

A young boy with short-cropped hair is seen from behind, sitting on a large, weathered log. He is wearing a light-colored, short-sleeved t-shirt and blue shorts. The background is a lush, green rural landscape with various trees and vegetation under a clear sky.

Rose C. Fagbemissi

EXPERTS FROM NECESSITY

Agricultural knowledge of children orphaned
by AIDS in the Couffo region, Benin

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Rose Chekoun-Ola Fagbemissi

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Experts from Necessity

Agricultural knowledge of children
orphaned by AIDS in the Couffo region, Benin

Rose Chekoun-Ola Fagbemissi

Thesis

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Dedicated to my late father Essoun Fagbemissi, to my son Geraud Mensah,
and to the children of the Couffo region

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Chapter 1

**General introduction
to the study**

1.1 Research problem and objectives

This chapter provides the background to the thesis. The rationale of studying the intergenerational farming knowledge differences in the context of AIDS¹ in Benin is provided as well as the research questions. The chapter closes with an articulation of the organization of the thesis and overview of chapters.

HIV² is no longer only a health problem but has become a multi-faceted development issue, particularly on the Africa continent. The pandemic is a leading cause of prime-age adult mortality in African countries (Barnett and Grellier, 2003; Lie, 2008; UNAIDS, 2008). There is also a rise in orphanhood as a consequence of a rise in parental death (Makumbi et al., 2005; Dewagt and Connolly, 2005; UNAIDS, 2008). Subsequently, there is a widespread concern among international agencies about the future of African children made orphans by AIDS. Although important assistance and care are provided through various kinds of interventions, the fate of the children living in farming communities is yet to be informed by systematic and accurate research. Evidence-informed decision makers in agricultural development and food security would be in a better position to make policies for improving the quality of life of orphaned children. (Jayne et al., 2004; Panos, 2008; UNICEF, 2006).

One of the areas of growing concern about rural child development is the erosion of agricultural knowledge in relation to the fact that HIV causes the death of adults in their most productive age. Adult death, as the direct impact of the HIV pandemic, is often projected with great concern to potentially cause a break in the intergeneration transmission of traditional/local knowledge from adult farmers to children. Such a loss of farming knowledge could cause further rural disintegration for generations to come. The above are important concerns and yet there is virtually no empirical research on this. Thus, the main objectives of this study are to:

1. contribute to the body of knowledge on the impact of AIDS on farm children who are orphans, their farm knowledge and their problem solving strategies, and
2. identify critical factors that need to be taken into account to best support orphans as child farmers.

The study draws upon methods and techniques in ethnobiology and ethnoecology, with the aim of providing a systematic account to address the

1 Acquired Immune Deficiency Syndrome.

2 Human Immune Deficiency Virus.

assumed loss of knowledge in a west African context. It consisted of researching from various angles, possible gaps between the generation of adults and that of children within a rural community affected by AIDS, for which farming is the main source of livelihood generation. The main expected output is to determine differences in local knowledge and expertise about farming between children orphaned by AIDS and children who have both parents in relation to adult knowledge.

The study of knowledge in this thesis is built around crop pest problems. This choice was made for several reasons. Crop pest knowledge forms a sub-domain of farming knowledge and farmers often put their knowledge of this domain into use in their pest management strategies (FAO³, 2006; Nathaniels, 2005; Price, 2001). Consequently, a journey into the pathways through which farmers address pest problems on their farms is a valuable standpoint to examine the combined effect of AIDS affection and generation on agricultural knowledge. The present study examines pest problems in maize and cowpea, and particularly the ways these problems are addressed by adults and children who farm in a region affected by AIDS.

Relevance of the study

The study has societal and scientific relevance. With respect to its societal relevance, the study provides an overview of the diversity of the children orphaned by AIDS in the Couffo region of Benin, and contributes to understanding the dynamics within the household arrangement of care to children. It also contributes to elucidating the links of AIDS to differences in agricultural knowledge within a relatively homogenous farming community. The study also illuminates the strategies and social networks that different categories of children and adults use to mobilize resources for pest management in food crops. This kind of information is relevant to rural development practitioners who are interested in supporting and training orphans, vulnerable children and rural youth.

The scientific relevance derives from systematically verifying the hypothesis of knowledge decline that is often associated with the impact of AIDS on farming communities. In addition, there has been very little research so far on the process by which farmers, especially young farmers, use or build connections in situations of social stress such as that of AIDS. The study also makes a methodological contribution in the sense that it provides insights on how to do research on children orphaned by AIDS. Such research poses numerous challenges relating to, for example, the tracing of children orphaned by AIDS, assessing relevant diversity among them, and collecting meaningful

3 United Nations Food and Agriculture Organisation.

data from children. Ultimately, this study provides an empirical account of intergenerational knowledge differences in an AIDS affected area, and sheds light on the background of different knowledge, problem solving pathways and pest control practices in the context of AIDS.

1.2 Context and Background

1.2.1 Agricultural problems, and the impact of AIDS in Benin and in Africa

Benin is a West African country with a population of 7 million inhabitants, among which 49% are younger than 30 (RGPH3⁴, 2002). Agriculture and related activities play an important role in Benin's national economy (CERPA⁵, 2004; ESR, 1994). However, the agricultural landscape is characterized by small farms and poor yields (Saidou et al., 2004). These poor yields are generally due to a host of socioeconomic, institutional and agronomic problems (Adegbola and Gardebroek, 2007; Polson and Spencer, 1991). Among the agronomic challenges to small scale farming, the literature often refers to problems such as a decline in soil fertility, poor quality of seed varieties; and pest and disease problems (Agossou et al., 2005; Fagbemissi et al., 2002; FAO, 1999; IITA⁶, 1996; IITA, 2000; Mulder, 2002; Saidou et al., 2004).

Couffo is one of twelve regions (provinces) of the country. It is located in south-west Benin and covers 2,404 square kilometers. The total population was estimated to be 524,586 inhabitants in 2002 (RGPH3, 2002⁷), with a density of 218 inhabitants per square kilometer. It shares a border with Togo in the west. The climate is subequatorial with four seasons: two rainy seasons and two dry seasons. The Couffo region is comprised of six local government municipalities namely: Aplahoué, Djakotomey, Dogbo, Klouékanmey, Lalo and Toviklin. The principal ethnic or cultural group is the Adja (88%), speaking a language of the same name. There are also Fon people and other minority ethnic groups. Agriculture and small business are the main occupations of the population.

Maize and cowpea are the dominant plants in the Couffo farm landscape. The total maize production for 2004 in the Couffo is 47,741 tons for a total cultivated area of 49,197 hectares. Data for cowpea for the same year show 7,451 tons for 12,922 hectares (CERPA, 2004)⁸.

4 Troisième Recensement Général de la Population (Benin Third Population Census), 2002.

5 Centre Régional pour la Promotion de l'Agriculture.

6 International Institute of Tropical Agriculture.

7 Recensement général de la population et de l'habitat (national census).

8 Centre régional de promotion agricole (previously known as Carder).

Farmers' solutions to pest problems depend largely on the resources they have. Resources include tangible (mainly productive resources) and non-tangible resources, such as knowledge (indigenous or scientific) and social networks, all of which are linked to cultural, agro-ecological, socio-economic and institutional contexts. In a situation where farm households are faced with AIDS, they often also face the serious erosion of resources including labor and livestock, and resort to coping strategies. Ultimately, making a living by AIDS-affected households involves a day-to-day negotiation in order to gain access to the necessary resources, especially for agricultural activities (Haddad and Gillespie, 2001). Hence, AIDS has increased the precariousness of life for millions of smallholders (Jayne et al., 2004). The disease has complicated the ability of afflicted households⁹ to solve the problems they face in their farming activities (Loevinsohn and Gillespie, 2003).

Earlier studies in several African countries indicated a shift towards an increasing number of children taking on adult responsibilities in the domain of agriculture and food security (Dewagt and Connolly, 2005; Manzolillo Nightingale, 2000; Rugalema et al., 1999). In connection with this there has been a widespread concern about whether children made orphans by AIDS have sufficient access to agricultural knowledge, whereby it is often assumed that inter-generational transfer of knowledge is under threat in communities affected by AIDS (FAO, 2005; Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003). This may involve knowledge of the bio-physical environment which is necessary for the survival of farming communities, and also knowledge needed to preserve the agroecology. Even in the absence of the HIV pandemic the availability of such knowledge is a concern (Davidson-Hunt and Berkes, 2003; Ohmagari and Berkes, 1997; Posey, 1999; Price, 2001; Ruddle, 1993; Salick, 1997; Thiébaud, 1996). The expectation is that the prevalence of HIV will go along with a loss of indigenous and other knowledge, and that this will undermine the food production capability of rural communities (FAO, 2000; ICAD¹⁰, 2001; IFAD, 2002). In the West African context, this assumed erosion of agricultural knowledge in AIDS-affected communities has so far not been systematically studied and tested. In this line, the present study focuses on how people use agricultural knowledge in solving crop pest problems in a rural area affected by AIDS in Benin, and compares affected and non-affected maize and cowpea farmers, with a special emphasis on knowledge differences between orphans and adults.

9 An afflicted household is a household in which at least one member is either ill or has died of AIDS. For analytical purpose, one cover category was used: the affected households which comprised the afflicted ones but also the households in which the orphans lived with their guardians who provided them with care and support of all kind.

10 Interagency Coalition on AIDS and Development.

The study on which this thesis is based intended not only to look at possible intergenerational differences in knowledge and their causes, but also to uncover differences between different categories of children farmers in a relatively high HIV prevalence area of the Couffo region in south-west Benin. The study examined different sub-groups of farmers: orphan farmers (girls and boys 10 to 14 years old) in comparison with adults (men and women). It investigated the steps people take when they are faced with a given crop pest and disease problem, how they access and mobilize resources such as land, knowledge, inputs (pesticides, insecticides, fertilizers, seed varieties) through social networks, and how this shapes their choice for solutions to deal with the problems in maize and cowpea cultivation. The main hypothesis is that different categories of orphans and adults have both different knowledge and different access to resources (material and non material), which in turn affects the solutions they choose and hence their pest control practices.

The research proceeded through the following axes: the children orphaned by AIDS and their households were, in a first step, located, counted and characterized to understand the diversity of their day-to-day life situations. Later on, orphans engaged in farming were identified and further profiled. Secondly, the study proceeded to document and analyze maize and cowpea farmers' knowledge in the agricultural domain in relation to their AIDS affection status and the generation they belonged to. In the following step, the pest problem solving process was studied. This consisted of examining the differential pathways followed by farmers of various categories to address crop pests. In the last step, the differential networks used to mobilize knowledge and non-knowledge resources to address pest problems were documented and analyzed. While the study considered the gendered nature of knowledge and productive resources, the focus has been placed on differences related to generation (age group) and AIDS affection status.

AIDS and rural orphans in Benin

One of the common features of the impact of AIDS on rural life is that an increasing number of children need to take on adult responsibilities (Loevinsohn and Gillespie, 2003; Rugalema et al., 1999). These vulnerable children mainly have to provide food for themselves and for their households (Action for Orphans, 2001; Bollinger et al., 1999; Rugalema et al., 1999; Smart, 2003). The next section introduces AIDS-related orphanhood in Benin.

Benin is among countries with an overall low national HIV prevalence (UNAIDS¹¹, 2004). However, there are several areas of high rates (above 7% -

11 United Nations' Program on HIV and AIDS.

PNLS¹², 2003). According to the literature, AIDS is an important cause of the death of adults in their most productive age (15 to 49) especially in rural areas (FAO, 2000; IFAD¹³, 2001; PNLS, 2003; UNAIDS, 1998 and 2004). When adults die they often leave orphans behind, who subsequently struggle to make a living. To date, it is difficult to have an accurate account of the numerical importance of children orphaned by AIDS in Benin. However, UNAIDS (2004) reported an estimated 48,000 of such orphans based on a 3.3% infection rate. According to the serosurveillance report of the PNLS (2003), there are at least 32,810 registered as children orphaned by AIDS in Benin. Since people tend to send orphans to work in big cities there are more orphans in Cotonou, the biggest city, than in any other place in the country. This migration from rural areas to big cities goes along with child traffic and adds to child vulnerability (Bollinger et al., 1999; UNICEF, 2003a and 2006).

There is lack of research on children orphaned by AIDS in Benin. However, it is often reported that these children particularly lack affection and care (IFAD/NGO, 2004) and are abandoned by relatives and community members due to stigma associated to the pandemic. Currently, there are only a few institutions that provide care and support for the orphans.

Benin has a national policy for the mitigation of the impacts of AIDS (Gouvernement du Benin, 2007; PNLS, 2003; UNDP-MS, 2006). However, in this policy there is little specific attention to rural and agricultural issues. Rural children orphaned by AIDS in Benin involved in agriculture are also not included in national policy to mitigate the impacts of AIDS (Bollinger et al., 1999; UNDP-MS, 2006). In the Beninese context, Bollinger et al. (1999) speculated on the lack of appropriate agricultural knowledge and productive resources as a result of the loss of the parental generation. From other contexts it is also reported that the death of adults may be followed by a subsequent loss of traditional local knowledge (Barnett et al., 1995; Rugalema et al., 1999; Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003). This is a serious concern since their knowledge is the first resource people turn to when facing adverse situations (FAO, 2001; Manzollilo Nightingale, 2000; Niehof, 2004). However, the 'loss of knowledge' claim as yet, is not supported by systematic empirical evidence, and hence must be seen as a hypothesis that may be confirmed or rejected.

In the Kenyan context, Rugalema et al. (1999) report that orphans of nine years old and above are involved in agricultural activities and are often confronted with pest control and soil fertility management problems. In Benin, crop pests are also among the most important technical limitations to food security in

12 Programme National de Lutte contre le Sida (National Program for the responses to AIDS).

13 International Fund for Agricultural Development.

the context of small scale farming (Saidou et al., 2004; Mulder, 2002). Thus, crop pests can be a useful entry point for studying knowledge differences in Benin.

Crop pests constitute a well-bounded agricultural sub-domain of which a significant body of knowledge exists. Agricultural research continues to develop new knowledge and technologies in this realm. Likewise, rural communities also hold a considerable body of indigenous knowledge in crop pest and disease control (CTA, 1998; Richards, 1985; Warren, 1991; World Bank, 2000). Pests problems are more pronounced when coupled with soil fertility depletion or inappropriate land use patterns (Adegbola and Arouna, 2004; Agossou et al., 2005). The situation is even worse in the face of AIDS, with the loss of assets and key resources (Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003).

1.2.2 The children orphaned by AIDS in the Couffo region

The Couffo region is one of the most AIDS affected regions in Benin (6% against an average of 2% for the country). Building upon the third general population census in Benin (RGPH3, carried out in February, 2002) a census co-organized by IFAD-NGO and Plan International reported a total of 37,372 orphans, which represents 12% of the population. As in the rest of the country, people do not like to take the HIV test. As a result, the local census organized to create a database on children orphaned by AIDS reveals that there are numerous orphans but it is difficult to index them as orphaned from AIDS. Table 1 shows the result of the orphan's census in Couffo.

Table 1: Orphan status per age group in Couffo

Age group	Paternal orphans	Maternal orphans	Double orphans	Total
0-4	3.382	810	281	4473
5-9	10.377	2.619	1.167	14.163
10-14	10.265	2.488	1.454	14.207
15-17	3.248	776	505	4529
Total	27.272 (73%)	6.693 (18%)	3.407 (9%)	37.372

Source: Orphans census in Couffo, June 2004 - IFAD-NGO/Plan-Benin.

