes or the expression of other phenomena (cognitive approximation, outcome of interview biases, expression of tail-end knowledge that would appear as central or consensual knowledge if the geographical scope of interviewing had been altered, etc).

The issue is a thorny one that has received very little attention from anthropologists and ethnobiologists alike. As mentioned above, for partisans of 'culture as consensus' that would reflect knowledge awareness of a model, one-off mentions of any form of cultural knowledge are the expression of an imperfect degree of familiarity with the core knowledge that defines the cultures and are therefore unworthy of consideration. Such knowledge is systematically discarded and excluded from the analysis (see Trotter and Logan 1986, Zent 2001, Heckler 2002). In the older model of the omniscient hearer-speaker, the risk was to see low-frequency knowledge integrated into the analysis of a given culture and portrayed as representing or explaining the culture on a par with more consensual knowledge. Aunger (1994), rather than neglecting this category of knowledge, has indirectly made an attempt to deal with it by developing a model that ultimately reduces and breaks down informant knowledge into clear sub-categories that lend themselves more easily to analysis, whilst separating the cognitive from the non-cognitive.

The downside of his methodology is that it is extremely time-consuming and requires the re-interviewing of informants in order to identify cognitive discrepancies between each round of interviewing. It is very difficult to put into practice in other cultures in studies focused on sensitive issues and with large scale surveys for obvious time and financial reasons.

The strengthening and expansion of the concept of continuum of plant use and the development of a theory outlined in this research that places continuum of plant use at the heart of long term processes and dynamics in ethnobotany appears to be a very promising way to reconcile scientific ethnobotany with the study of one-off remedies. Without even entering into the level of detail suggested by Aunger (1994), the present project has clearly contributed to highlighting the fact that one-off remedies, whether they are innovations, mistakes or cognitive approximations deserve all our attention as they are very likely to follow patterns outlined in existing continua of plant use. This is a significant finding that will hopefully re-ignite the interest of ethnobiologists in this type of knowledge whilst contributing to an increase in the coherence of studies focused on ethnobotanical knowledge, particularly in ethnomedicine and ethnopharmacology. Some of the best evidence for the patterning of innovation found during this research is the many different innovative uses in pest management that farmers have developed for soap in the area under study 30 years after it was first introduced in local markets for personal human hygiene. Remarkably, these innovative lines of use follow and strengthen existing continua of plant use.

Essentially, the theory of continua of plant use is very useful in that it allows one to get a feel for processes that are beyond debates on cultural consensus and invites us to consider ethnobotanical knowledge in a different light. For instance, the existence of very strong continua tells us that people in Wag Hamra over time have adapted their local use and knowledge of botanical pest management in such a way by increasingly resorting to plants but also to specific plant remedies with multiple uses, thereby minimising the proportion of plant remedies with limited applications. This can be seen as another form of economy or efficacy in ethnobotany that is not based on consensus as outlined by Trotter and Logan (1986), but based on a search for "multipurposity". This also means that the terms of the debate as presented by Etkin (1988) on nutritious remedies versus medical food are less relevant. The findings of this project suggest that farmers adapt their use of plants because they can serve (at least) a dual purpose. In other terms, farmers have retained specific plants because they are potentially both a food and a remedy or in pest management, because a plant remedy is both a pest repellent and a natural head shampoo for example. The key trend is that plant use in the context of Wag appears to have evolved following principles of economy and intensity.

The existence of continua of plant use also highlight a particular approach to drugs and remedies in the rural societies of Wag that is based on the observation and exploitation of the secondary effects of plant remedies. It is in stark contrast with the use of synthetic remedies in other societies where drugs are selected because of the potency of their primary effect and the (supposed) weakness of their secondary effects.

Findings that confirm the importance of multipurpose plant use and which highlight the fact that it is structured and patterned tend to add weight to and complement the theory of the cultural significance of plants and the concept of cultural keystone species presented recently by Garibaldi and Turner (2004). This importance is best understood if one considers the knock-on effects of the disappearance (or re-introduction) of multipurpose plant species in a given environment. In terms of the framework of continua of plant use, the disappearance of plants will not only affect and reduce the various uses to which the plant could be put, but also have a less visible knock-on effect on the use of other plants for similar purposes by weakening the strength of the continuum. The assumption here is that when plant use and knowledge from a continuum disappear the observation of the duality of plant use that characterises the continuum is reduced, thereby affecting people's ability to constantly recreate and maintain the continuum.

8.5.4 - Issues of relevance to the field of Ethiopian studies

Last but not least, the present study has helped to shed light on several ethnobiological issues that deserve closer and further research. The issue of termite sticks – evil eye repellents and its possible correlation with the past presence of rural populations of Jewish or judaised people in Northern Ethiopia appears to be very promising in this respect.

The divergence observed during this research between beliefs associated with the evil eye in Wag Hamra and observations on the same subject made in other parts of the highlands (Reminick 1973, 1974, in Shoa for example) suggest that the subject is a complex and diverse one. Moreover, the persistence and spread of evil eye beliefs in Wag more than a decade after the departure of the last Falashas for Israel raises a number of questions.

People interested in Ethiopian paradoxes and riddles will have noted with interest the ambiguous stand taken by farmers vis-à-vis plants normally associated with the esoteric practices of the *däbtära*. In general, the existence of numerous "grey" areas between the spheres of competency of *däbtära*s and that of the simple lay men, previously thought to be mutually exclusive, is particularly intriguing: phenomena of knowledge leakage between *däbtäras* and farmers, the existence of household spiritual remedies practised by non-*däbtära* farmers, etc.

In terms of religion, the existence, in what is otherwise known as one of the most fundamental Orthodox Christian areas in the highlands of Ethiopia, of widespread *zar* beliefs and practices illustrates the complexity and antiquity of beliefs in this area. Equally intriguing is the existence of a number of recorded *däbtära* remedies against crop pests such as migratory locusts (*anbätas*), considered until very recently an unstoppable plague, an unequivocal and accepted sign and demonstration of the wrath of God.

ANNEX 2.1: Checklist of issues discussed during the semi-structured interviews

DEFINITION OF LIVING ORGANISMS

DEFINITION OF PESTS

DEFINITION OF INSECT PESTS

PESTS AS VECTORS OF DISEASE

PESTS AS AGENTS OF MISFORTUNE

PESTS AND GOD

PESTS AND THE DEVIL

PESTS AND THE EVIL EYE

PESTS AND WITCHCRAFT

EVIL EYE AND CROPS

SEASONALITY OF PESTS (PAST AND PRESENT)

DISTRIBUTION OF PESTS (PAST AND PRESENT)

PESTS AND ALTITUDE

PEST INCIDENCE (PAST AND PRESENT)

MODERN PESTS

RANKING OF PESTS

COMMON SKIN AILMENTS

HIDE TREATMENTS

SMOKE TREATMENTS

PEST REMEDIES

BOTANICAL PEST REMEDIES

TRADITIONAL VERSUS MODERN REMEDIES

KNOWLEDGE TRANSFERS

KNOWLEDGE CIRCLES

KNOWLEDGE AND SECRECY

PLANT AVAILABILITY (PAST AND PRESENT)

ANNEX 2.2: People interviewed during the semi-structured interviews

NAME	VILLAGE	FARMERS ASSOCIATION	ALTITUDE	CHARACTERISTICS
TAREKE G.	ABI DEDO	BELLA	2400	VERY OLD FARMER
NEGA B.	MELATKO	BELLA	2400	OLD FARMER, LOCAL BAILITH
TEGABU B.	ABIDEDO	BELLA	2400	ACTIVE FARMER
MAMO B.	MEKENZEBA	BELLA	2600	ACTIVE FARMER
DEBESHU M.	ABIDEDO	BELLA	2400	OLD WOMAN
MAHABERAT M.	ABIDEDO	BELLA	2400	OLD WOMAN
SENDAI D.	ABIDEDO	BELLA	2400	ACTIVE WOMAN
DEBRE A.	ABIDEDO	BELLA	2400	OLD WOMAN, MIDWIFE
ZEWDU G.	ADDIS MENDER	BELLA	2600	OLD FARMER
AGEZE T.	ABIDEDO	BELLA	2400	OLD FARMER, BEE EXPERT
WASSE W.	ATERNA	BELLA	2300	OLD FARMER, BONE SETTER
ASMARE Z.	ATERNA	BELLA	2300	VERY OLD FARMER
BAYE T.	SHELASHMA	WOLEH	2200	OLD FARMER, TRADITIONAL HEALER
TADESSE G.	GA CHERKOS	BELLA	2200	OLD FARMER, RABIES EXPERT
BERIHUN E.	MEKENZEBA	BELLA	2600	OLD MONK
MERIGETA H.	GIORGIS	BELLA	2600	OLD KNOWLEDGEABLE DEBTERA
DEMESIE A.	ZOAMBA	MESKELO	3000	ACTIVE FARMER
WUBNESH G.	ZOAMBA	MESKELO	3000	VERY OLD WOMAN
AYENEW T.	DINK	MESKELO	3100	ACTIVE FARMER
ZERFIE K.	DINK	MESKELO	3100	OLD WOMAN
LAYESH F.	DINK	MESKELO	3100	VERY OLD WOMAN
MAMO A.	TAGURSA	MESKELO	2400	OLD FARMER
ZEWDIE M.	TAGURSA	MESKELO	2400	VERY OLD WOMAN
DEREBAW A.	MEKENZEBA	MESKELO	2500	TRADITIONAL HEALER
WONDIMU D.	MEKENZEBA	MESKELO	2500	ACTIVE FARMER, "SMALL" DEBTERA
BAYE K.	ADISKENNA	MESKELO	2300	OLD FARMER
DEGITU A.	WORKENNA	MESKELO	2300	OLD WOMAN
ADDIS M.	CHERKOS	MESKELO	2400	ACTIVE FARMER, "SMALL" DEBTERA
GASHEW .G	GERIMSIG	MESKELO	2200	OLD FARMER
BIYEYIN G.	TALLA GABRIEL	SHIMELA	2100	OLD FARMER
KES METEKU	TALLA GABRIEL	SHIMELA	2100	OLD FARMER, PRIEST
MELKAMU W.	BEHABENA MICHAEL	SHIMELA	2000	OLD FARMER
AYELEW R.	BEHABENA MICHAEL	SHIMELA	2000	ACTIVE FARMER
TAFFACH M.	BEHABENA MICHAEL	SHIMELA	2000	OLD FARMER
GISHEN G.	DERIMSIG ABBO	SHIMELA	2100	OLD FARMER, "SMALL" DEBTERA
KIBRET B.	SULUTA	SHIMELA	2400	OLD FARMER
ZEWDU W.	WALKEZBA	SHIMELA	2200	OLD FARMER
AMSAW K.	TSATSU	SHIMELA	2100	OLD FARMER

	SELASSIE			
DEMELLIE N.	TSATSU	SHIMELA	2200	ACTIVE FARMER
NEGUSSE A.	SHIMELA MARYAM	SHIMELA	2200	ACTIVE FARMER, LOCAL HERBALIST
GEBAYU A.	SHINDEBA	SHIMELA	2200	ACTIVE FARMER, TRADITIONAL LIVESTOCK HEALER
SERECHE W.	DURWA	YEKATIT	2100	VERY OLD FARMER
KASSE W.	SILIA	YEKATIT	2000	OLD FARMER, LOCAL HERBALIST
TADESSE T.	SILIA	YEKATIT	2000	ACTIVE FARMER
MEKONNEN G.	GULAMADJER	YEKATIT	2100	ACTIVE FARMER
AWOKE T.	DURWA	YEKATIT	2100	OLD FARMER
ABIO E.	DURWA	YEKATIT	2100	VERY OLD FARMER
MEKONNEN S.	ZIRAN	TSAMLA	2000	ACTIVE FARMER
ADMAS E.	DURENA	TSAMLA	2000	VERY OLD FARMER
SEYUM C.	DURENA	TSAMLA	2000	ACTIVE FARMER, LOCAL HERBALIST
ASRESE B.	BAICHAN	TSAMLA	1800	ACTIVE FARMER, BEE EXPERT
TALLA W.	SEREWA	TSAMLA	1900	OLD FARMER
FELEKE Z.	GUTABA	TSAMLA	1800	OLD FARMER
WOLDE YESUS T.	TSAMLA	TSAMLA	2000	OLD FARMER
MALAFIE W.	GUTABA	TSAMLA	1800	ACTIVE FARMER
KES BAJJU	SHUTAN	TSAMLA	1800	ACTIVE FARMER, PRIEST.
TAREKE G.(2)	ABIDEDO	BELLA	2400	VERY OLD FARMER
FANTAW A.	ZAROTA	BELLA	2200	OLD FARMER
WONDIMU (2)	MEKENZEBA	MESKELO	2500	ACTIVE FARMER, "SMALL DEBTERA"
NEGUSSIE A. (2)	SHIMELA MARYAM	SHIMELA	2200	ACTIVE FARMER, LOCAL HERBALIST
NEGUSSIE A.(3)	SHIMELA MARYAM	SHIMELA	2200	ACTIVE FARMER,LOCAL HERBALIST
ADANE M.	TSAMLA	TSAMLA	2000	OLD FARMER
WOLDE G.	ZIRAN	TSAMLA	2000	ACTIVE FARMER
KES SHEGAW	KA	KA MARYAM	2000	ACTIVE FARMER, FORMER PRIEST
DILA GROUP	DILA	KA MARYAM	1900	ACTIVE FARMERS

ANNEX 2.3: Questionnaire (Amharic phonetic)

Käbale..*Gott*..*Däbär*.......

Sïm...*Ay/Ab/Ina/Wond lïj/ Set lïj*

*Idme*5.....10.....15.....20.....30.....40.....50.....60.......

Yätäwolädä bot'a.. *Tïmhïrt bet*................*amät*

Käft........... *Sidet'a*................

Kafät'a............. LONG..............................LAT..............................

T'äbay

Yätä'bay sïm	*Mädhanät*	*Yäzaf kïfïl*	*Tïre / däräk*	*Indet*	*Kämïn gar*	*Wor*	*Tïkïm*	*Mäče*	*Betsab / Wuč'*	*Man*	*Wond / Set*
Zïmb	1										
Zïmb (k'usäl)	2										
	3										
Dukundukit	1										
	2										
	3										
K'ïmandgär	1										
	2										
	3										
Mujälle	1										
	2										
	3										
Yadjoro mäzgär	1										
	2										
	3										
Kurbät mamläč'a	1										
	2										
	3										
Nïb yasräkal	1										
	2										

	3										
č'ïrt	1										
	2										
	3										
Yäkäft k'unïč'a	1										
	2										
	3										
Kuakuša	1										
	2										
	3										
Yädoro k'unïč'a	1										
	2										
	3										
Nïb yaswotal	1										
	2										
	3										
Tohwan	1										
	2										
	3										
Yädjoro k'unk'un	1										
	2										
	3										
Yaya gätaba	1										
	2										
	3										
Näkäz	1										
	2										
	3										
Ikäk	1										
	2										
	3										
K'ïmal	1										
	2										
	3										
Isat k'usäl	1										
	2										
	3										
K'inč'eara	1										
	2										
	3										
Tïl k'usäl	1										
	2										
	3										

Tänägn	1										
	2										
	3										
Yäkäft mäzgär	1										
	2										
	3										
K'unčär	1										
	2										
	3										
Yäras k'ïmal	1										
	2										
	3										
K'unïč'a	1										
	2										
	3										
Yäfiäl ïkäk	1										
	2										
	3										
Mäzgär	1										
	2										
	3										
K'intarot	1										
	2										
	3										
Fäntara	1										
	2										
	3										
Yäkäft tïl k'usäl	1										
	2										
	3										
Mïst'	1										
	2										
	3										

Mädhanitoč

Yawïkal	*Sïm*	*Tïkïm*	*Tïkïm*	*Tïkïm*
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	*Mäskäl*			
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	*Mädhäne Aläm*			
21				
22				
23				
24				
25				
26				
27				
28				
29				
30	*C'ärkos*			
31				
32				
33				
34				
35				
36				
37				
38				
39				
40	*Rufael*			
41				
42				
43				
44				
45				
46				
47				
48				
49				
50	*Gäbrä Manfäs Kiddus*			
51				
52				

53				
54				
55				
56				
57				
58				
59				
60	*Kidan Mährät*			
61				
62				
63				
64				
65				
66				
67				
68				
69				
70	*Täklä Haymanot*			
71				
72				
73				

ANNEX 2.4: Questionnaire translated

FARMER
ASSOCIATION.....................................VILLAGE...PARISH.....

NAME...GFat Fat Mot Son Dau

AGE: 5....10.....15.....20.....30.....40.....50.....60.......

PLACE OF BIRTH FOR MOTHER.........................n°OF YEARS IN SCHOOL FOR CHILDREN...............

OWNERSHIP OF LIVESTOCK...........NUMBER OF YEARS IN MIGRATION................

ALTITUDE………. LONG..............................LAT..............................

NAME OF PEST/ AILMENT	REMEDY	PLANT PART USED	FRESH / DRIED	MODE	ADD.	TIME OF USE	USE	LAST USE	ORIG. OF KNOW	POSITION IN FAMILY	MALE / FEMALE
FLY	1										
FLY ON WOUND	2										
	3										
BITING FLY MAGGOT	1										
	2										
	3										
LIVESTOCK LICE	1										
	2										
	3										
JIGGER FLEA	1										
	2										
	3										
EAR TICK	1										
	2										
	3										
HIDE SHAVING	1										
	2										
	3										
EXTREME BEE REPELLENT	1										

	2										
	3										
RASHES	1										
	2										
	3										
LIVESTOCK FLEA	1										
	2										
	3										
RINGWORM	1										
	2										
	3										
CHICKEN FLEA	1										
	2										
	3										
BEE REPELLENT	1										
	2										
	3										
BEDBUG	1										
	2										
	3										
EAR PEST	1										
	2										
	3										
DONKEY PACK WOUND	1										
	2										
	3										
WEEVIL	1										
	2										
	3										
HUMAN SCABIES	1										
	2										
	3										
BODY LICE	1										
	2										
	3										
BURN	1										
	2										
	3										
LARGE BLACK ANT	1										
	2										
	3										
MAGOTTY WOUND FOR HUMANS	1										
	2										
	3										
MOSQUITO	1										

	2										
	3										
LIVESTOCK TICK	1										
	2										
CUTANEOUS LEISHMANIO SIS	1										
	2										
	3										
HEAD LICE	1										
	2										
	3										
FLEAS FOR HUMAN	1										
	2										
	3										
GOAT SCABIES	1										
	2										
	3										
HUMAN TICKS	1										
	2										
	3										
WARTS	1										
	2										
	3										
GRASSHOPPE RS	1										
	2										
	3										
LIVESTOCK MAGGOTTY WOUND	1										
	2										
	3										
STORAGE TERMITE	1										
FIELD TERMITE	2										
	3										

PLANT REMEDIES

Do you know this plant ?	What it is called	What is it used for ?	What is it used for ?	What is it used for ?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	Charcoal (finding of the True Cross)			
11				
12				
13				
14				
15				
16				
17				
18				
19				
20	Saviour of the World			
21				
22				
23				
24				
25				
26				
27				
28				
29				
30	Saint Cherkos			
31				
32				
33				
34				
35				
36				
37				
38				
39				
40	The Archangel Raphael			
41				
42				
43				
44				
45				
46				
47				
48				
49				

50	Saint Gebre Menfes Kiddus			
51				
52				
53				
54				
55				
56				
57				
58				
59				
60	The Covenant of Mercy			
61				
62				
63				
64				
65				
66				
67				
68				
69				
70	Saint Tekle Haymanot			
71				
72				
73				

ANNEX 2.5: List of villages in the communities surveyed (those in random sample are placed in bold)

MESKELO (TOTAL 18 VILLAGES)

BAHIR AMBA DIQUAL BELMANA **ADISKENNA** WORKENNA **TAGURSAN**

GELIMSIG AYATEKU WIRWERA **MEKENZEBA** WENBERBETA **ABITEKU**

GEBIU TAREGA ZOAMBA **DINK** ZARKORETEN **TABAY KASENA**

SHIMELA PA (TOTAL 27 VILLAGE)

SHIMELA WEYMAN **ARMIZI** CHAMU ARFA **ILALU SULUTA** WALKAN

ABIKINU SHASHEMAN TEGEMAN **SEMITARFA BISERTO** AMSTIE **MARZI**

BISHENKO **TALA** KAFU **TSATSU AWARANTELA** WALKEZBA **SHIMETEKU**

ZIGWAN NICHIRO **DERIMSIG BEHABENA ADDIS MENDER**

TSAMLA PA (TOTAL 12 VILLAGES)

GUTABA HULABA SEREWA **SEREGON DJIKWO GUGWANT** SHUTAN

TSAMLA SAWR **ZIRAN** DURENA **BAICHAN**

ANNEX 4.1: Correspondence between scientific and vernacular names for main pest species