Table 1 shows that the bulk of the orphans are children age 5 to 14 years old. In addition, almost 50% of them are not enrolled in school, and only 380 are officially registered as children made orphans by AIDS on a voluntary basis. The preparatory study that was part of this research project (see chapter 3) showed that even those in school devote considerable time to household activities. In addition, we found that the surviving parent or the care provider cannot always afford to pay for school fees. This is consistent with a forecasted increase in school withdrawal (Bollinger et al., 1999; IFAD-NGO¹⁴/Plan-Benin, 2004). The results from the preparatory study also suggest that fatherless orphans are by far the most significant in number in the Couffo. Often these children must help their mothers in a large range of on-farm and off-farm activities to secure food and income (Bollinger et al., 1999; FAO, 2000; UNAIDS, 2002, 2004 and 2006). Those who lost both parents are either in foster families, trafficked, or simply abandoned. Extended families or foster relatives do not always have answers to the problems the orphans must confront (Fagbemissi, 2005)¹⁵.

Children orphaned by AIDS engaged in agricultural activities constitute a very heterogeneous group. Empirical observations from the field show that they reside in various types of households and cultivate various crops. In the Couffo region, the children, like adults, grow mainly maize and cowpea, followed by pepper and groundnut in some cases¹⁶. Maize and cowpea are also the staple food crops for the majority of the households in the Couffo region. Moreover, within the households affected by AIDS, these two crops play important roles: maize is grown mainly for the household food consumption, while cowpea is produced to secure cash money to be invested in maize production and to fulfill other basic needs. For children orphaned by AIDS involved in farming activities, having or accessing appropriate knowledge is important to achieving food security.

1.3 Research questions

In view of the above, the overall research question that guided this research was as follows:

14 Institut de Formation et d'Action pour le Développement des Initiatives Communautaires Durables (French denomination of a local NGO working on training and facilitation of grassroots development initiatives).

15 Fagbemissi, C.R. 2005. Reconnaissance Survey. Exploring Children orphaned by AIDS' Agricultural Problems and Knowledge in Benin. Personal field report, July 2005, Wageningen University, the Netherlands.

16 See Fagbemissi (2005) mentioned above.

Are there any differences between what child farmers orphaned by AIDS know and do, compared to non-orphan farming children and adult farmers in addressing maize and cowpea pests, and what are the foundations of these differences, if any?

More specifically, the research questions were:

1. What is the magnitude of AIDS orphanhood in the Couffo, and what are the demographic and livelihood characteristics of households that contained children orphaned by AIDS?
2. What differences exist among maize and cowpea farmers (adults and children) with different AIDS affection status regarding their stocks of pest knowledge?
3. What differences exist among cowpea farmers (adults and children) with different AIDS affection status regarding the process through which they solve pest problems, and the solutions and practices that they choose?
4. What differential social networks do farmers (adults and children) with different AIDS affection status use to mobilize knowledge and other resources in dealing with pest problems?

1.4 Structure of the thesis ⁱ

The thesis starts by exploring the concept of knowledge in chapter 2. The chapter provides a conceptual lens focused on the intersections of AIDS affection, the generation to which farmers belong, and their combined linkages with farmer's agricultural knowledge. It is anticipated that the way farmers address pest problems is correlated with whether they are affected or not by AIDS. The core orientation of the conceptual design is ethnobiology and ethnoecology which situate knowledge as an element of culture and language as a gateway to uncovering traditional agroecological knowledge. This is supplemented by a problem solving perspective as a way to uncover how farmers use their knowledge in a given situation.

Chapter 3 presents an overview of the design of the study, its methodology - the techniques and strategies - that were used for data collection and analyses. Not all the chapters in the thesis use exactly the same methods and tools. Thus, this chapter is important in the sense that it gives a global overview and articulation of the research. One of the main components of the design resides in a community census organized in order to build a reliable database on children orphaned by AIDS in the Couffo, with the aim of locating those of the orphans who are involved in farming.

Chapter 4 reports on the results of this census, and provides an account of

the diverse categories of the orphans based on age and circumstances. This chapter is also of a paramount importance. It refines the rationale for the chosen operational framework of the study by providing insights for building the study sample. It also illustrates that there are dynamics in the orphans' everyday life that could influence positively or negatively their knowledge stocks and strategies in tackling pest problems. In this, precise information such as child involvement in farm work and the level of this involvement are importantly shown to be closely linked to their agroecological expertise in this thesis. Thus, child involvement in agricultural activities within the farm household is a gateway to analyzing other factors that could combine with the AIDS status to provide an important foundation for the intracultural variation in agroecological knowledge observed among the respondents. An interrelated dynamic discussed in chapter 4 is that of orphan mobility. In the process of identifying the orphans which were to be included in the research, it transpired that many orphans had changed household in a relatively short time. This unanticipated dynamic is clearly relevant to care provision and appears to be correlated with availability of land and the involvement of children in agriculture, and hence may also be connected to intergenerational knowledge differences. As orphan mobility is not reported much in the literature, it is prominently presented in chapter 4 even though it was not part of the original research questions.

Chapter 5 and 6 address aspects of agricultural knowledge that can be termed 'stocks', meaning the knowledge base present of the domain in question. Based on principles in ethnoecology, chapter 5 uses maize pest naming ability as a proxy to analyze differences between child farmers orphaned by AIDS and other categories of farmers. It goes further by providing an understanding of the determinants of the identified differences. Chapter 6 investigates differences in knowledge stocks among farmers. It uses farmers' semantics to uncover their perceptions and experiences about maize and cowpea pests, and provides a broad picture of what can be classified as expert versus novice knowledge based on language used to talk about pests and pest problems.

In chapter 7, the dynamic aspect of mobilizing agricultural knowledge is examined. This chapter provides an account of the ways in which different categories of farmers use their stock of knowledge to address cowpea pest problems. The chapter provides insight into the reasons that underlie farmers' pest control practices and connects these to the different networks and their use. The use of knowledge and networks in regard to how farming children orphaned by AIDS mobilize the resources they need is emphasized.

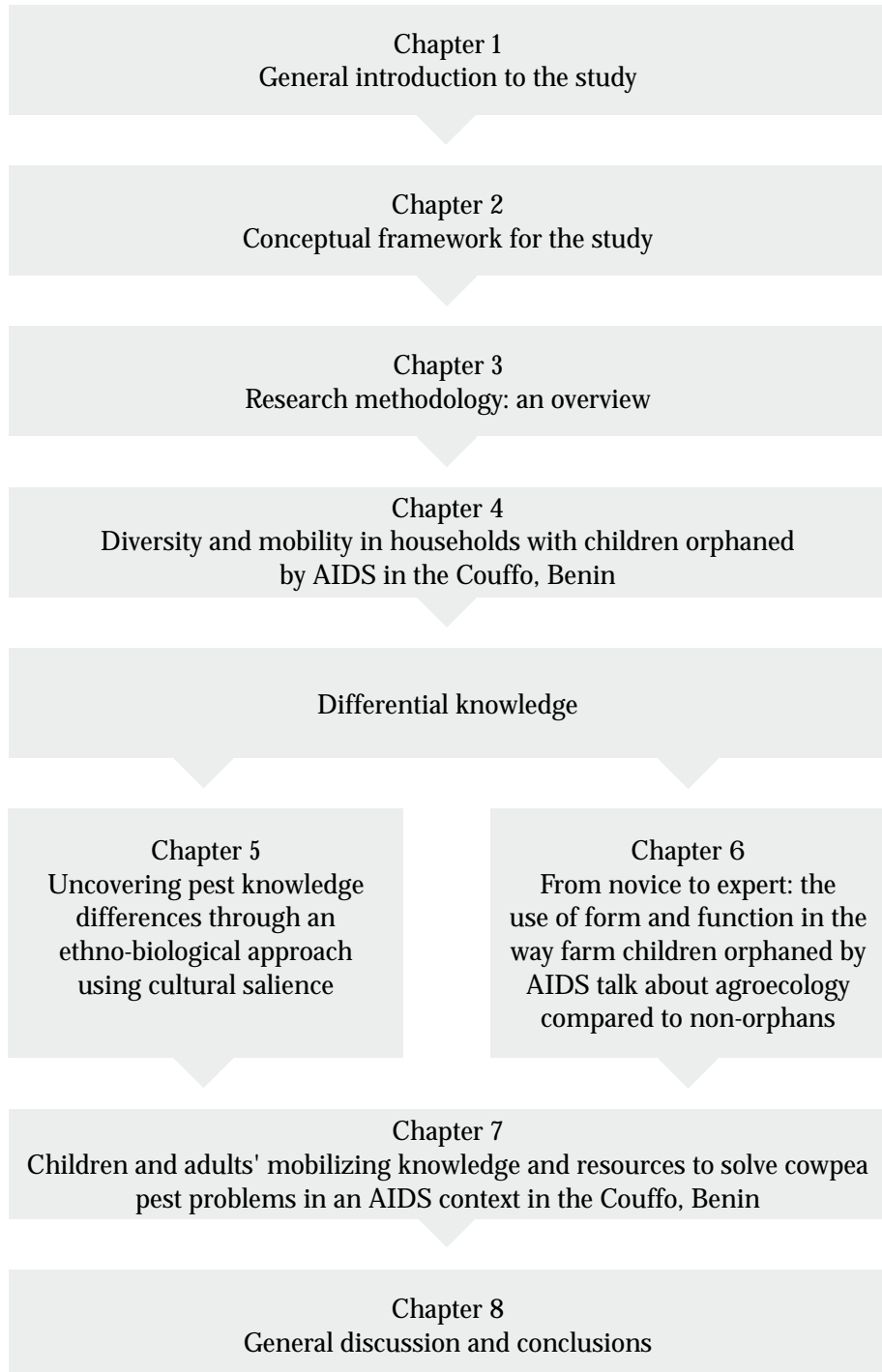
Chapter 8 integrates all the significant findings of the study which help to answer the research questions. It further places these findings in a global

perspective and sketches the implications for science, for care provision practitioners and policy makers. It ends by identifying some areas of future research of AIDS impacts on agricultural knowledge, but also on care provision for rural orphans and vulnerable children.

Note

ⁱ Due to progressive insight in the course of the research process, the technical terminology used in chapters 4 and 5 (which were already published before this thesis was finished) deviates from the terminology used in other chapters. Thus to harmonize the understanding of these terms, the following information is provided: HIV or AIDS are preferred over HIV/AIDS. HIV is used for the infection, and AIDS when referring to the impact of the pandemic. In categorizing the orphans, please note that -except for chapters 4 and 5- the term 'children orphaned by AIDS' is preferred over 'HIV/AIDS-orphans' in order to mitigate stigma. In the same vein, orphans are categorized as paternal (loss of the father), maternal (loss of the mother) instead of fatherless and motherless respectively. The terminology of double orphans (loss of both parents) is consistent across all chapters.

Figure 1: Structure of the thesis



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Chapter 2

**Conceptual framework
for the study**

Introduction

This chapter presents the conceptual framework upon which the study was based. It examines different ways of classifying and investigating people's agroecological knowledge.

This thesis distinguishes two main facets of knowledge which are: the static and the dynamic aspects of agroecological knowledge. These two facets also represent the exploitation of the existing stock of knowledge coupled with the search for new knowledge that feeds the exploration of new possibilities (Wu and Shanley, 2008). It is assumed that this approach would contribute to fuller capturing of the various dimensions of the effects of AIDS on farming knowledge. Conceptually, the static dimension of knowledge represents the 'stocks', that is, the content of people's minds. According to Price (2001: 156), knowledge 'is the sum of what has been learned, experienced and perceived' and this is what I previously labeled as 'static' knowledge or the 'stock' of knowledge. However, the stock of knowledge is built up over the years and its content influenced by experience of events, social positioning (Bourdieu, 1994) and culture sharing through language (Price, 2001). The dynamic aspects of knowledge as used in this thesis encompasses the ways people put their stocks of knowledge into use (take action) to address a given problem. This study uses a combination of ethnoecology and ethnobiology, and problem solving approaches as the main conceptual inspiration for the research on farmers' knowledge and practices surrounding maize and cowpea crop pests.

Ethnoecology and Ethnobiology use language as a gateway to documenting people's cultural knowledge in a given domain. Eventually, it is expected that differences among respondents according to their AIDS affection status and their generation could be understood via the informants language used (expressing their knowledge and perceptions) and the practices they perform. In addition, agricultural knowledge may also include scientific knowledge as well as traditional or folk knowledge. Thus scientific knowledge is also examined. Among the different kinds of informants and how they are affected by AIDS (or not) in the study we anticipated uncovering intercultural variation due to their different circumstances. These differences are anticipated to be linked to differences in resources, as part of the variation in life circumstances thus, justifying various pathways in solving pest problems. Ultimately, analyzing static and dynamic aspects of agricultural knowledge would provide a holistic understanding of the possible relationship between what people know and what they do, and the variation found in the context of AIDS.

In order to provide a full picture of the conceptual framework as conceived

for the study, this chapter is structured around the following sections: next to the introduction, the chapter provides an explanation and relevance of ethnobiology/ethnoecology as appropriate to studying knowledge as a stock especially in a context of AIDS. Two main points are emphasized: knowledge as a component of culture, and language as a gateway to uncover knowledge. In the next section, the problem solving process is elucidated. It explains the concept of knowledge put into action, and thus the dynamic process of knowledge utilization which ultimately evolves into sets of agricultural practices surrounding pest management options. In addition, the options people have for solving pest problems with the resources at their direct disposal or those they can mobilize as one of the determinants of knowledge difference in application is also analyzed. Finally, the analytical perspective is summarized in a design that depicts and explains the relationships between various concepts of the framework as well as the main assumption which leads the analysis of the effects of AIDS on farmers' knowledge and practices about crop pests.

2.1 Studying knowledge

There are various ways to document knowledge differences between children and adult farmers. This study makes use of two approaches:

1. Evaluation of individuals stocks of knowledge, that is what these individuals bear in their mind, given their culture and environment.
2. Examination of how individuals operationalize their stocks of knowledge, that is, the way they put their knowledge into action in a specific situation such as pest problem solving.

In the sections below I discuss relevant insights in relation to both dimensions.

2.1.1 Knowledge as a stock: the ethnoecological approach

Knowledge as a stock represents the contents of people's minds. It is the knowledge that has been built up or accumulated and embedded in individuals. The stock of knowledge has the dimensions of both breadth and depth (Wu and Shanley 2008). Several additional dimensions can be taken into account when evaluating people's stocks of knowledge. The most important for the purpose of this study are perception, information and beliefs.

Knowledge and perception are closely interrelated with human action and experience. In everyday language, perceptions and beliefs related to the

functioning of the bio-physical and social world are usually referred to as 'knowledge' (Leeuwis, 2004). Knowledge and perception are influenced by an individual's background, cultural context, social rules and religious beliefs (Björnsen-Gurung, 2002; Price, 2001). Knowledge and perception are not neutral; they are subject to social influences and interests (Grosz, 1993), and farmers have strategies to deal with information, evaluate their experiences and learn from them (Engel and Salomon, 1997; Röling, 1994). Information, education, training and experience allow farmers to develop and make use of new farming knowledge and technologies (FAO, 1996).

Indigenous versus scientific agricultural knowledge

In the sphere of agriculture there exist several types of knowledge as a stock. However, the present research takes into account two of them: indigenous and scientific knowledge. Each has its own logic and process of creation. Indigenous knowledge is the 'knowledge system of people who are linked by history of occupation and through ancestors to a given location' (Price, 2001: 156; Purcell, 1998: 260). In addition to this definition, Barsh (1997) and Kurin (1983) emphasize that indigenous knowledge is an aspect of culture which functions towards the long-term survival of a group. Hence, indigenous knowledge results from practicality, appropriate behavior and observation of the ecology (Grant and Miller, 2004; Purcell, 1998). Indigenous knowledge is often based on sets of uncontrolled, undocumented, and not always verifiable or replicable observations. It is linked to subjective experiences and rooted in the culture, history and biophysical environment of the group (Purcell, 1998; Raedeke and Rikoon, 1997). Modes used by farmers for validating such knowledge include practical experience, farm comparisons, intuition and discussions with peers (Leeuwis, 2004: 105-107).