Scientific name	English name	Amharic name (phonetic)	ኣማሪኛ	Preferred host	Altitude distribution	Seasonality
Echidnophaga gallinacea	Fowl flea or stick-tight flea	*Yädoro qunič'a, qunič'a, bätäka*	የዶሮ ቁኒጫ ቁኒጫ በተቃ	Poultry	Found at all altitudes	Prevalent throughout the year
Amblyomma varegatum	Cattle tick	*Mäžgär, yäkäft mäžgär*	መዥገር የከብት መዥገር	Cattle	Mainly found between 1800 and 2500 m	Throughout the year but main season between March and June
Boophilus decoloratus	Cattle tick	*Mäžgär, yäkäft mäžgär*	መዥገር የከብት መዥገር	Cattle	Mainly found between 1800 and 2500 m	Throughout the year but main season between March and June
Melophagus ovinus	Sheep ked	*K'imandjär*	ቂማንጀር	Sheep	From 2400 m upwards	Throughout the year
Psoroptes ovis	Mange mites	*Yäfiäl ikäk*	የፍየል እከክ	Sheep, goats	Found at all altitudes	Prevalent throughout the year.
*	Livestock flea	*Yäkäft qunič'a, qunič'a*	የከብት ቁኒጫ ቁኒጫ	Lambs, calves, kids. Exceptionally adult animals	All altitudes.	Throughout the year
Damalinia bovis	Livestock Biting louse	*K'imandjär, qäč'am*	ቂማንጀር ቀጫም	Cattle	Found at all altitudes	During the fodder bridging period (May-June-July) and during prolonged drought episodes
*	Type of fly	*Dibara*	ዲባራ	Cattle, equines	From 2400 m downwards	Throughout the year
Odentotermus obesus	Termite	*Mïst'*	ምስጥ	Crops	Up to 2600 m	During the crop season
Componotus compressus	Black teff eating ant	*K'inč'ara, djärgid, t'iska*	ቂንጫራ ጀርጊድ ጢስቃ	Teff	Up to 2500 m	During the crop season
Decticoides brevipennis	Wollo Bush Cricket	*Dägäza, fäntara*	ደግዛ ፈንጣራ	Crops	Up to 2500 m	During the crop season starting from September
Bruchus pisorum	Weevil	*Yatär näqäz*	ያተር ነቀዝ	Peas, lentils, faba beans	All altitudes	During the crop season
Sitophilus	Weevil	*Näqäz*	ነቀዝ	Large grain	From 2400 m	Throughout

zeamais				crops	downwards	the year
Pacnoda spp.	Sorghum chaffer	*Yämašila zïnzïnna*	የማሺላ ዝንዝና	Sorghum	From 2000 m downwards	During the crop season
Locusta migratoria	Migratory locust	*Anbät'a*	አንበጣ	All crops	All altitudes	During the crop season
Schistocera gregaria	Desert locust	*Anbät'a*	አንበጣ	All crops	All altitudes	During the crop season
Spodoptera exempta	Army worm	*Deri*	ዶሪ	All crops	Up to 2500 m	During the crop season
Tunga penetrans	Jigger flea	*Mujälle*	ሙጀሌ	Man	Approximately 2200 m up to 2500 m in the area under study	Throughout the year
Cimex lectularius	Bedbug	*Tïhwan*	ትሁዋን	Man	All altitudes	Throughout the year with a peak during the rainy season
Pediculus capitis	Head louse	*Yäras qïmal*	የራስ ቅማል	Man	All altitudes	Throughout the year
Pediculus humanus	Body louse	*Yälibs qïmal, yäsäw qäč'am*	የልብስ ቅማል የሰው ቀጫም	Man	All altitudes	Throughout the year
Pulex irritans	Flea	*Qunič'a, yäsäw qunič'a*	ቁኒጫ የሰው ቁኒጫ	Man	From 2000 m upwards	Throughout the year with strong peak between September and November.
*	Type of maggot	*Dukundukit, dukunduka*	ዱኩንዱቂት	Man	From 2400m downwards	Throughout the year
Musca domestica	Common fly	*Zimb*	ዝምብ	Man	All altitudes with predominance in lowlands	Throughout the year with strong peak in September - October
Rhipicephalus spp.	Ear tick	*Yädjoro mäžgär*	የጆሮ መዥገር	Man	From 2300 m downwards	Throughout the year
*	Ear midge or fly	*Yädjoro kunkun*	የጆሮ ቁንቁን	Man	All altitudes	Throughout the year
Amblyomma spp.	Tick	*Mäžgär, yäsäw mäžgär*	መዥገር የሰው መዥገር	Man	From 2500 m downwards	Throughout the year.
*	Mosquito	*Tänägn*	ተንኝ	Man	From 2000 m downwards	During the rainy season
Sarcoptes scabei	Mites	*Yäsäw ïkäk*	የሰው እከክ	Man	All altitudes	Throughout the year

* UNIDENTIFIED SPECIES

ANNEX 5.1: Correspondence between scientific and vernacular names for plant species used in pest management

Scientific name	*Amharic phonetic*	**አማሪኛ**	*Agawigna*	**Plant type**	**Altitude range**
FIRST PHASE (YEAR 2002)					
*.	*Mot'a* *Mat'a* *Mwat'a*	ሞጣ ማጣ መዋጣ		small tree	Up to 2000 m
Lepidium sativum	*Fit'o* *Fiet'o*	ፊጦ ፌጦ		herb	2000- 2700 m
***. Possibly Jasminum spp.**	*T'ämbäläl*	ጠምበለል		climber	Up to 2500 m
Chenopodium spp. including Chenopodium murale	*Amädmado*	አመድማዶ	*Jewzera*	herb	2000- 2700 m
Silene macroselen	*Wïgïrt*	ውግርት		herb	2000 m and above
***. Possibly Rumex spp.**	*Yayt' djoro* *Yäkola gomän* *Gomän* *Yähamle kulič'*	የአይጥ ጆሮ የቆላ ጎመን ጎመን የሃምሌ ቁሊጭ		herb	Up to 2300 m
Grewia spp. including Grewia ferruginea Grewia mollis	*Länk'wat'e* *Länk'wat'a* *Länk'ut'a* *Länk'ot'a*	ለንቅዋጤ ለንቅዋጣ ለንቁጣ ለንቆጣ		tree	1900- 2600 m
Lolium spp.	*Yäsinde ïnkïrdad* *Inkïrdad*	የስንዴ እንክርዳድ እንክርዳድ		grass	2000 m and above
Hagenia abyssinica	*Koso*	ኮሶ		tree	2500 m and above
*	*Alk'waza*	አልቆዋዛ	*Alkwaza*	tree	Up to 2000 m
Buddleja polystachya	*Anfar*	አንፋር		tree	All altitudes
Calotropis procera	*T'obiaw*	ጦቢአው		small tree	Up to 2200 m
Olea europea var. africana	*Wäyra*	ወይራ		tree	2000 m and above
Cyphostemma odenocaule	*Asärkuš* *Asärkuš* *täbätäbikuš* *Asärkuš fätäk'a*	አሰርኩሽ አሰርኩሽ ተበተቢኩሽ አሰርኩሽ ፈተቃ		creeper	1900-2600 m
Clematis hirsuta	*Yazo haräg* *Azo haräg* *Azo*	የአዞ ሃረግ አዞ ሃርግ አዞ		creeper	2000 m and above
Solanum incanum	*Yäk'olla ïmbway* *Imbway* *Tïniš ïmbway*	የቆላ እምብዋይ እምብዋይ ትኒሽ እምብዋይ		herb	Up to 2300 m
Solanum spp.	*Yädäga ïmbway* *Imbway* *Tïlik' ïmbway*	የደጋ እምብዋይ እምብዋይ ትሊቅ እምብዋይ		shrub	2400 m and above
Calpurnia aurea	*Zïgït'a* *Dïgït'a*	ዝግጣ ድግጣ		small tree	2000- 2700 m
Ozorea spp.	*Yäteb ïnč'ät*	የጤብ እንጨት		tree	Up to 2100 m
Myrtus communis	*Adäs*	አደስ		shrub	2300- 2600 m
Rumex nepalensis	*Tult* *Lit*	ቱልት ሊት		herb	?
Aloe spp.	*Ïret* *Ïret tafa* *Yäzïndjoro ïret*	እሬት እሬት ታፋ የዝንጆሮ እሬት		shrub	All altitudes
Ficus palmata	*Bäläs*	በለስ		tree	2000- 2600 m
Agave americana	*č'ärät* *Yäfäränji č'ärät* *Yäfäränji biska*	ጨረት የፈረንጂ ጨረት የፈረንጂ ቢስቃ	*Bisca*	shrub	2000- 2600 m

	K'ač'a	ቃጫ			
Dodonea angustifolia	*Kïtkïta*	ክትክጣ		small tree	2000- 2800 m
Cucumis spp.	*Yämdär ïmbway* *Ïmbway fič'ïka*	የምደር እምብዋይ እምብዋይ ፍጭቃ		creeper	1900- 2600 m
Brassica carinata	*Gomän zar* *Gomän*	ጎመን ዘር ጎመን		herb	2000- 2900 m
Cissus spp.	*T'ämäs'äs'a*	ጠመፀፃ	*Temetstsa*	climber	Up to 2100 m
Phytolacca dodecandra	*Indod* *Yämäkan ïndod*	እንዶድ የመቃን እንዶድ		shrub	2500- 2900 m
Boscia spp.	*šiša*	ሺሻ	*Shisha*	tree	Up to 2000 m
Euclea shimperi	*Dädäho*	ደደሆ		small tree	1700- 2600 m
Asparagus spp.	*Yäset kïst*	የሴት ቅስጥ		shrub	2000- 2900 m
Euphorbia tirucalli	*K'ïnč'ïb*	ቅንጭብ		tree	Up to 2200 m
Ricinus communis	*Gulo* *Gulho* *gulha*	ጉሎ ጉልሆ ጉልሃ		small tree	All altitudes
Lippia citriodora	*K'äse*	ቀሴ		herb	2000- 2600 m
Tapinanthus spp.	*T'äk'äs'äla*	ጠቀፀላ		parasite	All altitudes
***. Possibly Euphorbia spp.**	*K'ulkwal*	ቁልቋልዳ		tree	Up to 2300 m
Croton macrostachyus	*Mïsana* *Bïsana*	ምሳና ብሳና		tree	2000- 2600 m
Acokanthera schimperi	*Märäz*	መረዝ		tree	Up to 2400 m
Agave sisalana	*Yagaw č'ärät* *Yabäša č'ärät* *Bisk'a* *K'ač'a*	የአገው ጨረት የአበሻ ጨረት ቢስቃ ቃጫ	*Biska*	shrub	2000- 2600 m
***.**	*K'uliza*	ቁሊዛ		herb	Up to 2300 m
Commiphora spp. including Commiphora africana	*Ankwa* *Yäzïndjoro ankwa* *Näč' ankwa* *T'ïkur ankwa*	አንቅዋ የዝንጆሮ አንቅዋ ነጭ አንቅዋ ጥቁር አንቅዋ		tree	Up to 2200 m
Crinum spp.	*Ahak'äza*	አሃቅዛ	*ahakeza*	herb	Up to 2300 m
Ziziphus spina-christi	*Gäba* *Gaba*	ገባ ጋባ		tree	Up to 2400 m
Grewia bicolor	*Säfa* *Safa* *Saha*	ሰፋ ሳፋ ሳሃ		Small tree	Up to 2100 m
***. Possibly Kleinia spp.**	*Dwa*	ድዋ		herb	Up to 2500 m
Euphorbia ampliphylla	*K'ulk'wal*	ቁልቋልዳ		tree	1800- 2500 m
Commicarpus spp.	*Towant'äla*	ትዋንጥላ	*towantela*	herb	Up to 2300 m
Allium sativum	*Näč' šinkurt*	ነጭ ሺንኩርት		herb	Up to 2600 m
Terminalia browni	*Hïkïma*	ህክማ		tree	Up to 2200 m
Rumex nervosus	*Imbač'o* *Imbwač'o* *Imbak'ito*	እምባጮ እምብዋጮ እምባቂጠ		shrub	Up to 2700 m
Datura stramonium	*Astänagïrt*	አስተናግርት	*bebsa*	herb	Up to 2600 m
Otostegia integrifolia	*T'ïnjut* *T'unjit*	ጥንጁት ጡንጂት		shrub	2000- 2600 m
Hibiscus spp.	*Yät'äja č'ängär* *Yät'äja läbäk'*	የጥጃ ጨንገር የጥጃ ለበቅ		herb	1800- 2200 m
Commiphora spp.	*Ankwa* *Bat'uk'wa* *Fäč'uk'a*	አንቅዋ በጡቅዋ ፈጩቃ	*Batukwa*	tree	Up to 2200 m

Senna singueana	*Buša* *Bušbuša* *Bubuša*	ቡሻ ቡሽቡሻ ቡቡሻ		small tree	Up to 2400 m
SECOND PHASE (2003)					
Osyris spp.	*K'ärät'*	ቅረጥ		small tree	
Acacia spp.	*Grar* *Käy grar*	ቃየ ግራር		tree	
Hordeum vulgare	*Gäbs*	ገብስ		grass	
Malvia spp.	*Tult* *Lit*	ቱልት ልት		herb	
Rhus retinorrhoea	*Yädäga talo* *Talo*	የደጋ ታሎ ታሎ		tree	
Linum usitatissimum	*T'alba*	ጣልባ		herb	
Bersama abyssinica	*Azamär*	አዛመር		tree	
Sida spp.	*č'äfäräg*	ጨፈረግ		shrub	
Thea sinensis	*šay*	ሻየ		shrub	
Eragrostis teff	*T'äf*	ጤፍ		grass	
Triticum sp. aestivum	*Sïnde*	ስንዴ		grass	
Myrica salicifolia	*šinät*	ሺነት		tree	
Capsicum frutescens	*Bärbäre*	በርበሬ		herb	
***. Possibly Maytenus spp.**	*K'ok'oba* *K'uk'uba*	ቆቆባ ቁቁባ		tree	
Carthamus tinctorius	*Suf* *šuf*	ሱፍ ሹፍ		herb	
Pterolobium stellatum	*K'änt'af* *K'änt'afa*	ቀንጣፍ ቀንጣፋ		shrub	
Amaranthus spp	*Aluma* *Aluma gomän*	አሉማ አሉማ ጎመን		herb	
Rhoicissus tridentata **Cissus rotundifolia**	*Aba wäldiye* *Aba wälduwa*	አባ ወልደዬ አባ ወልድዋ		shrub	
***. Possibly Laggera tomentosa**	*Kubätabna*	ኩበትአብና		herb	
Satureja spp.	*Yäras k'ät'äl* *Yagaw k'ät'äl*	የራስ ቀጠል የአገው ቀጠል		herb	
Cymbopogon citratus	*T'äj sar*	ጥጅ ሳር		herb	
*	*K'uč'äm*	ቁጭም		shrub	
*	*Fät'äk'a* *Fatik'a*	ፈጠቃ ፋጢቃ		tree	
*	*T'unbuf*	ጡንቡፍ		small tree	
Eucalyptus camaldulensis	*Bahïr zaf*	ባህር ዛፍ		tree	
Becium grandiflorum	*Mänt'äsie*	መንጠሴ		shrub	
Verbascum sinaiticum	*Yäjib č'ama* *K'ut'int'ina* *Isatabïrd*	የጂብ ጫማ ቁጢንጢና እሳታብርድ		herb	
Ficus vasta	*Warka*	ዋርቃ		tree	
Juniperus procera	*S'ïd*	ፅድ		tree	
Erica arborea	*Ast'*	አስጥ		tree	
Ruta chalepensis	*T'enadam*	ጤናዳም		herb	
Rumex abyssinicus	*Mokmoko*	ሞክሞኮ		herb	
Hyparrhonia spp.	*Sänbälät*	ሰንበለት		grass	
Ferula communis	*Dog*	ዶግ		herb	
Pisum sativum	*Atär*	አተር		herb	
Stereospermum spp.	*Arizana* *Arazina*	አሪዛና አራዚና		tree	

	Zana *Yädoro gäday*	ዛና የዶሮ ገዳይ			
Cordia africana	*Wanza*	ዋንዛ		tree	
Citrus aurentifolia	*Lomi*	ሎሚ		tree	
Vicia faba	*Bakäla*	ባከላ		herb	
*	*Yäk'uruba mädhanit*	የቁሩባ መድሃኒት		shrub	
Nicotiana tabacum	*T'imbaho*	ጢምባሆ		herb	
*	*Yäjoro asfi* *Yäjoro asfat*	የጆሮ አስፊ የጆሮ አስፋት		fir	
Echinops spp.	*Kušäle*	ኩሸሌ		herb	
Rhus natalensis	*Yäkola talo* *Talo*	የቆላ ታሎ ታሎ		small tree	
Dombeya spp.	*Wälkäfa*	ወልከፋ		tree	
Ficus spp.	*T'ulusa*	ጡሉሳ		tree	
***. Possibly Mentha spp.**	*šal*	ሻል		herb	
Capparis spp.	*Gumäro* *Gmäro*	ጉመሮ ግመሮ		small tree	
Acacia spp.	*Grar* *T'ïk'ur grar*	ግራሪ ጥቁር ግራር		tree	
***.**	*K'uk'waša* *K'wak'uša*	ቁቋሻ ቋቁሻ		grass	
***. Possibly Impatiens spp.**	*Guršit*	ጉርሺት		tree	
Acacia spp.	*Gorgoro*	ጎርጎሮ		small tree	
Acacia spp.	*Grar* *Näč' grar*	ግራር ነጭ ግራር		tree	
***. Possibly Bidens spp.**	*č'uba* *Yäsäytan märfie*	ጨባ የሰይጣን መርፌ		herb	
Notonia coccinea	*T'ibšit* *T'išbit*	ጢብሺት ጢሽቢት		herb	
Ficus spp	*Bamba*	ባምባ		tree	
*	*Sibkana*	ሲብቃና	*sibkana*	tree	
*	*Yayt' šoh*	የአይጥ ሾህ		shrub	
Acacia spp.	*Abik'a*	አቢቃ		tree	
Phaseolus vulgaris	*Adängware*	አደንግዋሬ		herb	
Guizotia abyssinica	*Nug*	ኑግ		herb	
*	*Bägagänän*	በጋገነን		herb	
***. Possibly Mimosoidae family.**	*S'alwa* *T'wala* *Näč' s'alwa*	ፃሏ ጥዋላ ነጭ ፃላ	*Tsalwa*	small tree	
***. Possibly Mimosoidae family.**	*S'alwa* *T'wala* *K'ay s'alwa* *Yäzïnjoro s'alwa*	ፃሏ ጥዋላ ቀይ ፃላ	*Tsalwa*	small tree	
*	*Get'e*	ጌጤ		tree	
*	*Inkoy*	እንቆይ		tree	
*	*Yäwuha alkwaza*	የዉሃ አልቅዋዛ		algae	
***. Possibly Cucurbitaceae family.**	*Yäk'äl k'ät'äl*	የቅል ቅጠል		creeper	
***.**	*Ïbrätkana*	እብረትከና		tree	
Lens culinaris	*Mïsïr*	ምስር		herb	
Kalanchoe spp.	*Indahula*	እንዳሁላ		herb	

Not seen and not known as distinct species					
????	*Mušäršära*	ሙሽርሽራ			
????	*Bïnbäna*	ብንበና			
????	*Lïkïfitï*	ልክፍት			
????	*Zïwa*	ዝዋ			
?????	*Suk'uk'a*	ሱቁቃ			
?????	*T'amäna*	ጣምና			
????	*Yaynät mädhanit*	የአይነት መድሃኒት			
????	*Sarawora*	ሳራውራ			
????	*Mïwat'*	ምዋጥ			

*: no flowering specimen available for identification.

ANNEX 5.2: Critical values for X^2 and t

X^2

DoF	99 %	95 %	90 %	70 %	50 %	30 %	10 %	5 %	1 %
1	0.0002	0.003	0.02	0.15	0.46	1.07	2.71	3.84	6.64
2	0.02	0.1	0.21	0.71	1.39	2.41	4.6	5.99	9.21
3	0.12	0.35	0.58	1.42	2.37	3.67	6.25	7.82	11.34
4	0.3	0.71	1.06	2.2	3.36	4.88	7.78	9.49	13.28
5	0.55	1.14	1.61	3	4.35	6.06	9.24	11.07	15.09
6	0.87	1.64	2.2	3.83	5.35	7.23	10.65	12.59	16.81
7	1.24	2.17	2.83	4.67	6.35	8.38	12.02	14.07	18.48
8	1.65	2.73	3.49	5.53	7.34	9.52	13.36	15.51	20.09

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ONE-TAILED SIGNIFICANCE				
DoF	10 %	5 %	2.5 %	0.5 %
TWO-TAILED SIGNIFICANCE				
DoF	20 %	10 %	5 %	1 %
100	1.29	1.66	1.98	2.63

ANNEX 6.1: Qualitative perceptions of the change in availability of selected plant species over the last 30 years

0: same, -1: less, -2: much less, 1: more, 2: much more, ?: unclear

MESKELO

Species (Amharic)	Species (Latin)	Perceived change	Underlying reasons of change mentioned by farmers
Zïgïta	Calpurnea aurea	-1	Expansion of agriculture Fewer hedges
Tinjut	Otostegia integrifolia	0	Always grows well on eroded or rocky soil Fast dissemination
Märänz	Akocanthera shimperi	-2	Harvesting Expansion of agriculture
Wäyra	Olea europea var africana	-2	Harvesting Expansion of agriculture
Inkïrdad	Lolium temulentum	+1	Common wheat weed Decreasing yields
Iret	Aloe spp.	0	Semi-cultivated Fast spreading
Yabäša č'ärät	Agave sisalana	-1	Uprooting Switch to exogenous species
Yäfäränji č'ärät	Agave americana	+2	Recently introduced from Korem Faster growth, better fencing
Wïgïrt	Silene macroselen	-2	Over-harvesting for market Agriculture expansion
Azo haräg	Clematis hirsuta	-1	Expansion of agriculture Fewer trees for support
Länkwat'e	Grewia mollis	-1	Expansion of agriculture Harvesting
Kitkita	Dodonea angustifolia	+1	Predominant bush on degraded woodland
Imbač'o	Rumex nervosus	0	Expansion of agriculture Fast spreading
Gulho	Ricinus communis	-1	No replanting
Fieto	Lepidium sativum	0	Mixed cultivation with flax
č'amra	Otostegia spp.	-1	Expansion of agriculture
Yädäga ïmbuay	Solanum spp	0	Fast dissemination
Yäkolla ïmbuay	Solanum spp	-1	???
Quliza	???	0	Common weed
Asärkuš	Cyphostemma odenocaule	-1	Expansion of agriculture Fewer hedges
Käse	Lippia citriodora	-1	???
Amädmado	Chenopodium spp	-1	???
Bäläs	Ficus palmata	-2	Over-harvesting
Kosso	Hagenia abyssinica	-2	Expansion of agriculture Over-harvesting

Tult	Rumex spp	**+1**	Common weed Fast spreading Smaller yields
Anfar	Buddleja polystachia	**0**	Fast spreading Fast (re)-growth
Kulkwal	Euphorbia ampliphylla	**-2**	Expansion of agriculture Over-harvesting
Addäs	Myrtus communis	**+2**	Market cultivation
Gomänzar	Brassica carinata	**0**	Mixed cultivation with barley
Bïsana	Croton macrostachyus	**-1**	Expansion of agriculture
Yämdär ïmbuay	Cucumis spp.	**0**	Common weed
Yäset k'ïst	Asparagus spp	**0**	Expansion of agriculture Fast growth
Indod	Phytolacca dodecandra	**+1**	Market cultivation