Agricultural scientists tend to use different procedures for arriving at valid knowledge when compared to those used by farmers. Most natural scientists apply strict and systematic procedures for arriving at knowledge claims. Natural scientists emphasize the importance of verifiability and replicability in knowledge creation, which implies not only that something may be known, but that the method(s) of discovery must also be solid, and further, that the knowledge must 'contain the element of its explanation' (Purcell, 1998: 259). Through the application of rigorous methods scientists hope to arrive at universally valid knowledge and insights; they tend to be less interested in knowledge that is true only within a specific cultural setting. A scientific explanation must be demonstrable outside of any 'unique symbolic structure' (Purcell, 1998: 259). It must bear universality, not the practitioner's belief (Grosz, 1993; Purcell, 1998). Although there are many differences between

scientific and indigenous knowledge, they should not be exaggerated. At a more abstract level, according to Leeuwis (2004), all knowledge, including that of scientists, is local and contextual and thus occurs, and is meaningful in a specific cultural, technical and spatial context. Nevertheless, the knowledge of agricultural scientists can enrich 'farmers' indigenous knowledge in the sense that farmers' knowledge is not always adaptive to rapid changes in climate or ecology, or to developments such as industrialization and an increasingly market-oriented agriculture (Price, 2001; Leeuwis, 2004). All this implies that 'scientists' and 'farmers' knowledge can enrich one another in fostering agricultural development. An important message of the above is that knowledge is an integral part of people' culture.

The ethnoecological approach to studying knowledge stocks

The ethnoecological approach situates knowledge as an element of culture. Ethnoecology refers to how 'a given culture/language group organizes and classifies their knowledge of the environment' (Price, 2001: 157). Culture consists of the organized standards and rules about reality and human choices that people share to a certain degree. Goodenough (1964) says that culture (including knowledge) is a product of learning, as distinct from biological heritage. Individual knowledge (skill, know-how and expertise) is culturally bound (Nanda and Warms, 1998; Bourdieu, 1994). However, culture is dynamic and builds upon itself through time (Price, 2001; Romney et al., 1986). Moreover, variations exist within a culture and differences between people may arise from their different roles or their individual observational skills, motivation, interests and perception. As Bourdieu (1994) puts it, knowledge and skills are the result of cultural interactions, and as such, are embedded within culturally produced values and meanings. He added that knowledge and skills (social and technical) are 'styles of interaction, and reflect individual's position in a social space' (Bourdieu, 1994: 77-78). This highlights that real life situational diversity can be expected to produce diversity in individual farmers' agricultural knowledge.

The ethnoecological perspective can be used to uncover agricultural knowledge of farmers in the Couffo region, in the majority of whom belong to the Adja cultural group. This is done through measuring farmers' knowledge at individual and group levels using culturally correct concepts and responses (Price, 2001; Ellen, 1982; Romney et al., 1986; Gragson and Blount, 1999). Werner and Fenton (1970) emphasize that early research on cultural knowledge used key informants and was traditionally represented as a composite of many individual competences. The description of knowledge that accompanied this composite was 'that of a potentially omniscient native speaker-hearer', that is,

an individual who knows all about his/her culture. It is now accepted, however, that people's knowledge varies with their intelligence, interest, opportunity and social divisions such as gender. No individual can be said to hold the total stock of the knowledge of his/her culture. Therefore, a full description of people's knowledge will be 'a composite picture of the cultural competences of many informants', chosen among the population. As a result, two levels of knowledge will be reflected: the sum of all knowledge held by individuals, and the amount of knowledge shared by all members or the intersection of all individuals' competences (Werner and Fenton, 1970: 540; see also Price, 2001: 159).

One of the main principles in the ethnoecological approach is that of language as a 'gateway' to knowledge (Price, 2001: 158). It emphasizes naming as the basis of knowledge of living things and the way they are ordered in the nature, according to indigenous people's perceptions (Berlin, 1992; Ellen, 1982). Thus, the basis of analyzing farmer's knowledge rests on the assumption that knowledge domains (well-bounded areas of knowledge) can be documented based on salience of naming items (Price, 2001: 157). Furthermore, language is vital to culture and cultural continuity and information about farming and other aspects of life are included in this. Price (2001) emphasizes that language is a main instrument in learning because it provides continuity in communicating knowledge between people and transmitting knowledge across generations. Language is also a means of bringing in new observations as we can invent terms and communicate observations we find of particular value. Several studies have used farmer folk nomenclature in agriculture to illustrate that naming is positively correlated with the cultural importance of different living things such as crop varieties, insect species, etc., and the evidence of the significance of utility dimensions in the salience of the named items (Hunn, 1982, 1999; Ellen, 1982; Brown, 1984; Berlin, 1992; Grant and Miller, 2004; Björnsen-Gurung, 2002). Moreover, many authors have examined knowledge differences among farmers by studying indigenous agriculture and knowledge in the domain of crop protection (Johnson, 1974; Bentley, 1989). They concluded that farmers' knowledge varies according to their environment, and that farmers know more about some domains than others (Bentley, 1989; Chambers, 1983; Sherwood, 1997).

2.1.2 Knowledge in action: the pest problem solving process

In order to be useful, knowledge is tested and put to use in action. To do so, people refer to their own knowledge base, but also use information gathered from various sources. This can serve to turn an undesirable state of things

(a problem) into a desirable one (Leeuwis, 2004). Solving a given problem, for instance a pest problem, does not always occur in a straightforward and linear way. Nevertheless, several dimensions of problem solving can be distinguished. The present study focuses on aspects such as identifying the problem, explaining its causes(s), and determining and choosing among alternative solutions.

1) Identifying and defining the problem

A problem is defined as the difference between a current situation and the desired one, in view of goals and aspirations pursued (Leeuwis, 2004; Harris, 2002). A problem usually results from the appreciation of a present undesirable or imperfect state of things and the belief or hope that there is room for improvement. This means that the perception of a problem depends on an actor's priorities and aspirations. People in similar situations may set different priorities, in relation to multiple and different sets of goals. Moreover, problem perceptions may also depend on the sets of solutions that are available to (different groups of) actors. The success of the problem-solver greatly depends on his/her willingness and capacity to gain control over the identified problem (Harris, 2002). To this end, farmers try to understand the source of the problem.

2) Understanding and diagnosing the causes of a problem

Farmer define the problems they face and elaborate strategies to solve them according to their perception of the underlying causes (Gachimbi et al., 2002; Davidson-Hunt and Berkes, 2003). Such perceptions may be influenced by education, experiential learning, spiritual beliefs, values and preferences (Chambers et al., 1989; Björnsen-Gurung, 2002). Bentley (1989) argued that farmers actually know less about insects, particularly on their ecology and reproduction, than they know about plants. Bentley (1992) went further in explaining deficiencies in farmer knowledge of certain types of living things. According to him, farmers do not always realize that the failure of a plant to thrive is caused by an insect simply because the 'insect is too small to be seen with the naked eye' (Bentley, 1989: 30). This is also valid for disease problems. In contrast, farmers know more about plants because they are large and they stand in one place as opposed to insects which are small and mobile. Hence, he emphasized the ease (or difficulty) of observation as one of the factors explaining deficiencies in causal understanding. The other factor in Bentley's model on pests (and disease) knowledge is their cultural importance. The two factors combine to produce high or low level of awareness, and generate an extensive (or limited) body of semantics among farmers of a given

cultural setting (see also Bentley, 1992; Björnsen-Gurung, 2002; Price, 2001; Sherwood, 1997). Beliefs may also limit the value and the accuracy of farmers' understanding and reaction to pests. For instance, some farmers consider all insects as harmful. This may lead to an abuse of pesticides and the destruction of natural enemies which might keep pest populations at acceptable level. Heavy use of insecticides or pesticides may result in poisoning (Fayomi et al., 1998; Bentley, 1989; PRONAF, 2000), an increase in pests and their resistance to the treatment, and/or the occurrence of new pests unknown to farmers (Bentley, 1989; Pimentel and Goodman, 1978). Thus, problem solving may well result in the occurrence of new problems.

3) Identifying and choosing among solution options

People's options to solve a problem depend on how they define it and what they think is its cause. Thereafter, they set up their minds to make a choice among the available, affordable and culturally acceptable options (Leeuwis, 2004). According to Harris (2002), there are two basic types of solutions in problem-solving processes: addressing the cause or source of the problem, and addressing its effects or symptoms. The first type of solution is dedicated to cure the problem. In this range, there are three options. People can opt for prevention, elimination or reduction of the identified problem. The second type focuses on the effect of the problem. It comprises treatment, tolerance and redirection of the problem. It should be noted that problem solving is not necessarily linear. It can be a very iterative process, where farmers go back and forth between different dimensions of problem solving as well as between alternative solutions. Generally, several sets of solutions are considered by farmers, and several criteria may be used to evaluate and choose an appropriate solution (Nazarea-Sandoval, 1995; Leeuwis, 2004). Furthermore, Gatewood (1983) argued that there may be diversity in the ways in which different groups of farmers solve the same problem even in a homogenous cultural setting. Gender is one well acknowledged source of intracultural variation. In addition, solutions opted for may vary according to social status and the environment in which the problem occurs. This environment bears constraints and opportunities, and thus delimits farmers' 'solution space' (Leeuwis, 2004). Solution space in turn, is linked to issues of power. Giddens (1976) emphasizes power as 'transformative capacity' and 'human agency' which can be seen as the capability of each individual to intervene or alter the course of certain events and change the pre-existing state of affairs (Engel and Salomon, 1997). Those events include social experience and coping with life under adverse conditions. Even in such circumstances human beings can creatively use their agency and create a 'space for maneuver' (Long, 1989). Nevertheless,

constraints in the environment (e.g. physical and socio-economic) remain an important consideration in the context of choosing solutions and exerting agency (Rossing et al., 1999). Overcoming constraints and implementing solutions typically requires the mobilization of relevant resources. This is elaborated in the following section.

2.2 Resource diversity as a factor explaining differences in knowledge and practices

Resources can be seen as a major factor that shape the differences in pest knowledge and control practices among farmers. Resources are tangible (such as tools) and non-tangible (such as knowledge) assets that members of a society need in order to create a livelihood, realize ambitions and solve problems. Access to resources may be obtained through kin and non kin social networks in a given community. It is assumed that access to resources depends on the ability of an individual or capacity of a group of farmers to actively use or create those networks (Engels and Salomon, 1997; Leeuwis, 2004; Newman, 2001). For the purpose of this study, a distinction is made between knowledge and non-knowledge resources.

2.2.1 AIDS, networks and resources mobilization

Mobilizing resources is sometimes hindered by social realities such as that surrounding AIDS. In fact, AIDS brings changes that impact components of the environment (socio-cultural, agro-ecological, economic and institutional). These changes can have negative impacts on rural people's livelihood strategies, and can affect their access to productive resources (Baylies, 2002; Bollinger et al., 1999; Haddad and Gillespie, 2001, Ellis, 1998; Engberg, 1990). The nature and quality of social networks is of critical importance in gaining access to resources. Hence networks are a resource in themselves (Engel and Salomon, 1997; Trotter, 1999). Relevant resources in the context of this study are briefly discussed below.

Knowledge and information resources

Knowledge is a resource that farmers can rely on while dealing with their environment. Availability and access to particular knowledge can enhance or constrain people's agency, and sharing information can stimulate active learning and reinforce knowledge (Röling, 1989). According to Leeuwis, 2004, information is knowledge expressed in a tangible form (see also Price, 2001). Agricultural knowledge and information may be acquired through a range of

sources and media. These include family members and colleague farmers, and institutions such as agricultural extension, NGOs, newspapers, radio and schools. Frequently, actors in the agricultural chain (e.g. input suppliers, middlemen and/or food processors) also play a role in communicating knowledge and information. In the Couffo region, several initiatives were implemented to facilitate access to knowledge and to improve information sharing among cowpea farmers (Nathaniels, 2005; PRONAF, 2000).

Non-knowledge resources

Important non-knowledge resources include land, labor and agricultural inputs (e.g. fertilizer, pesticides, seed varieties, etc.) as well as cash money and tools for cultivation. Access to productive resources inside a cultural group may vary from one individual to another (Nanda and Warms, 1998; Long, 1989). Rights to land use are often conferred to groups rather than individuals in many societies (Muylwijk and Smetsers, 1996; Nanda and Warms, 1998). However, with the modernization of agriculture, private ownership of land is increasing (Edja, 2000; Rahmato, 2003; Toulmin, 2008). In the Couffo region, farmers often lack access to land, improved seeds, fertilizers and recommended pesticides. As a result, farmers may lose an important part of their harvest to pest attacks (FAO, 1996; Agossou et al., 2005), or resort to use banned pesticides to solve pest problems (Agli et al., 2001; Tovignan et al., 2001). The next section examines the connections of agricultural resources to gender and age.

2.2.2 Gender and age dimensions of access to knowledge and other resources

Often there exists a division of labor between men and women, which is accompanied by differences in access to productive resources and diverging interests and motivations (Niehof, 2004; Goebel, 2003; Muylwijk and Smetsers, 1996; Saito and Spurling, 1995). In connection with this, women and men are likely to hold different knowledge as well.

Knowledge and non-knowledge resources may also be closely related to age differentiation. Information and knowledge about the environment tends to be transmitted from one generation to the next in a culturally bound manner (Ruddle, 1993; Price, 2001; Ohmagari and Berkes, 1997). Thus, skills are transmitted and acquired through a structured and culturally specific process. In this process, children are gradually taught simple and more complex forms of knowledge depending on their age, while household labor tends to be divided in a similar age-dependent manner (Ruddle, 1993; Somnasang, 1996; Price, 2003). Learning generally starts from infancy (Turner, 2003; Ruddle,

1993), and involves a gradual participation of children in specific agricultural tasks and responsibilities. During learning activities, 'children absorb far more than practical details from their participation: they learn about attitudes and values related to conservation, discipline and resource sharing' (Turner, 2003: 141).