SHIMELA

Amharic name	Latin name	Perceived change	Underlying reasons of evolution mentioned by farmers
Fieto	Lepidium sativum	**0**	Mixed cultivation
Amädmado	Chenopodium spp	**-1**	Fewer animals and backyard dung heaps
Wïgïrt	Silene macroselen	**-2**	Over-harvesting Expansion of agriculture
Länk'wate	Grewia mollis	**-1**	Harvesting (fuel wood) Expansion of agriculture
Inkirdad	Lolium temulentum	**0**	Common wheat weed
Anfar	Buddleja polystachia	**-1**	Harvested (fuel wood) Erosion run-offs
Tobia	Calotropis procera	**+1**	Recent *däbtära* introduction
Wäyra	Olea europea var africana	**-2**	Harvesting 1984 drought
Asärkuš	Cyphostemma odenocaule	**0**	
Azo	Clematis hirsuta	**-1**	Drought
Kolla ïmbuay	Solanum spp	**0**	Common weed
Tämbäläl	Jasminum spp.	**-1**	Harvesting Agriculture expansion
Zïgïta	Calpurnea aurea	**0**	
Tult	Rumex spp	**0**	Common weed
Iret	Aloe spp	**0**	Fast spreading Semi cultivated
Bäläs	Ficus palmata	**-2**	Harvesting Erosion run-offs

Yäfäränji č'ärät	Agave americana	**+1**	Recent introduction from Korem
Kitkita	Dodonea angustifolia	**-1**	Harvesting Expansion of agriculture
Yämdir ïmbuay	Cucumis prophetarum	**-1**	Expansion of agriculture (ploughing cuts root)
Gomänzar	Brassica carinata	**0**	Mixed cultivation with barley
Siša	Boscia spp.	**-1**	Drought
Dädäho	Euclea shimperi	**-1**	Harvesting Expansion of agriculture
Yäset k'ïst	Asparagus spp	**-1**	Expansion of agriculture Fewer hedges
K'ïnčib	Euphorbia tirucalli	**+1**	Introduction from lowlands as first church plantation
Gulho	Ricinus communis	**-1**	Drought One variety extinct
Käse	Lippia citriodora	**-1**	Expansion of agriculture
Č'amra	Otostegia spp.	**-1**	Expansion of agriculture
Kalkalda	Euphorbia spp	**+1**	Brought by *däbtäras* from neighbouring communities
Bïsana	Croton macrostachyus	**-1**	Harvesting Expansion of agriculture
Märänz	Akocanthera shimperi	**-2**	Harvesting Uprooting due to erosion run
Yabäša čärät	Agave sisalana	**-1**	Competition with exogenous variety Slow growth
Quliza	???	**0**	Common weed
Wïfč'iš	Momordicus spp	**-1**	Over harvesting Expansion of agriculture Fewer hedges
Ankwa	Commiphora spp	**-1**	Harvesting Uprooting due to erosion run offs
Gäba	Ziziphus spina-christi	**-1**	Expansion of agriculture 1984 drought
Säfa	Grewia bicolor	**-1**	Expansion of agriculture 1984 drought
Kulkwal	Euphorbia ampliphylla	**-2**	Over harvesting Uprooting due to erosion run-offs
Tohwant'äla	Commicarpus plumbagineus	**-2**	Expansion of agriculture Fewer hedges
Imbačo	Rumex nervosus	**-1**	Expansion of agriculture
Hïküma	Terminalia browni	**-1**	Harvesting Drought
Astänagïrt	Datura stramonium	**-1**	Smaller herds Smaller backyard dung heaps
Tinjut	Otostegia integrifolia	**-1**	Expansion of agriculture
T'ïja č'ängär	Hibiscus crassinervus	**-1**	Expansion of agriculture
Batukwa	Commiphora spp	**?**	Over-harvesting Hedge planting inside villages
Bubuša	Senna singuinea	**-1**	Expansion of agriculture

TSAMLA

Amharic name	Latin name	Perceived change	Underlying reasons of evolution mentioned by farmers
Mota	???	**-1**	Expansion of agriculture
Fieto	Lepidium sativum	**0**	Mixed cultivation with linseed
T'ämbäläl	Jasminum abyssinicum	**-1**	Harvested
Wïgïrt	Silene macroselen	**-1**	Harvested Expansion of agriculture
Länkwat'e	Grewia mollis	**0**	
Alqwaza	???	**-1**	Harvesting
Täb ïnčät	Ozorea spp.	**0**	
Siša	Boscia spp.	**0**	
Gomänzar	Brassica carinata	**0**	Mixed cultivation with barley
Hamït'sa	Cissus spp.	**-1**	Expansion of agriculture Fewer trees
Dädäho	Euclea shimperi	**0**	Fast sprouting and growth
K'ïnčib	Euphorbia tirucalli	**0**	Church introduction
Gulha	Ricinus communis	**-1**	
Č'amra	Otostegia spp.	**-1**	Expansion of agriculture
K'alkalda	Euphorbia spp	**-1**	Expansion of agriculture
Märänz	Akocanthera shimperi	**-1**	Harvesting Expansion of agriculture
Quliza	???	**0**	Common weed
Wïfč'iš	Momordicus spp.	**-1**	Over-harvesting Expansion of agriculture
Ankwa	Commiphora spp.	**-1**	Harvesting Expansion of agriculture
Batukwa	Commiphora spp.	**-2**	Over-harvesting
Gäba	Ziziphus spina-christi	**0**	Fast regeneration
Saha	Grewia bicolor	**-1**	Expansion of agriculture
Dwa	Kleinia spp.	**-1**	Over-harvesting
K'ulkwal	Euphorbia ampliphylla	**-2**	Over-harvesting Expansion of agriculture
Towant'äla	Commicarpus plumbagineus	**-1**	Expansion of agriculture Fewer hedges
Hïkïma	Terminalia browni	**-1**	Harvesting (fuel wood, construction)
Tinjut	Otostegia integrifolia	**0**	

ANNEX 7.1: Plant continua for the smoke medium

Pest to pest continua:

	1^{st} pest remedies	2^{nd} pest remedies	Remedy overlap	% 1^{st} pest	% 2^{nd} pest
FLEA CHICKEN FLEA	9	11	8	89%	73%
FLY FLEA	13	9	5	38%	56%
FLY CHICKEN FLEA	13	11	5	38%	45%
BEDBUG FLEA	7	9	5	71%	56%
FLEA WEEVIL	9	6	5	56%	83%
CHICKEN FLEA WEEVIL	11	6	5	45%	83%
FLY WEEVIL	13	6	4	31%	67%
BEDBUG CHICKEN FLEA	7	11	4	57%	36%
FLY BEDBUG	13	7	3	23%	43%
FLY MOSQUITO	13	3	3	23%	100%
BEDBUG WEEVIL	7	6	3	43%	50%
MOSQUITO CHICKEN FLEA	3	11	3	100%	27%
FLEA MOSQUITO	9	3	3	33%	100%
FLY GROUND MAGGOTT	13	2	2	15%	100%
FLY CATTLE FLEA	13	2	2	15%	100%
GROUND MAGGOTTBEDBUG	2	7	2	100%	29%
GROUND MAGGOTTFLEA	2	9	2	100%	22%
GROUND MAGGOTTCATTLE FLEA	2	2	2	100%	100%
GROUND MAGGOTTCHICKEN FLEA	2	11	2	100%	18%
GROUND MAGGOTTWEEVIL	2	6	2	100%	33%
BEDBUG MOSQUITO	7	3	2	29%	67%
BEDBUG CATTLE FLEA	7	2	2	29%	100%
MOSQUITO WEEVIL	3	6	2	67%	33%
FLEA CATTLE FLEA	9	2	2	22%	100%
CATTLE FLEA CHICKEN FLEA	2	11	2	100%	18%
CATTLE FLEA WEEVIL	2	6	2	100%	33%
GROUND MAGGOTTMOSQUITO	2	3	1	50%	33%
MOSQUITO CATTLE FLEA	3	2	1	33%	50%
FLEA CATTLE LICE	9	1	1	11%	100%
CATTLE LICE CHICKEN FLEA	1	11	1	100%	9%
FLY CATTLE LICE	13	1	0	0%	0%
GROUND MAGGOTTCATTLE LICE	2	1	0	0%	0%
BEDBUG CATTLE LICE	7	1	0	0%	0%
MOSQUITO CATTLE LICE	3	1	0	0%	0%
CATTLE LICE CATTLE FLEA	1	2	0	0%	0%
CATTLE LICE WEEVIL	1	6	0	0%	0%

Pest to non pest continua

	Pest remedies	Non pest remedies	Remedy overlap	% pest	% non pest
FLY BEE REPELLENT	13	16	9	69%	56%
CHICKEN FLEA BEE REPELLENT	11	16	8	73%	50%
FLEA BEE REPELLENT	9	16	6	67%	38%
WEEVIL BEE REPELLENT	6	16	4	67%	25%
MOSQUITO BEE REPELLENT	3	16	3	100%	19%
BEDBUG BEE REPELLENT	7	16	2	29%	13%
GROUND MAGGOT BEE REPELLENT	2	16	1	50%	6%
CATTLE LICE BEE REPELLENT	1	16	1	100%	6%
CATTLE FLEA BEE REPELLENT	1	16	1	100%	6%
FLY COFFEE CEREMONY	13	8	4	31%	50%
FLEA COFFEE CEREMONY	9	8	3	33%	38%
BEDBUG COFFEE CEREMONY	7	8	2	29%	25%
MOSQUITO COFFEE CEREMONY	3	8	2	67%	25%
CHICKEN FLEA COFFEE CEREMONY	11	8	2	18%	25%
WEEVIL COFFEE CEREMONY	6	8	2	33%	25%
GROUND MAGGOT COFFEE CEREMONY	2	8	0	0%	0%
CATTLE LICE COFFEE CEREMONY	1	8	0	0%	0%
CATTLE FLEA COFFEE CEREMONY	2	8	0	0%	0%
FLY POT FLAVOR SMOKE	13	7	5	38%	71%
CHICKEN FLEA POT FLAVOR SMOKE	11	7	5	45%	71%
FLEA POT FLAVOR SMOKE	9	7	3	33%	43%
WEEVIL POT FLAVOR SMOKE	6	7	3	50%	43%
GROUND MAGGOT POT FLAVOR SMOKE	2	7	1	50%	14%
BEDBUG POT FLAVOR SMOKE	7	7	1	14%	14%
MOSQUITO POT FLAVOR SMOKE	3	7	1	33%	14%
CATTLE LICE POT FLAVOR SMOKE	1	7	1	100%	14%
CATTLE FLEA POT FLAVOR SMOKE	2	7	1	50%	14%
FLY ZAR SMOKE	13	6	3	23%	50%
FLEA ZAR SMOKE	9	6	3	33%	50%
BEDBUG ZAR SMOKE	7	6	2	29%	33%
MOSQUITO ZAR SMOKE	3	6	2	67%	33%
CHICKEN FLEA ZAR SMOKE	11	6	2	18%	33%
WEEVIL ZAR SMOKE	6	6	1	17%	17%
GROUND MAGGOTTZAR SMOKE	2	6	0	0%	0%
CATTLE LICE ZAR SMOKE	1	6	0	0%	0%
CATTLE FLEA ZAR SMOKE	2	6	0	0%	0%

Pest to non pest continua (aggregated)

(household smoke = bee repellent + coffee ceremony + pot flavour smoke + zar smoke)

	Pest remedies	Non pest remedies	Remedy overlap	% pest	% non pest
FLY HOUSEHOLD SMOKE	13	14	8	62%	57%
CHICKEN FLEA HOUSEHOLD SMOKE	11	14	7	64%	50%
FLEA HOUSEHOLD SMOKE	9	14	6	67%	43%
BEDBUG HOUSEHOLD SMOKE	7	14	4	57%	29%
WEEVIL HOUSEHOLD SMOKE	6	14	4	67%	29%
MOSQUITO HOUSEHOLD SMOKE	3	14	3	100%	21%
GROUND MAGGOT HOUSEHOLD SMOKE	2	14	2	100%	14%
CATTLE FLEA HOUSEHOLD SMOKE	2	14	2	100%	14%
CATTLE LICE HOUSEHOLD SMOKE	1	14	1	100%	7%
ALL PESTS HOUSEHOLD SMOKE	20	14	10	50%	71%

ANNEX 7.2: Plant continua for the ground floor medium

Pest to pest continua

	1st pest remedies	2nd pest remedies	Remedy overlap	% 1st pest	% 2nd pest
BEDBUG FLEA	11	13	10	91%	77%
GROUND MAGGOT BEDBUG	11	11	9	82%	82%
GROUND MAGGOT FLEA	11	13	8	73%	62%
FLEA HEAP TERMITE	13	12	4	31%	33%
GROUND MAGGOT HEAP TERMITE	11	12	3	27%	25%
BEDBUG HEAP TERMITE	11	12	3	27%	25%

Pest to non pest continua

	Pest remedies	Non pest remedies	Remedy overlap	% pest	% non pest
FIELD TERMITE EVIL EYE	3	3	2	67%	67%
BEDBUG CUSHION	11	2	2	18%	100%
FLEA CUSHION	13	2	2	15%	100%
GROUND MAGGOT CUSHION	11	2	1	9%	50%

ANNEX 7.3: Plant continua for the rubbing / washing medium

Pest to pest continua

	1st pest remedies	2nd pest remedies	Remedy overlap	% 1st pest	% 2nd pest
LIVESTOCK LICE LIVESTOCK FLEA (a)	34	28	24	71%	86%
HEAD LICE LIVESTOCK LICE (b)	25	34	13	52%	38%
HEAD LICE LIVESTOCK FLEA	25	28	12	48%	43%
SCABIES CATTLE TICK	25	21	11	44%	52%
LIVESTOCK LICE CATTLE TICK	34	21	10	29%	48%
LIVESTOCK FLEA CATTLE TICK	28	21	10	36%	48%
BODY LICE LIVESTOCK LICE (b)	15	34	9	60%	26%
BODY LICE LIVESTOCK FLEA	15	28	9	60%	32%
LIVESTOCK FLEA MANGE MITES (a)	28	14	9	32%	64%
JIGGER FLEA SCABIES (a)	12	25	8	67%	32%
SCABIES HEAD LICE	25	25	8	32%	32%
SCABIES MANGE MITES (b)	25	14	8	32%	57%
LIVESTOCK LICE MANGE MITES (a)	34	14	8	24%	57%
CATTLE TICK MANGE MITES (a)	21	14	8	38%	57%
SCABIES LIVESTOCK LICE	25	34	7	28%	21%
BODY LICE HEAD LICE	15	25	7	47%	28%
HEAD LICE CATTLE TICK	25	21	7	28%	33%
SCABIES BODY LICE	25	15	6	24%	40%
SCABIES LIVESTOCK FLEA	25	28	6	24%	21%
WOUND FLY CATTLE TICK	10	21	5	50%	24%
JIGGER FLEA CATTLE TICK	12	21	5	42%	24%
EAR PEST LIVESTOCK LICE	8	34	5	63%	15%
BODY LICE CATTLE TICK	15	21	5	33%	24%
BODY LICE MANGE MITES	15	14	5	33%	36%
HEAD LICE MANGE MITES	25	14	5	20%	36%
WOUND FLY JIGGER FLEA	10	12	4	40%	33%
WOUND FLY HEAD LICE	10	25	4	40%	16%
WOUND FLY LIVESTOCK LICE	10	34	4	40%	12%
JIGGER FLEA MANGE MITES	12	14	4	33%	29%
EAR TICK EAR PEST	7	8	4	57%	50%
EAR TICK HEAD LICE (a)	7	25	4	57%	16%
EAR TICK CATTLE TICK (b)	7	21	4	57%	19%
EAR PEST HEAD LICE	8	25	4	50%	16%
EAR PEST LIVESTOCK FLEA	8	28	4	50%	14%
WOUND FLY EAR TICK	10	7	3	30%	43%
WOUND FLY SCABIES	10	25	3	30%	12%
WOUND FLY LIVESTOCK FLEA	10	28	3	30%	11%
WOUND FLY MANGE MITES	10	14	3	30%	21%
EAR TICK SCABIES	7	25	3	43%	12%
EAR TICK LIVESTOCK LICE	7	34	3	43%	9%
EAR TICK LIVESTOCK FLEA	7	28	3	43%	11%
EAR PEST CATTLE TICK	8	21	3	38%	14%
WOUND FLY EAR PEST	10	8	2	20%	25%

WOUND FLY BODY LICE	10	15	2	20%	13%
JIGGER FLEA EAR TICK	12	7	2	17%	29%
JIGGER FLEA BODY LICE	12	15	2	17%	13%
JIGGER FLEA HEAD LICE	12	25	2	17%	8%
JIGGER FLEA TICK	12	3	2	17%	67%
JIGGER FLEA LIVESTOCK LICE	12	34	2	17%	6%
EAR PEST MANGE MITES	8	14	2	25%	14%
SCABIES TICK	25	3	2	8%	67%
TICK CATTLE TICK	3	21	2	67%	10%
TICK MANGE MITES	3	14	2	67%	14%
FLY MOSQUITO	1	2	1	100%	50%
FLY CATTLE TICK	1	21	1	100%	5%
WOUND FLY TICK	10	3	1	10%	33%
JIGGER FLEA EAR PEST	12	8	1	8%	13%
JIGGER FLEA LIVESTOCK FLEA	12	28	1	8%	4%
EAR TICK BODY LICE	7	15	1	14%	7%
EAR TICK TICK	7	3	1	14%	33%
EAR TICK MANGE MITES	7	14	1	14%	7%
EAR PEST SCABIES	8	25	1	13%	4%
EAR PEST BODY LICE	8	15	1	13%	7%
EAR PEST TICK	8	3	1	13%	33%
MOSQUITO CATTLE TICK	2	21	1	50%	5%
HEAD LICE TICK	25	3	1	4%	33%
TICK LIVESTOCK LICE	3	34	1	33%	3%
TICK LIVESTOCK FLEA	3	28	1	33%	4%
FLY WOUND FLY	1	10	0	0%	0%
FLY JIGGER FLEA	1	12	0	0%	0%
FLY EAR TICK	1	7	0	0%	0%
FLY EAR PEST	1	8	0	0%	0%
FLY SCABIES	1	25	0	0%	0%
FLY BODY LICE	1	15	0	0%	0%
FLY HEAD LICE	1	25	0	0%	0%
FLY TICK	1	3	0	0%	0%
FLY LIVESTOCK LICE	1	34	0	0%	0%
FLY LIVESTOCK FLEA	1	28	0	0%	0%
FLY MANGE MITES	1	14	0	0%	0%
FLY WEEVIL	1	4	0	0%	0%
WOUND FLY MOSQUITO	10	2	0	0%	0%
WOUND FLY WEEVIL	10	4	0	0%	0%
JIGGER FLEA MOSQUITO	12	2	0	0%	0%
JIGGER FLEA WEEVIL	12	4	0	0%	0%
EAR TICK MOSQUITO	7	2	0	0%	0%
EAR TICK WEEVIL	7	4	0	0%	0%
EAR PEST MOSQUITO	8	2	0	0%	0%
EAR PEST WEEVIL	8	4	0	0%	0%
SCABIES MOSQUITO	25	2	0	0%	0%
SCABIES WEEVIL	25	4	0	0%	0%
BODY LICE MOSQUITO	15	2	0	0%	0%
BODY LICE TICK	15	3	0	0%	0%

BODY LICE WEEVIL	15	4	0	0%	0%
MOSQUITO HEAD LICE	2	25	0	0%	0%
MOSQUITO TICK	2	3	0	0%	0%
MOSQUITO LIVESTOCK LICE	2	34	0	0%	0%
MOSQUITO LIVESTOCK FLEA	2	28	0	0%	0%
MOSQUITO MANGE MITES	2	14	0	0%	0%
MOSQUITO WEEVIL	2	4	0	0%	0%
HEAD LICE WEEVIL	25	4	0	0%	0%
TICK WEEVIL	3	4	0	0%	0%
LIVESTOCK LICE WEEVIL	34	4	0	0%	0%
LIVESTOCK FLEA WEEVIL	28	4	0	0%	0%
CATTLE TICK WEEVIL	21	4	0	0%	0%
MANGE MITES WEEVIL	14	4	0	0%	0%

Pest to non pest continua

	Pest remedies	Non pest remedies	Remedy overlap	% pest	% non pest
WOUND FLY SKIN RASHES	10	11	4	40%	36%
JIGGER FLEA SKIN RASHES	12	11	4	33%	36%
CATTLE TICK SKIN RASHES	21	11	4	19%	36%
SCABIES SKIN RASHES	25	11	3	12%	27%
HEAD LICE SKIN RASHES	25	11	2	8%	18%
MANGE MITES SKIN RASHES	14	11	2	14%	18%
EAR TICK SKIN RASHES	7	11	1	14%	9%
EAR PEST SKIN RASHES	8	11	1	13%	9%
TICK SKIN RASHES	3	11	1	33%	9%
LIVESTOCK LICE SKIN RASHES	34	11	1	3%	9%
LIVESTOCK FLEA SKIN RASHES	28	11	1	4%	9%
FLY SKIN RASHES	1	11	0	0%	0%
BODY LICE SKIN RASHES	15	11	0	0%	0%
MOSQUITO SKIN RASHES	2	11	0	0%	0%
WEEVIL SKIN RASHES	4	11	0	0%	0%
HEAD LICE RINGWORM	25	18	10	40%	56%
LIVESTOCK LICE RINGWORM	34	18	7	21%	39%
EAR PEST RINGWORM	8	18	5	63%	28%
LIVESTOCK FLEA RINGWORM	28	18	5	18%	28%
EAR TICK RINGWORM	7	18	4	57%	22%
CATTLE TICK RINGWORM	21	18	4	19%	22%
SCABIES RINGWORM	25	18	3	12%	17%
WOUND FLY RINGWORM	10	18	2	20%	11%
JIGGER FLEA RINGWORM	12	18	1	8%	6%
BODY LICE RINGWORM	15	18	1	7%	6%
MOSQUITO RINGWORM	2	18	1	50%	6%
TICK RINGWORM	3	18	1	33%	6%
MANGE MITES RINGWORM	14	18	1	7%	6%
FLY RINGWORM	1	18	0	0%	0%
WEEVIL RINGWORM	4	18	0	0%	0%