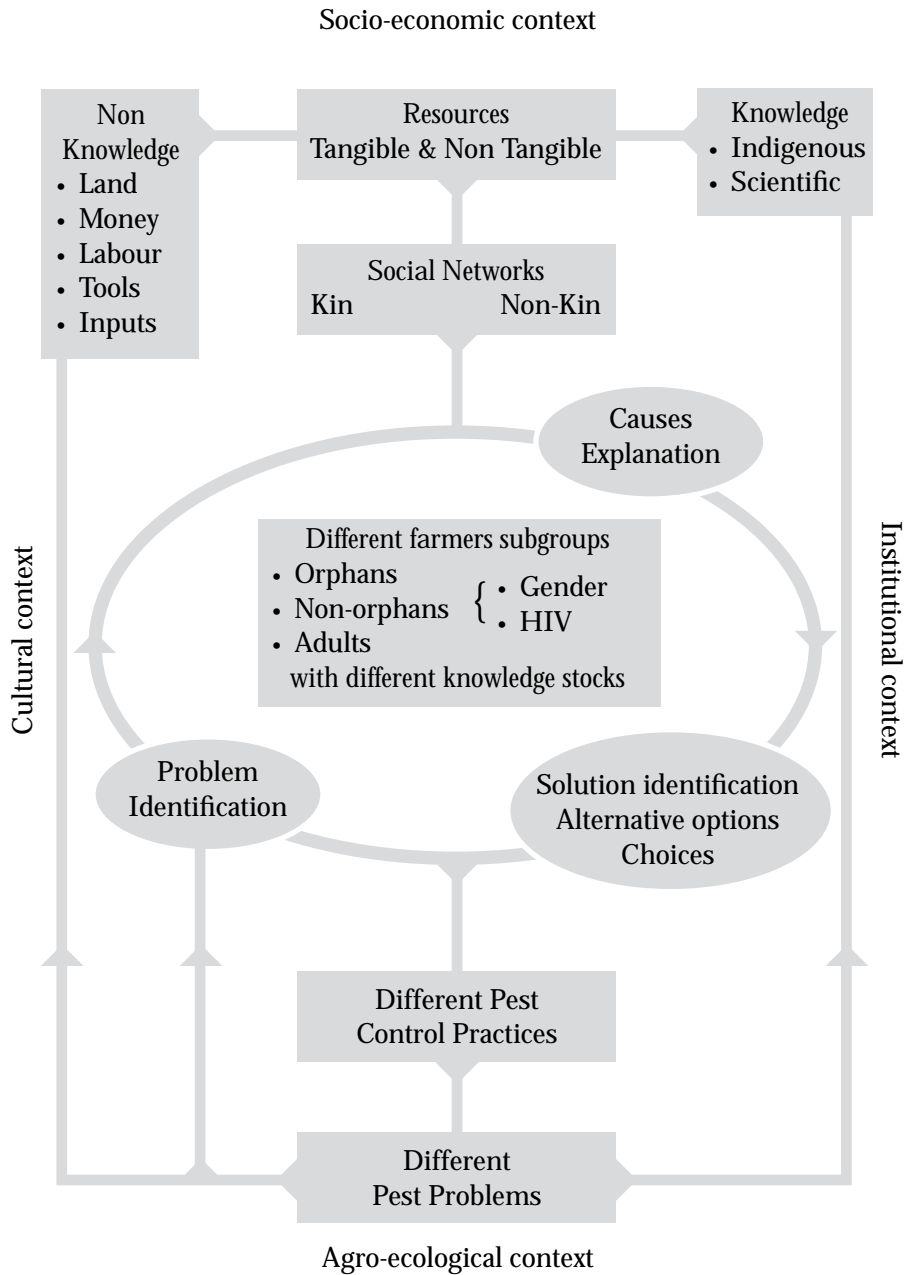
The nature and load of (agricultural and non-agricultural) work is often distributed along lines of gender and age (Price, 2003; Muylwijk and Smetsers, 1996; Ruddle, 1993). Children's contribution to farm household activities is likely to become more important when the household is afflicted by the HIV pandemic (Rugalema et al., 1999; Mutangadura et al., 1999). It has been observed that social and economic crises and rural poverty tend to increase the feminization of subsistence agriculture, as they are often accompanied by a male exodus to big cities (Salick, 1997). When this increases the latter's chances of contracting HIV, this only further amplifies the role of women and children in agriculture (Fagbemissi, 1999; Salick, 1997; Loevinsohn and Gillespie, 2003; Rugalema et al., 1999).

2.3 The conceptual model in sum

In all, the present study focuses on relationships between several phenomena and concepts in order to fully explore knowledge differences between children and adult farmers in the Couffo region. This is represented in Figure 2, the conceptual diagram.

At the heart of the figure are different sub-groups of farmers who can be differentiated by their AIDS status (affected/non affected), their age groups (children/adults) and their gender (women/men; girls/boys). Children are distinguished by their orphanage status (orphans/non-orphans). The model assumes that individuals of each sub-group hold different stocks of knowledge in the agricultural domain, especially the sub-domain of pest control. They engage in solving pest problems and put their stock of knowledge into use. In the process, they identify the pest problem and make a diagnosis of its cause(s). They examine alternative solutions at their disposal and choose among them, using various criteria. In doing so, they mobilize information, and non-knowledge resources such as cash money to buy inputs (e.g. pesticide) or hire labor and tools (e.g. for the spraying). All these resources - knowledge and non-knowledge - are mobilized through networks that can be kin or non-kin or both. Ultimately, they attempt to address the pest problem by performing some sets or patterns of pest control practices, which may result in positive

Figure 2: The conceptual diagram



Children-Adults knowledge mobilization and use to solve pest problems

or negative outcomes, and lead to a reconfiguration of (knowledge and non-knowledge) resources, as well as to new problem solving activities. The model also assumes that all these actions evolve within a wider and dynamic socio-economic, institutional, agro-ecological and cultural context (Price, 2001; Niehof, 2004; Bentley, 1989).

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Chapter 3

**Research methodology:
an overview**

Introduction

This chapter provides an overview of the research design and chronicles in summary form the challenging pathway followed through data collection and analyses (Tables 1, 2, 3 and 4). In-depth detail is provided in the chapters that follow in the thesis. This chapter is divided into three main sections with the first section describing the design of the study among the farmer's in Benin's Couffo region, and providing information on the elements of the methodological architecture for the study with its different phases. Cross-sectional methods and techniques, and specialized methods relevant to specific aspects of the study are then covered. Finally, ethical dimensions and difficulties in conducting research within an AIDS context are hereby acknowledged and are discussed in chapter 4 of the thesis.

The research is designed as a comparative study that draws from several academic traditions. Consequently, the overall methodology is a mixed method approach which combines qualitative and quantitative data collection and analyses. The rationale behind the decision to bridge qualitative and quantitative approaches is based on Scrimshaw (1990), who argued that the choice of a mixed model is justified by the search for validity and reliability of research findings. This is also reinforced by the multi-layered effects of the HIV pandemic on affected communities, and the multidimensional nature of agricultural knowledge. My conviction is that qualitative methods are more accurate in terms of validity, while quantitative ones offer more reliability and replicability (see Scrimshaw, 1990). This implies that the study area and sample(s) be selected through systematic procedures. Likewise, conducting the study in several sequences (see Table 1 to 4) is rooted in the fact that the research focuses mainly on children. Thus, accommodating children's shorter attention span (Kirova, 2003).

In the mixed qualitative/quantitative method approach of the study, some of the methods are general and used throughout the data collection timeline, while others are specific to some of the research questions. In all, direct observations, semi-structured and structured interviews were combined with participant observation of selected cases of AIDS affected and non-affected children and their care-givers in the investigation of the knowledge stocks and pest problem solving strategies among sub-groups of farmers. Information gathered was later scaled-up through surveys, using questionnaires (with structured questions).

3.1 Description of the research design

The research design is comprised of 4 component phases: the preparatory survey and sample building; the study of agricultural knowledge stocks; the study of pest problem solving process (how farmers put their stock of knowledge into action to solve pest problems), and resource mobilization through social networks. Case studies and surveys are embedded in these 4 components. Details are provided in Tables 1 to 4.

3.1.1 Phase 1: The preparatory survey and sample building

This consisted mainly of the identification of the magnitude of AIDS-related orphanhood and the characteristics of households where the orphans resided. It included the collection of secondary data through documentation and discussions with resource persons in order to gather important information on children orphaned by AIDS, and select the research sites. Once the sites were selected a census survey was conducted resulting in stratified sampling of orphan children (and their care givers) for more in-depth research. The information generated by the survey as well as the secondary data and interviews in this phase of the research contributed to the elaboration of the typology of children orphaned by AIDS, and the subsequent diversity among them.

Details are provided in Table 1.

3.1.2 Phase 2: Uncovering agricultural knowledge stocks among Couffo farmers

Phase 2 builds upon phase 1 with the further development of activities started during the exploration. In addition to the initial field visits, there were a series of informal discussions with farmers (children and adults) that helped to build folk classification and illuminate the importance of maize and cowpea pests in the Adja culture. Formal discussions with researchers such as agronomists, entomologists and extension agents were carried out, and provided information that was used to build scientific indexes of maize and cowpea pests. Later on, in-depth research was carried out among selected apt cases (Mitchell, 1983) through a succession of semi-structured interviews among farmers, to obtain more detailed information on their perceptions and experiences of pests. Hence, activities consisted of documenting knowledge stocks among the identified categories of farmers: children orphaned by AIDS, non-orphans, and AIDS-affected and non-affected adult farmers engaged in maize and cowpea cultivation. Variations in knowledge by AIDS affection status, age group and gender were examined.

Cultural domain analysis in agriculture was conducted with emphasis on the sub-domain of pests of maize and cowpea, addressing a broader range of living things that Adja people labeled as 'enemies of the farmers' (insects, rodents, birds and others). Various techniques such as free listing and pile sorting complemented by farmers' narratives, direct and participant observations served as data collection strategies. Chapters 5 and 6 provide more elaborated details.

3.1.3 Phase 3: Uncovering pests problem-solving processes among the Adja farmers

This phase in the research consisted of comparing children and adults' pest problem-solving processes and resource mobilization to address pest problems. Specifically, the different ways AIDS affected and non-affected Adja child and adult farmers use their knowledge to address pest problems was documented and analyzed. Strategies and steps to address cowpea pest problems were uncovered, with the aim of highlighting possible intergenerational differences. Aspects such as problem and cause(s) identification, types of solutions, and decision-making for action were investigated. A detailed account is provided in chapter 7 of the thesis.

3.1.4 Phase 4: Uncovering networks used by Adja farmers in problem-solving processes

Phase 4 of the research focused on documenting the social networks used by the different categories of farmers to access knowledge and other important resources in order to solve maize and cowpea pest problems. It examined the different types of connections (kin and non-kin) used, and elucidated the relationship of resource mobilization to pest management practices. Information collected covered the sources of and access to knowledge and information. Details on arrangements/negotiations on land, input and credit were also documented. More information is given in chapter 7.

3.1.5 The surveys

Although this might be stated as the last phase of the study, practically, the survey was broken down into several components. Thus, each in-depth field study was followed by a subsequent survey. A total of 5 surveys were conducted. Two surveys were dedicated to characterizing the AIDS orphans and their activities and uncovering their diversity and mobility. One survey was organized to collect systematic data on farmers' knowledge, perceptions and experiences of maize and cowpea pests. Two additional surveys were conducted: one on participants' knowledge in relation to cowpea pest problem

Table 1: The preparatory survey and sample building.

Research questions	Operational objectives and activities	Expected outputs
<p>1. What is the magnitude of AIDS orphanage in the Couffo, and what are the demographic and livelihood characteristics of households that contained children orphaned by AIDS?</p>	<p>Research Phase 1 Preparatory survey Objective: Site selections and sample building in the Couffo region</p>	
	<p>A1: Secondary data collection</p>	<p>Information gathering on AIDS related orphans from various sources</p>
	<p>A2: Identify potential villages and sample of orphan children</p>	<ul style="list-style-type: none"> • Identification of potential village with children who are orphaned by AIDS • Village names and number • Details of orphans in them
	<p>A3: Develop orphan typology</p>	<p>Name listed for stratified sampling of orphan children</p>

Methods, instruments and strategies for data collection

Analysis

Research Phase 1

Preparatory survey

Objective: Site selections and sample building in the Couffo region

Consult books, reports and resource people

Compare information from various sources

- Use current NGO and Government HIV databases
- Interview NGO and Government HIV resource people
- Informal discussions
- Focus group discussions
- Unstructured interviews

- Select children from database clusters in selected communities
- Develop list of children's names and details
- Select village with orphan clusters
- Build and disaggregate list of the orphans by sex, age, education level and main care provider
- Use the orphans list to analyze their diversity
- Logit analysis to understand orphans mobility and other differential life circumstances
- Regression to understand the determinants of orphans' mobility

- Census
- Cases study

Table 2: Uncovering agricultural knowledge stocks among Couffo farmers.

Research questions	Operational objectives and activities	Expected outputs
<p>2. What differences exist among maize and cowpea farmers (adults and children) with different AIDS affection status regarding their stocks of pest knowledge?</p>	<p>Research Phase 2 Field visits Objective: Document and compare child and adults farmers' knowledge of pests in maize and cowpea</p>	
	<p>A1: Produce folk and scientific indexes on pest types and pest relationships to maize plants</p>	<ul style="list-style-type: none"> • Key informants' folk and scientific knowledge of maize insects and other pest types • Cultural knowledge through the way children and adults physically identify and name pests
	<p>A2: Assess and compare children's and adults' perceptions and experiences of insects and other pests in maize and cowpea cultivation</p>	<p>Folk and scientific knowledge of types of insects and other pests in maize and cowpea through the way children and adults perceive them</p>

Methods, instruments and strategies for data collection

Analysis

Research Phase 2

Field visits

Objective: Document and compare child and adults farmers' knowledge of pests in maize and cowpea

- Check list
- Focus group discussions
- Semi-structured interviews
- Free list and list task

- Cognitive Saliency Index (CSI)
- Tobit analysis to explain CSI similarities & differences

- Focus group discussions
- Semi-structured interview
- In-depth case studies

- Semantics analysis & classification of pests
- Chi-square and Fisher statistics to uncover and explain similarities & differences
- Mantel-Haenszel statistics to account for generational gap in knowledge

Table 3: Uncovering how Couffo farmers put their stocks of knowledge into action to

Research questions	Operational objectives and activities	Expected outputs
<p>3. What differences exist among cowpea farmers (adults and children) with different AIDS affection, regarding the process through which they solve pest problems, and the solutions and practices that they choose?</p>	<p>Research Phase 3 Sequence 1: Field visit Objective: Compare child and adult farmers' use of knowledge to solve pest and disease problems</p>	
	<p>A1: Describe and evaluate how children and adults recognize/ identify and explain a pest problem and its causes</p>	<p>The way children and adults identify and explain a pest problem and their understanding of its cause is assessed</p>
	<p>A2: Describe and evaluate the solution options children and adults have, and their pathways to take pest control action</p>	<p>Available solution options for children and adults are identified and the criteria used to choose among them are described and explained</p>
	<p>A3: Describe individual pest problem solving strategies and pest control practices</p>	<p>Similarities and differences in pest problem-solving steps, and reasons behind these similarities and differences are fully described</p>

solve pest problems.

Methods, instruments and strategies for data collection

Analysis

Research Phase 3

Sequence 1: Field visit

Objective: Compare child and adult farmers' use of knowledge to solve pest and disease problems

- Focus group discussions
- Cases study
- Structured interviews
- Field visits
- Observations

Chi-square and Fisher statistics to account for the differences in understanding the causes of pests among children of different AIDS status

- Focus group discussions
- Semi structured interviews

Chi-square and Fisher statistics to uncover the differences in solution options and choices among affected and non affected child farmers

- Participant observation
- Semi-structured interviews

Chi-square and Fisher statistics to uncover the differential strategies and practices to solving pest problems among affected and non affected child farmers

Table 4: Uncovering networks used by Adja farmers in problem-solving processes.

Research questions	Operational objectives and activities	Expected outputs
<p>4. What differential social networks do farmers (adults and children) with different AIDS affection status use to mobilize knowledge and other resources in dealing with pest problems.</p>	<p>Research Phase 4 Objective: Describe and explain how children and orphans use social networks to mediate knowledge and non-knowledge resources</p>	
	<p>A1: Describe and analyze social networks used by children and adults to mobilize knowledge resources</p>	<p>Types and number of individual networks used by children and adults to mobilize knowledge are described</p>
	<p>A2: Describe and analyze social networks used by children and adults to mobilize non knowledge resources</p>	<p>Similarities and differences in the way individual farmers build relations and use them to access key resources for cowpea cultivation is described and explained</p>

Methods, instruments and strategies for data collection

Analysis

Research Phase 4

Objective: Describe and explain how children and orphans use social networks to mediate knowledge and non-knowledge resources

- Unstructured interviews with key informants
- In-depth interviews
- Surveys

Chi-square and Fisher statistics to analyze the types and amount of individual networks for children and adults by gender, age group and HIV-orphan hood status

- Unstructured interviews with key informants
- In-depth interviews
- Surveys

Chi-square and Fisher statistics to analyze the differential types and importance of individual networks by gender, age group and HIV-orphan hood status

solving processes, and the one on mobilization of resources. Breaking the general survey into several successive complementary surveys was aimed at reducing the time during which participants (especially the children) would be subjected to answering questions.