LIVESTOCK LICE PACK WOUND	34	36	8	24%	22%
LIVESTOCK FLEA PACK WOUND	28	36	8	29%	22%
HEAD LICE PACK WOUND	25	36	6	24%	17%
SCABIES PACK WOUND	25	36	5	20%	14%
MANGE MITES PACK WOUND	14	36	5	36%	14%
JIGGER FLEA PACK WOUND	12	36	4	33%	11%
CATTLE TICK PACK WOUND	21	36	4	19%	11%
EAR TICK PACK WOUND	7	36	3	43%	8%
WOUND FLY PACK WOUND	10	36	2	20%	6%
EAR PEST PACK WOUND	8	36	2	25%	6%
BODY LICE PACK WOUND	15	36	1	7%	3%
TICK PACK WOUND	3	36	1	33%	3%
FLY PACK WOUND	1	36	0	0%	0%
MOSQUITO PACK WOUND	2	36	0	0%	0%
WEEVIL PACK WOUND	4	36	0	0%	0%
SCABIES LEISHMANIOSIS	25	15	8	32%	53%
JIGGER FLEA LEISHMANIOSIS	12	15	7	58%	47%
CATTLE TICK LEISHMANIOSIS	21	15	3	14%	20%
MANGE MITES LEISHMANIOSIS	14	15	3	21%	20%
WOUND FLY LEISHMANIOSIS	10	15	2	20%	13%
LIVESTOCK LICE LEISHMANIOSIS	34	15	2	6%	13%
HEAD LICE LEISHMANIOSIS	25	15	1	4%	7%
TICK LEISHMANIOSIS	3	15	1	33%	7%
FLY LEISHMANIOSIS	1	15	0	0%	0%
EAR TICK LEISHMANIOSIS	7	15	0	0%	0%
EAR PEST LEISHMANIOSIS	8	15	0	0%	0%
BODY LICE LEISHMANIOSIS	15	15	0	0%	0%
MOSQUITO LEISHMANIOSIS	2	15	0	0%	0%
LIVESTOCK FLEA LEISHMANIOSIS	28	15	0	0%	0%
WEEVIL LEISHMANIOSIS	4	15	0	0%	0%
SCABIES HUMAN WOUND	25	49	16	64%	33%
LIVESTOCK LICE HUMAN WOUND	34	49	14	41%	29%
HEAD LICE HUMAN WOUND	25	49	13	52%	27%
CATTLE TICK HUMAN WOUND	21	49	11	52%	22%
JIGGER FLEA HUMAN WOUND	12	49	10	83%	20%
LIVESTOCK FLEA HUMAN WOUND	28	49	10	36%	20%
WOUND FLY HUMAN WOUND	10	49	8	80%	16%
MANGE MITES HUMAN WOUND	14	49	7	50%	14%
EAR TICK HUMAN WOUND	7	49	6	86%	12%
EAR PEST HUMAN WOUND	8	49	4	50%	8%
BODY LICE HUMAN WOUND	15	49	3	20%	6%
MOSQUITO HUMAN WOUND	2	49	2	100%	4%
TICK HUMAN WOUND	3	49	2	67%	4%
FLY HUMAN WOUND	1	49	1	100%	2%
WEEVIL HUMAN WOUND	4	49	0	0%	0%
JIGGER FLEA LIVESTOCK WOUND	12	26	11	92%	42%

SCABIES LIVESTOCK WOUND	25	26	11	44%	42%
CATTLE TICK LIVESTOCK WOUND	21	26	9	43%	35%
HEAD LICE LIVESTOCK WOUND	25	26	5	20%	19%
MANGE MITES LIVESTOCK WOUND	14	26	5	36%	19%
WOUND FLY LIVESTOCK WOUND	10	26	4	40%	15%
EAR TICK LIVESTOCK WOUND	7	26	4	57%	15%
BODY LICE LIVESTOCK WOUND	15	26	3	20%	12%
LIVESTOCK LICE LIVESTOCK WOUND	34	26	3	9%	12%
LIVESTOCK FLEA LIVESTOCK WOUND	28	26	3	11%	12%
EAR PEST LIVESTOCK WOUND	8	26	2	25%	8%
TICK LIVESTOCK WOUND	3	26	2	67%	8%
FLY LIVESTOCK WOUND	1	26	1	100%	4%
MOSQUITO LIVESTOCK WOUND	2	26	1	50%	4%
WEEVIL LIVESTOCK WOUND	4	26	0	0%	0%
BODY LICE SOAP	15	14	11	73%	79%
HEAD LICE SOAP	25	14	8	32%	57%
LIVESTOCK LICE SOAP	34	14	8	24%	57%
LIVESTOCK FLEA SOAP	28	14	7	25%	50%
SCABIES SOAP	25	14	6	24%	43%
CATTLE TICK SOAP	21	14	4	19%	29%
MANGE MITES SOAP	14	14	3	21%	21%
WOUND FLY SOAP	10	14	2	20%	14%
JIGGER FLEA SOAP	12	14	2	17%	14%
EAR TICK SOAP	7	14	2	29%	14%
FLY SOAP	1	14	0	0%	0%
EAR PEST SOAP	8	14	0	0%	0%
MOSQUITO SOAP	2	14	0	0%	0%
TICK SOAP	3	14	0	0%	0%
WEEVIL SOAP	4	14	0	0%	0%
HEAD LICE HAIR COSMETICS	25	13	12	48%	92%
LIVESTOCK FLEA HAIR COSMETICS	28	13	8	29%	62%
LIVESTOCK LICE HAIR COSMETICS	34	13	8	24%	62%
CATTLE TICK HAIR COSMETICS	21	13	6	29%	46%
SCABIES HAIR COSMETICS	25	13	5	20%	38%
WOUND FLY HAIR COSMETICS	10	13	4	40%	31%
BODY LICE HAIR COSMETICS	15	13	3	20%	23%
EAR TICK HAIR COSMETICS	7	13	3	43%	23%
MANGE MITES HAIR COSMETICS	14	13	3	21%	23%
EAR PEST HAIR COSMETICS	8	13	2	25%	15%
FLY HAIR COSMETICS	1	13	0	0%	0%
JIGGER FLEA HAIR COSMETICS	12	13	0	0%	0%
MOSQUITO HAIR COSMETICS	2	13	0	0%	0%
TICK HAIR COSMETICS	3	13	0	0%	0%
WEEVIL HAIR COSMETICS	4	13	0	0%	0%
HEAD LICE BURN	25	30	8	32%	27%
LIVESTOCK LICE BURN	34	30	8	24%	27%

LIVESTOCK FLEA BURN	28	30	7	25%	23%
CATTLE TICK BURN	21	30	7	33%	23%
SCABIES BURN	25	30	6	24%	20%
WOUND FLY BURN	10	30	4	40%	13%
EAR TICK BURN	7	30	4	57%	13%
BODY LICE BURN	15	30	4	27%	13%
EAR PEST BURN	8	30	3	38%	10%
MANGE MITES BURN	14	30	3	21%	10%
JIGGER FLEA BURN	12	30	2	17%	7%
TICK BURN	3	30	2	67%	7%
FLY BURN	1	30	0	0%	0%
MOSQUITO BURN	2	30	0	0%	0%
WEEVIL BURN	4	30	0	0%	0%
JIGGER FLEA WART	12	14	8	67%	57%
SCABIES WART	25	14	7	28%	50%
MANGE MITES WART	14	14	6	43%	43%
CATTLE TICK WART	21	14	5	24%	36%
WOUND FLY WART	10	14	4	40%	29%
LIVESTOCK LICE WART	34	14	4	12%	29%
HEAD LICE WART	25	14	3	12%	21%
BODY LICE WART	15	14	2	13%	14%
TICK WART	3	14	2	67%	14%
LIVESTOCK FLEA WART	28	14	2	7%	14%
EAR TICK WART	7	14	1	14%	7%
EAR PEST WART	8	14	1	13%	7%
FLY WART	1	14	0	0%	0%
MOSQUITO WART	2	14	0	0%	0%
WEEVIL WART	4	14	0	0%	0%
HEAD LICE HAIR	25	13	12	48%	92%
LIVESTOCK LICE HAIR	34	13	8	24%	62%
LIVESTOCK FLEA HAIR	28	13	8	29%	62%
CATTLE TICK HAIR	21	13	6	29%	46%
SCABIES HAIR	25	13	5	20%	38%
WOUND FLY HAIR	10	13	4	40%	31%
EAR TICK HAIR	7	13	3	43%	23%
BODY LICE HAIR	15	13	3	20%	23%
MANGE MITES HAIR	14	13	3	21%	23%
EAR PEST HAIR	8	13	2	25%	15%
TICK HAIR	3	13	2	67%	15%
JIGGER FLEA HAIR	12	13	1	8%	8%
FLY HAIR	1	13	0	0%	0%
MOSQUITO HAIR	2	13	0	0%	0%
WEEVIL HAIR	4	13	0	0%	0%

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Amharic books

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List of acronyms

ANRS	Amhara National Regional State
DDT	Dichloro-Diphenyl-Trichloro-ethane
GID	Gastro Intestinal Disorders
GPS	Global Positioning System
MSF	Médecins Sans Frontières
NGO	Non Governmental Organisation
TNRS	Tigrean National Regional State
TPLF	Tigrean People Liberation Front

Glossary of Amharic terms used

A

abatačïn[36]	literally "our parents"; "our ancestors" in the broadest sense (people from the previous generation, both family and non family members).
adängware	lowland legume crop particularly sensitive to weevil infestation.
adäs	shrub species. Myrtus salicifolia.
addis mändär	literally 'new village'. Name often given to newly established villages or settlements.
adhbar	pre-Christian spiritual entity. Nowadays sometimes regrouped with the fallen angels under the Christian generic *agannent* or *Säytan* (devil, Satan). Synonimous with *qolle*, *wuqabe*.
agannent	generic term used by members of the Orthodox Christian faith to describe fallen angels *sensu stricto* and a number of pre-Christian spirits.
agwagot	skin rashes / scales. Common skin condition among young children in Wag Hamra.
alämoč'	wasting disease caused by spirits, possibly *zars*.
alqwaza	unidentified tree species.
amädmado	herb species. Chenopodium spp.
amoč'	plant species. Crinum spp.. Also used as a generic term by farmers to designate plants with "a bulb remedy".
anbäta	Locusta migratoria. Migratory locust whose devastating invasions are interpreted by farmers as a sign of the wrath of God.
anfar	tree species. Buddleja polystachia.
ankwa	tree species. Commiphora spp.
arawit	wild animals.

[36] The Amharic phonetical transcripion used is taken from David Appleyard's Colloquial Amharic published by Routledge in 1995.

arsoadär	literally "to rest having ploughed". Commonly used to describe farmers, particularly highland Amhara farmers.
astänagïrt	plant species. Datura stramonium. Literally "that which makes one speak".
atär näqäz	pea weevil. Bruchus pisorum. Pigeon pea is no longer cultivated in the area under study because of the very high infestation levels of this new pest.
awalya	midwife.
awoqi	wise.
Awraja	administrative unit used in Imperial times, corresponding to the equivalent of a District.
azmari	itinerant troubadour and poet.