3.1.6 In-depth case studies

The inclusion of in-depth case studies aimed to go beyond the survey information, and reporting on events or details of experience in order to gain deeper insights into the lives of the informants and more detail about the information collected through previous field visits and discussions. Hence, the case study as part of the design, was used to gather detailed information on participants' knowledge and the ways they address maize and cowpea pest problems in their daily farming life. The case studies connected all the research questions and generated important information and insights that contributed to answering those questions. In addition, farmers chosen for the case studies were followed in daily activities, and events linked to their farming activities were recorded. Other more out of the ordinary events were also opportunities for recording information, for example with regard to uncovering how individual farmers used their social networks (or created new connections) in order to meet the objectives they set for growing maize and cowpea.

The cases

A total of 17 individuals participated in the in-depth case studies representing children - orphans and non orphans of the same age (male and female). These children were then used to index their households and adults in their household (affected/non-affected - biological parent or main care person of the selected child). Individuals chosen for the case studies are characterized in the subsequent chapter of this thesis. In sum, these cases provided vivid documentation for comparing child and adult farmers ranging from their stocks of knowledge to the pest management options and practices, and consequently conferred validity to the findings.

3.1.7 Sampling and sample size

The purpose of this section is to give an indication about the process of sampling. The study used key informants as well as selected individuals across the study population. At the start, key informants were selected according to their experience/expertise in maize and cowpea cultivation. People were also selected from institutions working with the local population in agricultural as well as on HIV and AIDS issues. Provisionally, in phase 1 (see Table 1) a total of 12 resource persons (six professionals at institutions and six adult

farmers) were included in the initial interviewing, in addition to orphan and non-orphan farmers for the informal discussions. A total of six focus group discussions were organized. A household census served to document the study area population from which child farmers orphaned by AIDS were later on selected. Equal numbers of non-orphans with residence in the same village as the orphans were also selected based on a stratified random sample for comparison. The cases for in-depth study were blindly chosen within each subgroup to reach a total of 17 cases comprised of orphans, non-orphans, affected and non-affected adults.

A total of 322 children orphaned by AIDS comprised of paternal, maternal and double orphans, were identified during the census. This population served as the basis for sampling among the orphans for the focus groups, individual interviews and surveys. Generally, 15 individuals were selected within each category of orphans for the survey. To this sample, 15 respondents were added from affected adults, 15 from non affected adults, and 15 from non-orphan children. Two different samples were constituted: one to study the stocks of knowledge, and the second for the problem-solving process and networking. Different individuals were always selected for focus groups which introduced each phase of the study. Only children were selected for the game playing, and 2 groups of six girls and six boys were chosen for this purpose. Additional information is provided in each research paper chapter in this thesis with respect to the specific sampling strategies and sample size.

3.2 Methods, techniques and strategies of data collection and analysis

A variety of methods were applied in data collection and analysis. This section first describes the methods, techniques and strategies that were used throughout the study, and later, elaborates on specific specialized methods that were used to generate and analyze very particular kinds of data for selected research questions.

3.2.1 Cross-cutting methods, techniques and strategies for data collection and analysis

Focus group discussions (FGD)

A focus group discussion is a group interview used to obtain detailed information about a particular topic that the researcher wants to explore. The

focus group is an important tool for qualitative data collection. It enlightens the researcher about general properties, perceptions, rules and beliefs within a group of people sharing the same interests or characteristics (Caffarella, 2002; Morgan, 1998; House and Howe, 1999; Krueger and Casey, 2000), in order to grasp the variability of views regarding a specific topic. Generally, a focus group discussion consists of 6 to 12 individuals. A group facilitator keeps the discussion on track by asking a series of open-ended questions meant to stimulate discussion (Hebbeler and Gerlach-Downie, 2002; Larson and Hegland, 2003; Mitra, 1994). For the purpose of this study, focus group discussions were conducted as an entry point with the identified farmers at the beginning of each area of investigation. For instance, local terminologies and perceptions on pests (insects and other) were first collected through FGD. Data collected via FGD were supplemented by information from individual interviews with key informants. Data were collected using unstructured interview grids.

Interviews

Interviews were conducted throughout the study. Three types of interviews have been used.

- **Unstructured interview**
Unstructured interviews are used at the beginning of research when the questions to ask or the state of things on the ground are not yet clear enough. It is particularly useful for learning native terms or to frame more unambiguously relevant questions for the study (Bernard, 2002; Werner and Schoepfle, 1987). Information from unstructured interviews mostly assisted in designing an appropriate guide for the semi-structured or questions for structured interviews. For the present study, the unstructured interview was also a valuable data collection tool to cover sensitive subjects such as the AIDS-orphan's feelings and relations within their neighborhood, and about their living strategies.
- **Semi-structured interview**
Semi-structured interviews are based on the use of an interview guide. This guide consists of a list of questions structured around different ordered topics of interest to the researcher (Bernard, 2002; Spradley, 1979). In the present study, the semi-structured interview format was useful for collecting very precise, reliable and comparable data (Bernard, 2002). It helped in the collection of data on maize and cowpea pest problems and the pathways of reaching pest control solutions and practices. This technique contributed

to gathering information on networks and resources negotiation.

- Structured interviews

Structured interviews are used for very accurate data collection (Bernard, 2002; Weller, 1998; Ghiglione and Matalon, 1978; Javeau, 1982). In this study, the structured interview was in the form of questionnaires of various structures.

Observations

According to Beaud and Weber (2003), observation is a technique that enables discovery and verification, and gives account of the course of an event, its material context or frame, and imbedded interactions. Thus, observation is a process in which the observer elaborates questions and seeks answers, building upon stimulus s/he receives from the subject of the observation. Questions are generally confined within an observation guide, and are the result of preliminary information gathered from various sources, and from the field (Beaud and Weber (2003)). In the present study two types of observations were used, namely direct observation, and shortened participant observation.

- Participant observation

Participant observation is a strategy to get closer to people in order to collect information on the real state of the observed phenomenon. It is an occasion to have 'inside' lived experiences for instance of people's practices and behavior, and to be able to explain them with conviction (Bernard, 2002; Spradley, 1980). The main point of participant observation is that the researcher can collect data from various angles during the course of her/his stay. However, when the researcher is limited by time constraints, she/he goes through a rapid assessment while using participant observation (Bernard, 2002). In this case, a clear plan and clear idea of what to observe is defined in advance. The present study was based on that variant of participant observation, and included observation of pests control practices as well as problem-solving processes. A checklist containing questions about specific issues of the research was used to collect data (Bernard, 2002). Several tools were also used during the participant observation series: life stories, direct observation, and questionnaires. The shortened participant observation was particularly useful because it reduced people's reactivity and contributed to building good rapport between the researcher and members of the selected households. This, consequently reinforced the validity of the data collected.

- Direct observations

Direct observation was used to gather information throughout the investigation of farmers' pathways in pest problem solving, especially the diagnosis of the pest problem and the actions taken by farmers on the field to combat or prevent pests infestations. Interpersonal relationships of individual farmers with various actors of the networks involved in the resources mobilization process were also observed. Interviews were conducted to supplement the observation series in order to reduce misinterpretations and mistakes in analyzing the information gathered.

Analyzing differences and similarities among farmers about pest knowledge and control practices

Analysis of differences and similarities among sub-groups of farmers was performed using various statistical procedures such as the Pearson' Chi-square (reinforced when appropriate by the Fisher's exact test), and simple or multiple regression. The various tests were used to help illuminate the intra-cultural variations/differences by generation (between adults/children), by AIDS affection status (between affected and non affected farmers), and by orphanhood status (between orphans and non-orphans). Age groups and gender effects were also examined as complementary layers when appropriate. Each paper-chapter in the thesis that provides research results also explains the analytical procedures, however, complementary detail on a selection of somewhat more specialized methods and their analysis is presented below.

3.2.2 Specific methods, techniques and strategies for data collection and analysis

Different methods were combined in order to capture all aspects of knowledge differences between orphan farmers and adults. Data collected were also analyzed with complementary methods and techniques that are explained below.

The cultural domain analysis

The aim of the cultural domain analysis is to understand how people in different cultures or subcultures differently interpret the content of a domain (Borgatti, 1999). It is a method designed to study how people in a group think about lists of things that somehow go together. This involved using information collected from informants about what goes with what. Different techniques were used to collect data about similarities as the farmers of the Adja cultural group perceives them. These included free listing and pile sorts, but also direct observations of farmers practices and data from follow-up discussions.

The first step of the cultural domain analysis as implemented in this study was the free-listing, which was followed by the pile sorting and a series of follow-up conversations.

- Free listing

Free listing is a main component of a cultural domain elicitation. The technique consists of asking informants to list or name the kinds of X (pest) she/he knows. The items are mostly listed with the intention of what goes with what (e.g. flowers are different from fruits). People's ability to recall items is shown by the frequency of the appearance of these items as well as their position on each individual list. free listing was used in this study to delimiting the domain of pests and that of their management options as situated in the Adja culture. The main tool in free listing is a list task procedure. The list task as a data collection tool in cultural domain analysis has been described by Weller and Romney (1988), Weller (1998) and Borgatti (1999).

- Pile Sorting and follow-up interviews

After collecting information from the respondents, the pile sort consist of using cards, each containing the printed name of one of the items at a time (name of pests and name of control methods) mentioned by the participants in the free lists. This technique allows informants to match similar items (Bernard, 2002; Borgatti, 1999; Price, 2001). In the pile sort, people feel free to make as many piles as they like (with the exception that there must be more than one pile and that not all piles contain only 1 item). This study used the pile sorting to uncover Adja farmers categorization of different types of pests (insect, animals, birds, flies, etc.). Later on, the pile sort was enforced by a series of follow-up conversations in the form of semi-structured interviews with farmers, providing them the opportunity to explain their conception and the way they understood damages (the reasoning behind the groupings they made), as well as their relationships with the pests. The exercise aimed at analyzing the differences in farmer's categorization of pest, using their semantics extracted from the follow-up conversations instead of the data from the pile sort procedure itself.

Game-playing

The game-playing method was initially used in psychology to uncover hidden feelings of socially excluded people, and in child education to uncover the inner thinking of children. It is appropriate to enable conversation in very sensitive situations. Many authors emphasize the difficulties in working with children

and they recommend the need to choose an appropriate method to achieve good results while exploring children's perspectives (Mathews and Tucker, 2000; Parkinson, 2001; Van Manen, 1994; Frey, 1986). Mathews and Tucker (2000) say that children are not generally encouraged to express their thinking. Thus, children get tired quickly of talking about what they know during the course of an interview. They also sometimes struggle for words to accurately reflect what they want to express, certainly because they are limited in terms of vocabulary, articulation, memory and experience. According to Parkinson (2001), researchers must keep children 'busy thinking' by having them doing something during the interviews. In addition, the unequal power relationship in the interviews with an adult as interviewer and a child as interviewee can be an obstacle to children expressing their capabilities (Kirova, 2003). To minimize this effect, Mathews and Tucker (2000) suggest that conducting 'supportive and respectful' interviews can be a very 'empowering experience' for children (see also Cappello, 2005; Prosser and Schwartz, 1998).

For the purpose of the present study, game-playing was chosen as an initial activity to uncover children's conceptions of pests and the damage they cause to plants on the farm (phase 2, A1 depicted in Table 2). The game was conducted in one school in each research village with a small sample of children. This strategy enabled an easier access to each child's experience and understanding of pests. Other researchers have used games in their studies to entertain the exchange of thoughts and talk among children and have achieved interesting results (Fagot et al., 1995; Kirova, 2003; Björnsen-Gurung, 2002). The tool generally consists of a game board, markers of various colors and game cards on which names of pests children previously mentioned during the informal conversations are written along with a photograph of the pest. Game-playing implies dialogue with children. The dialogue was engaged through an unstructured interview. Responses from this informal talk helped to select the figures and arrange them in such a way that give children the opportunity to respond to a variety of questions from their peers. Generally the game is lead by a question. For this study, the game was called 'What do they know about pests?' The objective was to define and negotiate meaning during the game and build a relevant interpretation scheme for the data collected.

3.3 Specific advanced data analysis approaches

Various procedures were used to analyze data collected to determine and explain the differences in farmer's stocks of knowledge, their choices in pest problem solving processes, and mobilization of knowledge and non-knowledge

resources. The section starts with the salience analysis as a method to evaluate folk knowledge through their differential naming abilities.

3.3.1 Salience analysis

Analysis of data from the list task covers two parameters: term frequency and mean position in the individual list. To only define a cultural or cognitive domain boundary, 'term frequency' is adequate and enough (Weller and Romney, 1988:14; Borgatti, 1999: 122-30; Davies and Corbett, 1994). The mean position of a term in a list helps to perfect the term frequency parameter mentioned above. The tendency to occur at the beginning of elicited lists of terms corresponds to the mean position of a term, while the occurrence of a term in all idiolects of all subjects corresponds to the frequency of that term (Weller and Romney, 1988; Sutrop, 2001). The basic terms in every domain are the most salient. The most salient term, the one that is always named first by all subjects, takes the value 1. The less salient terms have a value declining toward 0 in the list task. Parameter that provides more insight about the internal structure of the identified cultural domain is called saliency (Berlin and Kay (1969). Actually, it is not enough to define the border of a domain. To cognitively establish the basic terms in a domain, objective criteria are needed for ordering the terms and grouping them into basic and non-basic. Hence, the frequency or the mean position is not sufficient. Smith (1993) developed a free-list salience index (see also Smith et al., 1995; Smith and Borgatti, 1997), and proposed a formula which captures frequency of mention and position in the list across informants. Sutrop (2001) refines the salience index into cognitive salience index (CSI), which takes the value 0, for the less salient items, to 1, for the most salient item. At the same time, he revisited the previous formula and framed it as follow:

$$S = F / (NmP)$$

with F being the frequency of a term (F is the number of the lists where a term is listed); N the total number of lists (number of subjects); mP the mean position of a term.

The mean position of a term is calculated as follows:

$$mP = (\sum R_j) / F,$$

where R_j is the rank of a term in list j ($j = 1, \dots, N$)

Therefore, the salience index can be written as:

$$S = F^2 / (N \sum R_j)$$

A cognitive salience index shows the psychological salience (see Davies and Corbett, 1994) combined with the frequency and the mean position into one parameter. The cognitive salience index structures the cultural domain or cognitive domain according to the salience of the terms in that domain and works equally for small and large samples (number of subjects). It is free from the side effects caused by the length of individual lists, and makes the results of every investigation comparable with every other.

According to Berlin (1992) salience is a function of biological distinctiveness, while Hunn (1982) emphasizes the utilitarian dimension. In order to better elucidate the effect of AIDS, as well as its nature and magnitude on traditional agroecological knowledge, an advanced analysis of the disparity in CSI among the Adja farmers was conducted. Below is the description of the complementary advanced statistical analysis undertaken to this end.

The Tobit model to analyze the differences in CSI scores

The Tobit model was chosen to explore the factors which could explain the differences in the CSI scores. The reason for choosing this model was dictated by the nature of the CSI scores: the values are censored and varied between 0 and 1 (see Amemiya, 1984; Greene, 2003; McDonald and Moffitt, 1980; Rahman, 2005 for detailed information about the model). Generally, the model assumes that there is an underlying latent variable, y_i , such that:

$$\begin{aligned} y_i &= X_i \beta + u_i && \text{if } X_i \beta + u_i > 0 \\ y_i &= 0 && \text{if } X_i \beta + u_i \leq 0 \\ &&& i = 1, 2, \dots, n \end{aligned}$$

where y_i is the dependent variable (cognitive salience index - CSI); n is the number of observations; X_i is a vector of independent variables; β is a vector of parameters to be estimated, and u_i is an independently distributed error term assumed to be normal with zero mean and constant variance σ^2 .

3.3.2 Analysis of orphans' diversity and mobility

Data collected from households and orphans census were analysed with different procedures in order not only classify those orphans and the types of households in which they were found, but also to elucidate the reality of their everyday life and the root causes of, for instance, orphans' mobility as social

change brought by AIDS affection in their communities. Detailed information is provided in chapter 4. Below is the description of the main analytical tool used.

The Logit model to analyse determinant of orphans' mobility

The Logit model was used in this study to analyze diversity and mobility among HIV/AIDS orphans. Logit is an estimation model based on the probability of people to choose among sets of alternatives. It is used to understand the main motivations or explanatory factors behind a choice (Maddala, 1983). The choice operated by the farmer is random and follows a logarithmic function. Thus, if Y is the decision and X the vector of variables which explain that decision, the X vector is the function of certain factors justifying farmer decisions such as the characteristics of the agro-ecology, social networks, solutions available, socio-economic status, household size, farm size and many other important factors (Adesina et al., 2000; Nkamleu and Coulibaly, 2000; Fagbemissi et al., 2002). The value of each variable is reflected through an exponential curve and calculates by a logarithmic function on the form of $Y = f(X, e)$, with 'e' equal to the absolute error for the Logit distribution, which is probabilistic. The model is generally written in the form of:

$$Y_{ik} = f(I_{ik}) = \frac{e^{z_{ik}}}{1 + e^{z_{ik}}}$$

with

$$Y_{ik} = X_{ik} \beta_{ik}$$

Y_{ik} is the dependent variable, taking the value 1 for the farmer presenting a given feature, and 0 if not; X_{ik} is a matrix of the explanatory variables for that farmer; β_{ik} are the vectors of the parameters to be estimated; I_{ik} is an implicit variable which indexes Y .

Complementary data analysis

In addition to this three analytical packages, simple regression was also used to uncover the differential involvement of children in farming and its relations to HIV/AIDS orphans' mobility among the Adja communities.

3.3.3 Social networks analysis

Network analysis in this study consisted of the identification of the existing or newly constructed ties and their differential use by farmers. It covered also the observation and analysis of the relationships between individual farmers and

other social and institutional actors of maize and cowpea sector in the Adja cultural setting. Contrary to authors who proposed to analyze networks in terms of intensity (Bernard et al. 1990; Steinberg, 1999), this study analyzed social networks in terms of the type of resources different groups of farmers were able to mobilize through them. Hence, emphasis was put on their functionality and utility for their users. Types/nature of the connections - kin and non kin, occasional or permanent - were examined at individual as well as group level (see also Breiger and Pattison, 1986; Engel and Salomon; Trotter II, 1999). It should be noted that a focus on individual connections (ego-centered) was the entry point of the networks analysis in this study. Matrices of the uncovered connections were built and differences in their uses were analyzed and reported on using the Pearson Chi square (reinforced by the Fisher exact test when the data did not strictly meet the Pearson Chi²) rules.

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Chapter 4

Diversity and mobility in households with children orphaned by AIDS in the Couffo, Benin

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Abstract

This paper characterizes children orphaned by AIDS in the Couffo region of Benin. A 2006 census conducted for the research revealed a total of 315 such orphans, aged 0 to 14 years, within 88 households. Seventy-one percent of these children were under the care of their mothers or grandmothers, 68% were fatherless, 58% were between the ages of 7 and 12, and 68% were in primary school. An in-depth study of the orphans' lives, undertaken to complement the census, revealed that these orphans were highly mobile between households, with almost 50% of them moving homes within a six-month period. An analysis of this phenomenon found that orphan mobility was a deliberate household strategy to manage orphanhood. Tensions arising out of care arrangements and resource allocation were among the main reasons for the high degree of orphan mobility. The context of orphan mobility also highlighted the practical role the orphans were able to fulfill within the affected households. The findings show that orphan mobility is a social phenomenon with two functions: on one hand, it may help HIV/AIDS-affected households to manage the increase in the number of orphans; on the other, it can provide an opportunity for orphans to move to a 'safer' environment anytime they do not feel secure. The implications for institutions providing care to orphans were also identified. Among other things, we recommend that a distinction be made between the main caregiver and the 'endorser' of an orphan as this was found to be an important difference. We also recommended that a distinction be made between orphans under and over the age of 10. For instance, children in the age group 10-14 years should be defined as 'pre-adults,' as their position within the household and their needs for services are different from those of orphans under age 10.

Introduction

The HIV/AIDS pandemic has shifted from being a health issue only to being a development problem in the sense that it frequently causes the death of adults at their most productive ages (Barnett and Whiteside, 2003; Lie, 2008; UNAIDS, 2008). In addition, the consequent rise in HIV/AIDS-related orphanhood has become a major concern within the international community (Makumbi, Gray, Serwadda, Nalungoda, Kiddugavua, Sewankambo et al., 2005; UNAIDS, 2008).

This paper discusses diversity among children orphaned by AIDS in the Couffo region of Benin. The orphan classifications currently used by care-providing organizations do not take diversity of children's orphanhood status and household circumstances into account as they are often based solely on static demographic variables. We argue for a more dynamic categorization of orphans, especially those orphaned by the HIV/AIDS pandemic. In the Couffo region, the diversity of children orphaned by AIDS appeared intertwined with the frequency with which they moved between households; thus, we sought to better understand orphan diversity and mobility in order to design appropriate care for them.

Our interest in orphans' diversity and mobility between households was a spin-off of research conducted for different reasons. Our initial interest was mainly to study knowledge of agricultural processes among children orphaned by AIDS - an interest that arose from widely reported concerns about erosion of agricultural knowledge in HIV/AIDS-affected communities (see Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003; FAO, 2006). Other scholars have reported on the association between children's age and the type of ecological knowledge they have (e.g. Ruddle, 1993; Zarger & Stepp, 2004). For the purposes of our own study we wanted to locate and contact children orphaned by AIDS in the Couffo region who were of different age categories. However, getting in touch with these orphans proved difficult, one of the main obstacles being the well-known stigmatization linked to HIV and AIDS. We thought that our best entry point would be through organizations providing care for orphans. We anticipated that, as a precondition for effective service provision, such organizations must give consideration to the typology of their target population (see Biaou, 1997; Leeuwis, 2004; Adjei-Nsiah, Leeuwis, Sakyi-Dawson, Giller and Kuyper, 2007). Care-providing organizations generally distinguish the individual characteristics of orphans, such as level of education, age and sex, and the primary persons in charge of the orphan(s) (Drew, Makufa & Foster, 1998; UNICEF/UNAIDS, 2003; IFAD-ONG, 2004; Subbarao and Coury, 2004). However, this kind of administrative data proved inadequate

for our study. Such data does not make a clear distinction between children orphaned by AIDS, other orphans and additional categories of vulnerable children, and we were primarily interested in the situation of the former.

In an effort to improve upon available databases, we set out to organize a census that would form a proper basis for our study on children's knowledge of agricultural processes, specifically those orphaned by AIDS. While conducting the census we discovered that a large amount of the data provided by care-providing organizations was no longer accurate, mostly because orphans had moved from the registered household to somewhere else. Initial investigations revealed that this observed orphan mobility was associated with tensions arising as a result of care arrangements within the households. It could also be linked to the resources that orphans could bring (or not bring) to the household. We felt that identifying such tensions and dynamics could have methodological relevance for scholars with an interest in children in difficult situations. Above all, insights into orphan diversity and mobility between households could help care-providing organizations to better position their services.

The present article, which reports on our investigation, aims first to examine the demographic and livelihood characteristics of rural households with children orphaned by AIDS. Second, the article aims to uncover the relevance of orphan mobility as a new dimension for the characterization of children orphaned by AIDS, and consequently to better understand the observed patterns of mobility between the orphans' households. To achieve this, we conducted a local census, analyzed the results, and revisited the households at a later stage. These data are complemented by two apt case studies that highlight some general principles relating to orphan mobility (see Mitchell, 1983).

The article reviews the HIV/AIDS pandemic and its link to rural livelihoods in Africa, in Benin, and specifically in the Couffo region. We highlight HIV/AIDS-related orphanhood as one of the major consequences of the pandemic. Care provision for these orphans in Benin is contextualized by examining institutional care-provision responses and their classification of orphans. The results are presented in three sections: an overview of the basic typology of the children orphaned by AIDS in the Couffo region and the households in which they were found; a description of the magnitude of the phenomenon of orphan mobility in the region; and, an exploration of the root causes of orphan mobility in Couffo. This is followed by qualitative accounts of the characteristic patterns of orphan mobility between households. Finally, we review the major findings and discuss the implications for future research pertaining to children orphaned by AIDS and make suggestions for care-provision policy.

4.1 Analytical framework

The HIV/AIDS pandemic and rural livelihoods

The HIV/AIDS pandemic is presently a leading cause of adult mortality in sub-Saharan Africa (Barnett and Whiteside, 2003; FAO, 2006; IFAD, 2002; UNAIDS, 2008), leaving affected households with an increasing number of orphans in circumstances of pain and uncertainty (Makumbi et al., 2005; UNAIDS, 2008).

In Benin, results of HIV/AIDS prevalence studies conducted from 2002 to 2005 mention an overall HIV prevalence of 2%, with estimated prevalence ranging from 1% to 6.4% across different municipalities (UNDP & Ministère de la Santé, 2006). In 2006, UNDP and Ministère de la Santé (2006) estimated that approximately 52 persons were becoming infected per day in the country, compared to 35 in 1999-2000. As in other sub-Saharan countries, HIV prevalence seems to have stabilized in Benin's big cities, whereas prevalence generally continues to increase in the rural areas (FAO, 2006; UNDP and Ministère de la Santé, 2006). In fact, the prevalence of AIDS has become a considerable threat to rural communities in Benin and elsewhere (Bollinger, Stover and Martin-Correa, 1999; Rugalema, 1999a; Baylies, 2002; Loevinsohn and Gillespie, 2003; FAO, 2006).

Agriculture is the main source of food security in Benin's rural areas. Food security is achieved through household consumption of harvests and the marketing of farm surpluses. The sale of surplus produce provides farming households with income to purchase items they do not produce themselves (Thiébaud, 1996; Fagbemissi, Coulibaly, Hanna and Endamana, 2002). However, the improvement of rural livelihoods brought about by agricultural research and extension services is being undermined by the dramatic impacts of the HIV/AIDS pandemic, causing a substantial reduction in food production (World Bank, 2000; IFAD, 2002; De Waal and Whiteside, 2003; Loevinsohn and Gillespie, 2003; FAO, 2006). The effects on rural livelihoods are particularly disastrous because HIV frequently affects the most economically productive adults in farming households and consequently generates many orphans (Topouzis, 1998; Whiteside, 2002; Deiniger, Garcia and Subbarao, 2003).

The rise in HIV-related orphanhood and the national mitigation approach in Benin

Orphanhood is a direct, negative long-term impact of HIV and AIDS, and the incidence of orphanhood is expected to increase in coming years (Case, Paxson and Ableidinger, 2002; Loevinsohn and Gillespie, 2003; Makumbi et

al., 2005). However, this claim is not always supported by official statistics (Foster and Williamson, 2000; Ainsworth and Filmer, 2002). Nevertheless, in Benin, mitigating the impact of the increase in HIV-related orphanhood is of concern. The prevalence of HIV and AIDS worsens poverty and is therefore considered a major threat to the national strategy to respond (Government of Benin, 2007). As part of a national programme for poverty alleviation, Benin has recently elaborated strategies to respond to an increase in HIV-related orphanhood (Government of Benin, 2007). In this regard, and under the auspices of international organizations and donors, funds are being used to support initiatives at the local and household level (Government of Benin, 2007; UNAIDS, 2008; UNICEF/UNAIDS, 2003). Generally, the national approach consists of identifying the orphans and providing them with assistance, including healthcare for basic illness and/or antiretroviral medicines (IFAD-ONG, 2004; UNDP and Ministère de la Santé, 2006; UNAIDS, 2008). A close look at the national care policy reveals that the approach to care provision for orphans has two facets: household-based care and institutional care. Household-based care is given by the surviving parent or members of the extended family (e.g. uncles, aunts, grandparents and other relatives), whereas institutional care is assured through forms of statutory residential structures or formal fostering households (Government of Benin, 2007) (for details on the World Bank's approach, see Siaens, Subbarao and Wodon, 2003; Subbarao and Coury, 2004).

The central focus of the national strategy for household-based care is the provision of care for vulnerable groups, mainly women and children. The strategy largely consists of providing psychological and social support for children orphaned by AIDS, but it also aims to provide support for households or foster families through food and school tuition subsidies. In some cases, support is also given to communities in order to strengthen their capacity to understand and to appropriately respond to the local impacts of HIV and AIDS (Government of Benin, 2007).

The national strategy is inspired by a community of practices - elaborated within international organizations - that aim to optimally address the needs of HIV/AIDS-affected populations (Subbarao and Coury, 2004). These organizations (e.g. United Nations Joint Programme on HIV/AIDS (UNAIDS), United Nations Children's Fund (UNICEF) and the World Bank) often classify orphans by emphasizing the type of orphanhood: that is, children (usually under age 15 years) who have lost their father, their mother or both parents. Organizations also look at whether children are living with a surviving parent, with an extended family member (called informal fostering), or within a

formal fostering household or institution. Other aspects noted include household type (e.g. male-headed or female-headed), the sex of the person in charge of the orphan, and the age of the child (Subbarao and Coury, 2004). In cooperation with the government of Benin, care-providing organizations and donor agencies may support orphans through food aid, when possible taking into account the size of the household in which they live. These groups may also provide tuition subsidies for orphans who attend primary school. (For instance, a few of the orphans in the Couffo census were enrolled in non-formal training within the framework of a recently started project in the region.) However, less support is generally given to those who are in secondary school.

4.2 The Couffo census

A census is a method of enumerating people; it is used in population studies and HIV/AIDS surveys. A census consists of counting and characterizing the population in a given, well-defined territory in order to provide reliable statistics on the number of inhabitants, the number of households, and the residents' characteristics (such as age, occupation, housing types and conditions, etc.). To determine the *de jure* population (individuals counted in their normal place of residence), everyone needs to be counted (see Canada Census, 2001; United Nations, 2007). Accurate and valuable information is gathered through the census questionnaire and is used to implement or improve services, such as care provision for children orphaned by AIDS (Brouard, 1993; Nalugoda, Wawer, Konde-Lule, Menon, Gray, Serwadda et al., 1997; Durr & Dumais, 2002; Makumbi et al., 2005). Data collected through censuses are generally analyzed using typologies, which means classifying the people enumerated based on pre-defined demographic characteristics (Biaou, 1997; Adjei-Nsiah et al., 2007; Sang-Yi, Chang-Bae & Yong-Gab, 2008).

Agriculture is the main activity among rural people in Benin and in the Couffo region thereof (CERPA, 2004). Couffo was selected for the census because it is one of the most AIDS affected areas in the country, with approximately 6% HIV prevalence versus 2% nationally. In explaining the relatively high prevalence of HIV and AIDS in the Couffo region, people generally point to two factors. The first is its proximity to the Togolese Republic; this favors migration from both sides of the border. The second is the presence of relatively liberal cultural values about sex, as well as well-established commercial sex activities. These two factors have contributed to

the spread of the epidemic and justified early HIV campaigns in the region (Bollinger et al., 1999; Médecins Sans Frontières, 2003; IFAD-ONG, 2004). But despite those efforts, people in Couffo (as well as throughout the country) are still reluctant to voluntarily test for HIV. Consequently, existing data are not reliable with respect to the magnitude of HIV-related orphanhood. Previous attempts by IFAD-ONG (Institut de Formation et d'Action pour le Développement des Initiatives Durables), a non-governmental organization specializing in providing care to vulnerable children, and Plan-Benin in 2004 to create a database for Couffo yielded the identification of numerous orphans who were difficult to characterize as children orphaned by AIDS. Conducting a census proved to be an inevitable step to locate and contact those orphans specifically.