B

bahïr kulkwal	succulent plant species. Opuntia ficus-indica.
bal	tradition.
bäläs	tree species. Ficus palmata.
Bal Igziabher	Celebration of the day of God. Celebrated as *Bal Wond* in other areas of the highlands
balmädhanit	local plant expert.
balzar	*zar* doctor, person who orchestrates *zar* ceremonies.
bäräro	cockroach.
bätäka	chicken flea. Echidnophaga gallinacea.
batukwa	tree species. Commiphora africana.
bebsa	Agawigna name for Datura stramonium.
bïl	clever, bright.
bimbi	generic term used to describe any small irritating and flying insects such as flies, midges, mosquitos, etc.
birr	Ethiopian currency (£1 = birr 16)

bïsana	tree species. Croton macrostachyius.
biska	Agawigna name for Agave spp.
bubuša	small tree species. Senna singuinea.
buda	Person who possesses the evil eye as well as other powers, such as the ability to transform himself at will into a hyena and the ability to kill someone slowly by breaking a twig of a certain plant.
bukbuka	generic term used to designate any rotten mouldy wood as well as specific tree species, whose rotten mouldy wood is much sought after for household fumigation purposes.

C

č'at	shrub species. Catha edulis.
č'ärät	plant species. Agave spp.
č'ič'an	small ants (unidentified species) that attack bee-hives. Also used as a generic term to describe any small-sized ants.
č'ïrt	skin rashes / scales. Common skin condition among young children in Wag Hamra.

D

däbtära	ambiguous character of the northern highlands of Ethiopia. He is simultaneously a professor of religious studies (poetry, liturgical dancing and singing, etc), a healer and occasionally a sorcerer. According to tradition, the *däbtäras* are the descendants of the clerics who accompanied the Ark of the Covenant on its journey from Jerusalem to Ethiopia.
dädäho	small tree. Euclea shimperi.
däga	cool high altitude belt (>2500). Also used by farmers as a relative altitude marker to indicate any higher altitude, regardless of the Cartesian altitude level.
dägäza	Wollo Bush Cricket. Decticoides brevipennis.
dämära	bundle of sticks burnt during the celebration of the finding of the True Cross. It is used in Wag to purify the inside of houses for the whole year. The way and direction in which it falls after burning are interpreted as omens for the forthcoming year.

damotra	unidentified household insect pest species from the lowlands of Ziqualla.
Derg	authoritarian military marxist regime led by Mengistu Haile Maryam that prevailed in Ethiopia from 1976 to 1991.
deri	army worm. Spodoptera exempta.
didit	DDT powder.
dog	herb species. Ferula communis.
dokma	tree species. Syzygium spp.
dukundukit	ground maggot. Unidentified species.
dwa	plant species. Kleinia sp.

E

ensät	endemic crop species. False banana. Ensete ventricosum.
ensasat	domesticated animals.

F

fäntara	grasshopper. Unidentified species.
fiet'o	fenugreek. Lepidium sativum.
fre	plant fruit.

G

gäba	tree species. Ziziphus spina-christi.
ganel	devil.
Genbot Lideta	This particular day marks the annual celebration of the birth of the Virgin Mary, whilst also being for some people the day during which animals are sacrificed and food offerings are presented in front of the abode of spirits (*adhbar, qolle, wuqabe*) in various places (big trees, rivers, household, etc) in order to obtain blessing and household protection for the rest of the year.

gïnt'	scorpion.
gota	small grain store located inside the household. It is used to store the grain to be prepared and eaten during a few days.
gotära	main large household grain store.
Gott	local administrative unit at community level encompassing up to several villages.
grar	tree species.Acacia spp.
gulho	small tree species. Ricinus communis.
gurmit	a particular type of wound.

H

hamït'sa	creeper species. Cissus spp.
hïkïma	tree species. Terminalia browni. Commonly used as *bukbuka* in Wag Hamra.

I

ïkäk	scabies.
ïmbwač'o	shrub species. Rumex nervosus
ïndod	shrub species. Phytolacca dodecandra
ïnjära	traditional Ethiopian pancake made either of *täff*, wheat, barley or sorghum.
ïnkïrdad	herb species. Lolium spp.
ïsatabïrd	literally "that cools the fire". Generic term describing several plant species used to treat burn wounds.

J

jergid	Agawigna term for chicken flea. Echidnophaga gallinacea.

K

kädjämäro	literally "since the time of Adam".
kalkalda	plant species. Euphorbiaceae spp.
käntafa	shrub species. Pterolobium stellatum.
k'ärät	small tree species. Osyris spp.
k'imandjär	livestock lice. Damalinia bovis.
kinč'eara	large ant that feeds on newly sown *täff*. Componotus compressus.
k'ïnč'ib	tree species. Euphorbia tirucalli.
k'intarot	wart.
kitkita	shrub species. Dodonea angustifolia.
kosso	tree species. Hagenia abyssinica.
kubätabna	herb species. Laggera spp.
k'ulkwal	tree species. Euphorbia ampliphylla.
kurro	strangles disease caused by the bacterium Streptococcus equii. Only affects equines.
kutintina	herb species. Verbascum sinaiticum.
kwakuša	ringworm.

L

länk'wate	tree species. *Grewia spp.*
läzälalem	literally "for eternity".
lïkïfït	contamination of matter (water, food) by a devil. Contact with or ingestion of the contaminated substance is believed to cause serious illnesses.
lit	herb species. Malva spp. Used interchangeably with *tult*.

M

mäntäsie	shrub species. Becium ovatum.
märänz	tree species. Akocanthera shimperi.
mäs'hafa anbäta	literally "the book of locusts". Esoteric *däbtära* remedy against migratory locusts.
mäžgär	tick. Amblyomma spp.
mïst'	termite. Odentotermus obesus.
mujälle	jigger flea. Tunga penetrans.
mušäršära	unidentified plant species used to treat burn wounds.

N

näč' šinkurt	garlic. Allium sativum.
näfsat	all moving living creatures.
näqäz	grain weevil. Sitophilus zeamais.

Q

qïne	study of poetry in that form part of the *däbtära* curriculum.
qolla	hot low altitude belt (<1500). Also used by farmers as a relative altitude marker to indicate any lower altitude, regardless of the Cartesian altitude level.
qolle	pre-Christian spiritual entity. Nowadays sometimes regrouped with the fallen angels under the Christian generic *agannent* or *Säytan* (devil, Satan). Synonimous with *adhbar*, *wuqabe*.
qunič'a	common flea. Pulex irritans.
qunisa	unidentified plant species.

S

šäläme	household fumigation treatment for patients suffering from wasting diseases inflicted by spirits. Plants fumigated are often aromatic.

šärarit	generic term for any spider species.
säw	human being.
Säytan	In its narrowest sense, the term describes the fallen archangel Satanael. In its broadest and generic sense, the term encompasses the fallen angels (devils), as well as a cohort of pre-Christian spirit entities (*adhbar, wuqabe, selabi, zar, shotelai, ayntela*, etc).
Shotälai	evil spiritual entity known to target and harm foetuses in the womb.
šifta	highway robber, vagabond.
šinät	tree species. <u>Myrica salicifolia</u>.
šïnkurt	bulb, onion.
šiša	tree species. <u>Boscia spp</u>.

T

täbay	'vermin' or 'insect', 'any animal which eats grain'.
täj sar	herb species. <u>Cymbopogon citratus</u>.
täkät'säla	parasite plant species. <u>Tapinanthus spp</u>, the plant *par excellence* of the *däbtära.*
talo	tree species. <u>Rhus retinhorrea</u>.
tämbäläl	plant species. <u>Jasminum abyssinicum.</u>
tank'ol	malice, foul-play.
t'ankway	sorcerer, seer. Type of *däbtära* that practices black magic.
teff	<u>Eragrostis teff</u>.
timbaho	plant species. <u>Nicotiana spp</u>. including <u>Nicotiana glauca</u> and <u>Nicotiana tabacum</u>.
t'inziza	large black and orange bumble bee (unidentified species).
t'iska	Agawigna name for chicken flea. Echidnophaga gallinacea.
tobia	plant species. <u>Calotropis procera.</u>

tohwan	bedbug. Cimex lectularius.
towant'äla	herb species. Commicarpus plumbagineus.
t'salwa	unidentified tree species. Mimosoideae family.
tult	herb species. Rumex species. Used interchangeably with *lit*.
tundjit	shrub species. Otostegia integrifolia.

W

Wagshum	literally "the one appointed for Wag". Hereditary title granted to the Agaw king by the newly appointed Amhara emperor following the overthrow of the Zagwe dynasty and the restauration of the Solomonid dynasty.
wanza	tree species. Cordia africana.
warka	tree species. Ficus vasta.
wäyra	tree species.Olea africana var. europea.
wïfč'ïš	plant species. Momordicus spp.
wïgïrt	plant species. Silene macroselen.
wogiesa	traditional bone setter.
Woräda	current adminstrative division equivalent to a district. Is further divided into Farmers Associations.
woyna däga	warm mid altitude belt (>1600, <2500). This altitude marker is hardly used by farmers in the study area.
wuba	malaria.

Y

yabäša	"Ethiopian" in general with an Amhara-Tigray emphasis.
yabäša č'ärät	plant species. Agave sisalana.
yädäga ïmbuay	herb species. Solanum spp.
yädäga talo	tree species. Rhus retinorrhoea.

yädjoro kunkun	described as ear pest or ear worm in the study area (unidentified species).
yädjoro mäžgär	ear tick. Ripicephalus sp.
yädorogäday	tree species. Stereospermum spp.
yädoro qunič'a	chicken flea. Echidnophaga gallinacea.
yäfäränji	"non-Ethiopian".
yäfiäl ïkäk	skin condition affecting goats and to a lesser extent sheep. Caused by the attack of microscopic and invisible mites (Psoroptes spp.), it is responsible for what is otherwise known as goat scabies or mange mites.
yagaw č'äråt	plant species. Agave sisalana.
yagaw kätäl	herb species. Satureja sp.
yägäbs ïnkïrdad	literally "the *ïnkïrdad* of the barley". Lolium spp.
yäjibamoč'	plant species. Crinum spp.
yäjibč'ama	plant species. Verbascum sinaiticum)
yäjibšïnkurt	plant species. Crinum spp.)
yäkäft quniča	livestock flea (unidentified flea species).
yäkolla ïmbuay	shrub species. Solanum incanum.
yäkolla talo	tree species. Rhus natalensis.
yäkolla zïmb	literally "the lowland fly". Derogatory expression used by highland people to stigmatise lowland people.
yälïbs kämal	body lice. Pediculus humanus.
yämašila zinzinna	literally " the sorghum beetle". Pacnoda sp.
yämder ïmbuay	plant species. Cucumis ficifolius.
yäras kämal	head lice. Pediculus capitis.
yäsäw ayn	literally "the eye of the person". Indirect way of describing the evil eye.
yäsäw qunič'a	common flea. Pulex irritans.

yäset kïst	shrub species. Asparagus spp.
yäsinde ïnkïrdad	literally "the *ïnkïrdad* of the wheat". Lolium temulentum.
yäyn wog	literally "the piercing power of the eye" in reference to the evil eye.
yayt šoh	unidentified shrub species

Z

zämämän	a type of millipede (unidentified).
zar	the *zar* cult refers to a group of spirits and practices relating to these spirits and their function. It is one of the spirit possession cults. *Zar* is an invisible supernatural power capable of reading the future, a doctor in time of illness and capable of causing destruction, plague and death if people do not pay respect to him.
zema	religious / theological studies that form part of the *däbtära* curriculum.
zïgïta	small tree species. Calpurnea aurea.
zïmb	common fly. Musca domestica.