4.3 Methods

Sampling strategies and sample size

Given the large size of the Couffo region, a first challenge was the choice of a representative area in which to carry out the study. The timeframe of the study, the information available on HIV/AIDS from the Programme National de Lutte contre le Sida (PNLS) (National Programme for the Fight against AIDS) and from IFAD-ONG, together with relevant information collected from key resource persons linked to the care-provision systems in Couffo, led to the choice of two municipalities, namely Aplahoué and Klouékanmey. Aplahoué is located 20 km from the office of IFAD-ONG and was the first locality in the Couffo region to benefit from national sensitization efforts in regard to the HIV epidemic (pers. comm., Leandre Dahoundo, Health Programme Coordinator, IFAD-ONG, March 2006). Thus, intensive HIV/AIDS-awareness campaigns seem to have lessened fear and stigmatization in this community. Klouékanmey had the advantage of hosting IFAD-ONG. The proximity and community-based nature of this NGO facilitates access to care provision for nearby households. The choice of the two study sites enabled access in the area to children orphaned by AIDS and also facilitated the compilation of a reliable database. Nine villages were eventually randomly sampled for the purposes of the study (see Table 1).

Data collection

The Couffo census was conducted in three phases. The first phase consisted of counting all the households with children orphaned by AIDS within the two research sites (Aplahoué and Klouékanmey municipalities). We recorded

Table 1: Geographical distribution of the study villages, Couffo region, Benin (n = 9 villages).

Municipalities	Villages
Aplahoué	Kissamey; Azove-central; Aplahoué-central; Dékpo
Klouékanmey	Tchikpé; Adjahonmey; Ayahohoué; Djotto; Klouékanmey-central

information such as household size, composition and household members' HIV/AIDS status. The age, sex and education level of all orphans in each household were also recorded. The second phase consisted of gathering information on the households' main livelihood activities, the number of orphans involved in farming activities, and the portion of land assigned to each orphan. In the third phase we further characterized the orphans' households according to total available farm land (for farming households), the total number of children involved in farming, and the portion of farm land allocated to each orphan involved in farming activities. Farming included ploughing and weeding of farm lands planted with maize or cowpea.

To build the register of the orphans, the households were recorded according to the types of orphans residing within. The resident orphans, aged 0 to 14 years, were enumerated in the period April to May 2006¹⁷. The orphans were counted in the households where they lived, and the presence or absence of a surviving parent was also noted. Given the complexity of the situation, building trust and good rapport with household members was a crucial step, and thus the IFAD-ONG staff were very helpful in this regard. Information was gathered through semi-structured interviews.

Investigating and analyzing orphans' mobility

A third visit to the households took place six months after the first two enumerations were made. This round of visits revealed that a considerable number of the orphans were no longer in the households where they had been originally enumerated. This situation prompted us to re-examine the census data and identify which households had experienced these movements, as well as the magnitude of the phenomenon. It is worth noting that these movements

¹⁷ The head of the household was a gateway to accessing the orphans in the household (especially during the second phase of the census), by granting permission to talk to the orphans in confidence.

can occur within the extended paternal family¹⁸ (composed of several collateral households) in the same neighborhood, resulting in a change of either the main care person or endorser. We noticed that there was often someone else 'shadowing' an orphan's main caregiver, whom we call an endorser; an 'endorser' is a person who reaches out to arrange care for a given orphan in a way that mitigates, for example, some of the stigmatization linked to HIV and AIDS. (This concept is examined later in the article). Movement can also occur when an orphan's main care person changes her/his residence, moving from one village to another. In this article, the first situation is termed 'change in endorsement', and the second one 'change of residence.' The results of our re-examination of the census data enlightened us on the relevance of orphan mobility and its importance in capturing the diversity of the HIV/AIDS-affected households and the dynamics of their relationships with the orphans within them.

In order to gain a better understanding of the observed patterns of orphan mobility, we decided to investigate some specific cases, to further explore under what conditions orphan mobility was occurring in Couffo. Ultimately, these cases illuminated the embedded aspects of the management of children orphaned by AIDS and the crises sometimes surrounding changes in their residence. The criteria for the choice of the cases were determined by the main aspects of orphan mobility and the types of households in which orphan mobility mostly occurred. Some children were observed in their progress from their former households to their new residences, but this was limited to movements within the Couffo region. The cases were constructed by analyzing information gathered from the children as well as from adults who had 'endorsed' them at one point or other during their movements. Here, we illustrate typical aspects of the orphans' mobility by summarizing two apt cases that portray change in endorsement followed by change of residence. We analyzed the data with the Statistical Package for Social Scientists (SPSS) and present the results in percentages of orphans and types of households. Next, we proceeded to a two-stage exploration of some important variables, first by using a Logit regression, complemented by a simple regression. Analysis of the data was based on the level of significance of the key variables.

Ethical dimensions of the study

The HIV epidemic in Benin and elsewhere presents various challenges, among which are ethical issues, as the disease is socially marked with stigma

18 In Couffo, a child belongs to his/her father's family. Care arrangements are the responsibility of the paternal relations, but in the event of failure, the maternal relatives can take over.

and discrimination, and thus often threatens human dignity, resulting in vulnerability. Although Wolf & Lo (2001), referring to the Nuremberg and Helsinki declarations, stated that ethical principles must be interpreted in the context of specific cases, our approach to ethical concerns was based on informed consent, confidentiality, and protection of groups that are most vulnerable (see Ahn, Grimwood, Schwarzwald and Herman, 2003; Muthuswamy, 2005). The research effort presented us with the possibility of a two-fold context of vulnerability. The first aspect relates to the notion of 'HIV/AIDS affection,' and the second derives from a possible power imbalance resulting from a situation in which an adult is researching children - a situation that is more pronounced when the children are orphans (see Andrews, Skinner and Zuma, 2006; UNICEF, 2006; Earls, Raviola and Carlson, 2008).

In this study, informed consent was achieved on a voluntary basis via the Couffo census of HIV/AIDS-affected households. Here, we note that the notion of 'affection' was preferred over 'affliction' or 'infection' as it helped to minimize stigmatization and encourage voluntary participation in the census and the study as a whole. Confidentiality and rapport-building were, hence, achieved. The IFAD-ONG staff sensitized people to participate on the basis of understanding the objective of the study rather than on the basis of the organization's position as a care-providing institution in Couffo. We cannot, however, guarantee the total absence of false expectations at the participant's level, insofar as the participants may have felt that by participating they were improving their chance of being considered for assistance in the future. With respect to a possible power imbalance between the children and the researcher, building rapport and confidence was of great importance. Not only did we take time to achieve a good level of familiarity with the orphans through several interactive games and also through showing an interest in their daily lives, but we also avoided the involvement of parents (adults in general) at sessions with the children. Furthermore, it was only at the level of the researcher that the distinction was made between children orphaned by AIDS and other orphans, and it was clearly explained that not all the orphans would be part of the final study, but that the selection would be made on the basis of drawing numbers from a hat.

4.4 Results

The results are presented in three parts. First, we present the outcome of the Couffo census, specifically by giving a basic typology of the households with children orphaned by AIDS and the orphans found within them. The second

part gives our account of the mobility of the enumerated orphans and the relevance of mobility as a new dimension in the characterization of orphans for the purposes of improving care provision. The third part illuminates the factors behind these orphans' mobility.

Characteristics of the children orphaned by AIDS and their households in Couffo

A total of 88 households with children orphaned by AIDS, containing 322¹⁹ orphans, ages 0 to 14 years old, were enumerated through the Couffo census. Table 2 summarizes some characteristics of the orphans.

The census figures reveal that there were 68% fatherless orphans, 23% double orphans, and only 9% motherless orphans in the Couffo region. It is notable that 55% of the orphans were below age 10 years, and 68% were in primary school. Some characteristics of the orphans' households are summarized in Table 3.

A population of orphans can comprise three basic categories: paternal, maternal and double orphans (those who have lost both parents). But the orphans counted in the census were actually distributed within four categories of HIV/AIDS-affected households: 43% of the 88 households contained only fatherless orphans, 29% had only double orphans, 19% had mixed orphans (meaning orphans of different orphan status), and 9% contained only motherless orphans. The fact that there were relatively few households with motherless orphans shows that there may be only a few households headed by male adults in the study area. In addition, Table 3 shows an almost equal split between orphans living in a surviving parent's household and those living in a fostering household. The majority of the orphans lived in small households with four or fewer members.

Regarding care arrangements for the orphans, 71% of the affected households had a female as the main care provider, compared to 29% of households with a male main care provider. The majority of the households (90%) declared that they had direct or indirect access to formal care-providing institutions via local platforms. Direct access encompasses benefitting from food subsidies, subsidized medical consultations and some school tuition subsidies. Indirect access concerns mostly the sharing of food with those in the extended family who are already receiving subsidies. Support from the extended families included more affective components, such as more frequent visits, or providing help during an intensive period of farm activity, or standing as guarantor if there was a need to borrow money for some unavoidable expenditure. Family

19 Three hundred fifteen of the total of 322 were used for the typologies of orphans in this chapter due to the lack of accurate information about key criteria chosen for their categorisation.

Table 2: Characteristics of the children orphaned by AIDS enumerated in the Couffo census (n = 315 orphans)

Characteristics	Status of the orphan (%)			
	Fatherless	Motherless	Double orphan	Total
Orphan's age (years)				
0-6	22	1	3	26
7-9	19	3	7	29
10-12	18	3	8	29
13-14	9	2	5	16
Sex of the orphan				
Female	35	4	12	51
Male	33	5	11	49
Orphan's level of education				
None	10	1	2	13
Primary school	47	4	17	68
Secondary school	10	2	4	16
Apprentice	1	2	-	3
Orphan's link to main care provider				
Father	-	3	-	3
Mother	45	-	-	45
Grandmother	12	-	14	26
Aunt	1	6	9	16
Uncle or grandfather	10	-	-	10

support sometimes included remittances sent home by those living in a big city. Moral support from an orphan's endorser was also observed.

The orphans' households were also characterized according to main livelihood activities. The census revealed that the orphans' households were

Table 3: Characteristics of the households with children orphaned by AIDS enumerated in the Couffo census (n = 88 households).

Characteristics	Status of the households (%)				Total (%)
	With fatherless orphans	With motherless orphans	With double orphans	With mixed orphans*	
Type of household					
Surviving parent's household	43	9	-	-	52
Fostering parent's household	-	-	29	19	48
Size of household					
Small (≤ 4 memb)	22	5	18	13	58
Medium (5 to 7 memb)	19	-	9	5	33
Large (≥ 7 memb)	2	4	2	1	9
Sex of the main care giver in the household					
Females	40	2	19	10	71
Males	5	7	8	9	29
Source of care provision for the household (e.g. food, tuition, care, remittances)					
Official care networks	43	7	22	18	90 ^a
Extended family	32	8	19	17	76 ^a
Main livelihood activity in the household					
Agriculture	31	6	20	18	75
Small business	13	2	2	1	18
Livestock	1	-	2	1	4
Off-farm labour	-	-	2	-	3

* Mixed households' were households that contained orphans of different orphan status; ^a Some of the households had support from official care networks or from extended family members.

Table 4: Patterns of orphan mobility among the households with children orphaned by AIDS, six months after the Couffo census.

	Mobility (%) 'Yes'	Mobility (%) 'No'
Mobility patterns by characteristics of the household (n = 88 households)		
Status of the household		
Fatherless (n = 37)	43	57
Motherless (n = 8)	50	50
Double (n = 26)	45	55
Mixed (n = 17)	58	42
Main household's source of livelihood		
Agriculture (n = 66)	31	69
Small business (n = 16)	75	25
Livestock (n = 4)	25	75
Off-farm (n = 2)	0	100
Household type		
Fostering parent's (n = 42)	50	50
Surviving parent's (n = 46)	44	56
By sex of the main care provider		
Females (n = 62)	45	55
Males (n = 26)	52	48
Mobility patterns by type of orphan mobility (n = 315 orphans) ^a		
Orphan moved from the former household, but still lives in the extended family in the same village		18
Orphan moved from the former household and village to a new household in another village		30
No movement by orphans		52

^a The initial number of the orphans was 322, but information on some of them were not reliable for the analyses performed in this chapter.

mainly farming households (75%); other household activities included small business (18%), livestock (4%) and off-farm labor (3%).

The extent of orphan mobility in Couffo

Table 4 highlights the extent of orphan mobility within the surveyed households. A close look at the data revealed that all types of households experienced orphan mobility, but to varying degrees. Farming households were among those displaying the least orphan mobility (31%), while households involved in small business experienced the most movement of orphans (75%). This difference probably relates to the importance of farming in rural livelihoods and the importance of land ownership in rebuilding livelihood activities. It may also relate to the more flexible character of small businesses as compared to farming. The households with motherless orphans experienced slightly more orphan mobility than the households with fatherless orphans (Table 4). Households containing orphans of different statuses (mixed-orphan households) seemed to experience the most movement of orphans, as 58% of these households had experienced orphans moving out of their initial household. Likewise, the percentage of households displaying orphan mobility was higher among orphans initially living in fostering households than for those living with their surviving parent.

Mobility also occurred as a result of a change in the main care provider, which could result in orphans moving out to join their new carer within the extended paternal family (18% of the orphans), or else moving outside the extended family and village (30%). Often, the last type of movement happened in the case of tension, or as a result of a high degree of stigma, and/or because of the remarriage of a female surviving parent. In total, 48% of the orphans in the census database changed residence during the study period.

Determinants of orphan mobility in Couffo

Possible determinants were explored to enhance our understanding of orphan mobility in Couffo. Building upon the findings of previous studies, such as concerning the impact of HIV and AIDS on household composition (i.e. Kamali, Seeley, Nunn, Kengeya-Kayondo, Ruberantwari and Mulder, 1996; Ntozi and Zirimenya, 1999; Urassa, Boerma, Isingoa, Ngalula, Ng'weshemi, Mwaluko and Zaba, 2001), on rural livelihoods (i.e. Hunter, Bulirwa and Kisseka, 1993; Cohen, 1998; Rugalema, 1999a; Baylies, 2002; Loevinsohn and Gillespie, 2003; Dewagt and Connolly, 2005), and on the link between gender and care provision (i.e. Beer, Rose and Tout, 1988; Levine, Britton, James, Jackson, Hobfoll and Lavin, 1993; McDaniel and Zulu, 1996; Drew et al., 1998; Mutangadura, Mukurazita and Jackson, 1999; Foster and Williamson,

Table 5: Explanatory variables linked to orphan mobility, Couffo census.

Variables	Measurement
Dependent variable	
Mobility (i.e. orphan moved out of the household)	1 if the child moved; 0 otherwise
Independent variables	
Sex of the orphan	1 for female; 0 otherwise
Age of the orphan	Continuous variable
Sex of the main care provider of the orphan	1 for female; 0 otherwise
Change in the main care provider of the orphan	1 if that occurred; 0 otherwise
Orphan is living in surviving parent's household	1 if yes; 0 otherwise
Farming is the main source of livelihood of the orphaned household	1 if yes; 0 otherwise
Orphan is involved in farming	1 if yes; 0 otherwise
Number of observations: 315	

2000), a set of relevant variables was selected for exploration (Table 5).

The variables were tested for multicollinearity before proceeding to the analysis using logistic regression. The aim was to understand the role of the independent variables in explaining the mobility of children orphaned by AIDS in Couffo. The results given in Table 6 highlight the variables identified as the driving forces of orphan mobility in Couffo.

Five of the tested variables help explain the orphans' mobility. Two variables were positively linked to mobility: 1) change in the main care provider and 2) age of the orphan. The three other variables were negatively correlated to mobility: 1) farming as the household's main source of livelihood, 2) the sex of the main care provider, and 3) the orphan's involvement in farming. The relationship of age to mobility was significant at the level of 5%. Complementary observations from the field showed that orphan mobility differed according to the child's age. Children below age 10 years did not move much. This may be because children below age 10 are usually in primary school, and some tuition subsidies

Table 6: Determinants of orphan mobility in the Couffo region, Benin.

Variables	z-test	Standard error	p-value
Sex of the orphan	-0.042	0.288	0.966
Age of the orphan	1.394	0.348	0.048*
Sex of the main care provider of the orphan	-2.604	0.329	0.009**
Change in the main care provider of the orphan	5.938	0.325	0**
Orphan living in surviving parent's household	-0.418	0.311	0.878
Farming as main livelihood activity of the orphan's household	-4.198	0.303	0**
Orphans' involvement in farming	-3.209	0.301	0.012**
Constant	-4.440	0.309	0.009**
Log likelihood	-152.141		
LR chi ² (7)	76.231		
Number of observations = 315			
Overall correct predictions = 74.39%			
p > chi ² = 0**			
Pseudo R ² = 0.307			

* Significant at 5%; ** Significant at 1%; the variable 'age of the orphan' is in logarithm form.

are provided by care institutions and government agencies; but from the age of 10 onwards, the burden may become too heavy for the orphan's household. Orphans are then often passed on to another member of the extended family, or placed in major towns as domestic workers. From then on, children may become a financial resource able to contribute to the care of others left behind in the initial household). This was linked to a change of the main caregiver or the endorser, which appeared to have a significant correlation with orphan mobility ($p < 0.01$). Thus, a change in the main care provider or endorser may often result in a child moving out of the initial household.

Table 7: Explanatory variables linked to the orphans' involvement in farming.

Variables	Measurement
Dependent variable	
Farm portion assigned to a child for weeding as proxy to evaluate her/his involvement in farming	Percentage of the total household's farm land
Independent variables	
Total farm size of the household	Defined in hectares
Farming is the main livelihood activity of the orphans' household	1 if yes; 0 otherwise
Orphan lives in a surviving parent's household	1 if yes; 0 otherwise
Orphan follows adults of a fostering household	1 if yes; 0 otherwise
Size of the household	Category: 1 for small size; 0 otherwise
Orphan does farming on his/her own	1 if yes; 0 otherwise
Sex of the orphan	1 for female; 0 otherwise
Age of the orphan*	Expressed in category (age group): 1 = below age 7 years; 2 = ages 7-9; 3 = ages 10-12; 4 = ages 13-14. Only age categories '3' and '4' are used in the analysis.
Number of observations = 148	

* The orphans' involvement in farming becomes vital for the affected household from orphan's age 10 onwards.

The sex of the main care provider is another important explanatory factor. The results show a negative correlation between the sex of the main care provider and the mobility of an orphan ($p < 0.01$). Given the result for this variable, one could infer that orphaned children living with a female caregiver are likely to experience less mobility. However, there are other variables that may influence or alter this assertion. The next section elaborates on these.

Table 8: Determinants of the orphans' involvement in household farming activities.

Variables	t-test	Standard error	p-value
Orphans in age group 10-12 years	1.678	0.020	0.026*
Orphans in age group 13-14 years	0.989	0.028	0.174
Sex of the main care giving person of the orphan	0.292	0.021	0.771
Orphan lives in a surviving parent's household	0.600	0.019	0.549
Farming as the main livelihood source of the orphan's household	2.486	0.02	0.012**
Total farm size of the household	-10.23	0.012	0**
Orphan follows the adults of a fostering household	1.4	0.021	0.164
Size of the household	3.13	0.02	0.002**
Orphan does farming on his/her own	2.39	0.036	0.012**
Constant	9.46	0.113	0**

F-statistics for F(9, 147) = 21.59

Number of observations = 148

$p > F = 0^{**}$

Adjusted $R^2 = 0.534$

* Significant at 5%; ** Significant at 1%; the variable 'total farm size of the household' is in logarithm form.

Child involvement in farming and orphan mobility

There was a negative and significant correlation between orphan mobility and both farming as the main source of the household's livelihood and the orphan's involvement in farming activities ($p < 0.01$). Despite this, 31% of the orphans in farming households had nevertheless moved (Table 4). Empirical observations from the field and previous studies by other scholars suggest that it is not just living in a farming household that matters. It is much more the activities the children carry out and the degree of their involvement in farming

activities that are linked to their mobility (Hunter et al., 1993; SafAIDS/CFU, 1996; Rugalema, 1999b). Hence, Table 7 presents our exploration of those dynamics within farming households in Couffo. We based our analysis on weeding as the main farming activity at the time the study was conducted²⁰. We used the household farmland proportion assigned to the orphan for that activity (weeding) as a proxy to further explore the link between orphans' involvement in farming and their mobility. Among the orphans enumerated, 148 were actively involved in farming. The analysis was undertaken by a simple regression to examine the specific dynamics linked to orphan mobility in the farming households with children orphaned by AIDS.

The results of our exploration reveal five significant variables, among which four had a positive link to orphans' involvement in farming (Table 8). These variables can be considered important factors helping to explain how orphans' involvement in farming can lead to their mobility.

The relationship of the orphans' age to their involvement in farming corroborates the results presented in Table 6, which point to the effect of the orphans' age group. This finding is also backed by our field observations. In particular, orphans in the age group 10-12 years constituted the bulk of those involved in farming (household farm labor). The correlation, however, was not significant at 1% for the age group 13-14. Orphans in this age group are likely to be already engaged in farming on their own, on a separate plot (significant at 1%: Table 6), thus they are likely to contribute to household food resources directly through their own harvests. Orphans in that age group may also be providing managerial assistance to their foster parents, such as arranging labor when required, allocating work to the youngest in the household, and helping adults to purchase inputs, among other duties.

Another important finding is that the variable household farm-landholding size appears to contradict the association between child involvement in farming and farming as the main source of household livelihood. This is due to the influence of the number of household members and implies that, in this study, small households involved the orphans in farming more often than larger households ($p < 0.01$). Actually, these results underscore our field observations that households with relatively large land resources were also the ones with more household members. Hence, when more children are available as household laborers, the work is distributed accordingly. Although we did not categorize the affected households by the gender of the household head, field observations revealed that large households often had a male head and

20 During the second phase of the census, these 148 orphans were enumerated as orphans involved in farming activities. Data were collected on the portion of the household's farm that was allocated to each orphan living in it.

relatively significant land resources, whereas women often headed the smaller households and had less fertile farmlands. In Couffo, the average size of households' farm landholdings (among households containing orphans) was 0.6 hectares, but more than half the households farmed on just 0.1 hectares. Additional observations confirmed that small-sized households relied on their own harvests as their main food source. These small households were mostly female-headed households (mainly mothers and grandmothers). As a consequence, there may not be enough adults in such a household to contribute to the labor needed, with the work consequently falling on the shoulders of children. Thus, the implication is that orphans in small households (all of which were female-headed in the Couffo census) are comparatively important for their household's food production strategies.

Consequently, children orphaned by AIDS and living in farming households would experience less mobility than the average orphan, depending on the household's available farmland and how much the orphan could contribute to farming activities and household food resources. This relationship between orphans' involvement in farming and orphan mobility is certainly one facet of the impact of HIV and AIDS on rural livelihoods in Couffo.

Intra-household human relationships and orphan mobility

Orphan mobility is fuelled not only by orphans' contribution to farming. An important embedded issue relates to the problematic distribution of household resources in general. The following cases showcase this assertion. These cases reflect the fact that the main care provider is not the only person who takes responsibility (in principle or in reality) vis-à-vis the orphan. As mentioned, there often exists a person, whom we call an endorser, who is a moral supporter of the orphan and his/her carer. Sometimes, direct or indirect conflict can occur between the endorser and the main care person. The two case descriptions (Boxes 1 and 2) provide insight into the kinds of conflict that can arise in relation to care arrangements, eventually leading to orphans' mobility. We use pseudonyms when referring to the characters.

Case 1 (Box 1) illustrates how a conflict about a child orphaned by AIDS can lead to household disruption. The case shows that caring for a child orphaned by AIDS is not totally selfless. If new resources are not appropriately shared, the disappointment of some household members can put the orphan in a difficult situation. Case 1 draws attention to how the management or sharing of the resources a given orphan may bring in can potentially harm a household's unity and lead to formation of a new household. In this case, the endorser was the grandfather who gave his approval to the grandmother to host and take care of the two grandchildren.

Box 1: Case 1 - Double orphans living with their grandparents

Felix and Joshua live with their grandparents. As the head of the household, the grandfather accepted the two orphans into his household. After a dispute with the grandfather, their grandmother, Shikavi, took full responsibility for the two children. The main reason, she explained, was the way the children were treated by the grandfather and his tendency to utilize the food provided for the children by the care institution for his own needs. The disputes were so frequent that Shikavi decided to leave her husband's house and go back to her own village with the two orphans. When asked why she had to take so radical a decision, she said:

'Anyway, the children were not his problem. I was alone with these small children, and my husband added to it with his 'noise' about the people who visit me and the children. He is only interested in eating what the organization brings to the kids. The children and I always have to work hard for our daily needs, and to pay for what they need for school. Sometimes, when he drinks, he becomes too violent, and this is not good for the children. So, to raise my grandchildren in peace, I decided that was enough, and we left.'

When questioned about the problems he had with his wife about these children, the grandfather said:

'It is not easy in our village when people know that someone got the disease (HIV or AIDS) in your family. I decided to take on me the shame of my son who married a woman who finally killed him. Now that the children are getting support from outside, my wife wants to enjoy the benefits alone. It is not fair, and I let her know that I share the shame, and I should share the resources. That's all. If it is not the case, she can go wherever she wants, out of my sight.'

In their new home, the children seemed quite happy when questioned about their feelings. They were impressed by the respect that other members of their new family had for their grandmother. However, they pointed out their difficulties with other children in the household:

'They leave us with the cleaning when our grandma is not around....'

The orphaned children also confirmed that not much had changed in their everyday struggle for life:

'Sometimes, we have serious problems.... Our grandma does not have money to pay for the school materials on time.... When we are sick, a man with a big motorbike comes sometimes to bring us to the hospital, and there, they give us some medicine.'

Case 2 depicts the difficulties faced by those who have lost a father or husband to the disease. Loss of the male counterpart has a serious effect on access to resources for orphans and widows. Likewise, polygamy does not seem to contribute positively to providing a safe environment for orphans. Case 2 illustrates that the death of the male head of the household often entails shifts in position and power within the household; this may ultimately create a hostile environment for the orphans. Hence, in addition to other resources, a lack of non-tangible resources such as affection and esteem can also cause orphan mobility and accelerate household disruption.

Box 2: Case 2 - A double orphan living in her sister's household

Julie is a double orphaned girl living with her sister Angeline. When her parents died, her sister agreed to be married to a man who already had a wife. Angeline moved to her new household, taking Julie, and became her sister's main care provider. Shortly after, her husband also died of AIDS. They did not have any children together.

According to Julie, her life is far from being easy in her sister's household. She is always caught in the middle of confrontations between the two widows. Talking about the situation, she said:

'My stepmother accused my sister of the death of her husband. Whenever they start, I just feel pity for my sister as she can cry the whole day. You can imagine, what of me then? My stepmother can beat me for anything. Sometimes, I miss school because it can take a long time before I finish whatever she wants me to do. Sometimes my sister helps me, but she also has her duties. My sister is under that woman's command, and she always tells us that if we are not happy the doors are open....'

Angeline tested HIV-positive and this reinforced her stigmatization by her co-wife. Beside all this, the two wives often fought about resource sharing. According to Angeline, the first wife registered Julie as one of the children of the house in order to bring more money for food into the house. But she did not always easily include Julie and her sister in benefiting from it.

In the end, Angeline broke down and decided to leave her late husband's household. Together with her sister, they settled in their own parents' house. She explained her main motivation:

'As I am infected by the virus, my only joy is to take care of Julie as the child I will never have. My concern now is how long will I live to take care of her?'

For the sake of taking care of her sister, she finally decided to overcome the stigma and ask for help. She started going to the meetings of people living with HIV, hoping that in the end she might be registered with the care-provision organization and benefit from assistance, as she might then get some antiretroviral drugs for herself.

As a whole, the two cases illustrate the existence of tensions regarding the allocation of resources gained by a household through having an orphan taken into its care. Those resources may come from the late parents' assets or from a community platform of care provision. The case studies also illustrate that stigmatization is still present despite all the sensitization campaigns, and stigma often starts within the household. This can be very problematic considering that a secure, affective environment is a key resource for children who have already been traumatized by having witnessed the suffering and eventual death of one or both parents.

4.5 Discussion

The major points that emerged from the study can be reflected upon under several headings. We first examine the gender-based nature of household care provision, its link to the age of orphans in the household, and the relationship to orphan mobility in Couffo. This is followed by consideration of the importance of an 'endorser' in an orphan's life. Finally, we discuss orphans as being not a burden but a resource for their household, especially due to a contribution to household food security.

Gender-based care provision, orphans' age and orphan mobility

Several scholars have expressed concern about orphan management as one of the side effects of the HIV/AIDS pandemic. In fact, orphan management induces household relocations and inter-household movements of children. In this study, there was a high number of relatively small households among the households containing orphans. These small households tend to be formed when a female caregiver/endorser moves from one residence to another. This type of household may also be formed when co-wives in a polygamous household are separated after the death of the husband; in this case, women who do not seek to be remarried to one of their brothers-in-law can negotiate to leave with the children for a new residence.

The findings show that fatherless orphans in Couffo were numerically more important than other categories of orphans. One implication of this situation is that the majority of these children had female caregivers. Our study highlights this reality, similarly acknowledged by other scholars (McDaniel and Zulu, 1996; Topouzis, 1998; Ntozi and Zirimenya, 1999; Makumbi et al., 2005). Given the social disadvantages for female adults in a patriarchal society (being less favored in terms of resource allocation), women may be hindered in their attempts to be good care providers/endorsers, despite their best efforts and pre-dispositions. Children orphaned by AIDS can quickly become a burden to a household with a shortage of basic resources, such as food and money for school fees and materials. This has also been highlighted by other authors (Levine et al., 1993; McDaniel and Zulu, 1996).

The relationship between care provision, the age of the orphans, and the sex of the main caregiver is largely emphasized through the case illustrations (see Boxes 1 and 2). Additional field observations showed that children aged 10 and above may be valuable human resources for their households; alternately, they can quickly become a burden, as they are in most cases in their last two years of primary school. In these two years, taking care of an orphan can seem expensive; the children are often too busy with school assignments to help with household duties. The next section elaborates on this.

The notion of the endorser and his/her contribution to household care arrangements

An endorser is a person who in some sense supports another person. Endorsing can consist of publicly giving approval or support to another person, often a family member or close friend, to openly express his/her agreement with an action of, or a position adopted by, that person (the endorsee). Thus, this person acts as a moral umbrella. In this study, we found that the endorser was generally a member of the orphan's extended paternal family, who either offered his/her home to the orphan/s or kept watch over them in their surviving parent's household. Having an endorser is particularly important in a patriarchal society like that in the Couffo region, especially for female-headed households. The intention is to minimize the occurrence of child-headed households. In Couffo, we surmise that the endorser's main role is to arrange a main care provider (sometimes the endorser him/herself) to monitor a child's wellbeing. But this role can have hidden advantages. For instance, the endorser can claim some rights over the orphaned child and may use the orphan as a family laborer or household resource-provider. When an opportunity arises to access care-provision platforms, it is often the main caregiver who is registered, together with the orphan, and this often creates friction at a later stage. When tensions

occur, an important part of the endorser's function - to monitor the orphan's wellbeing - is often jeopardized and can result in household disruption. This aspect of care arrangements ought to be considered and better understood in order to improve the benefits of care provided by institutions to affected families or communities. In addition, it is important to note that non-tangible resources, such as affection, household harmony and peer-to-peer valuation, should not be neglected or underestimated in the cognitive and psychological development of orphans and vulnerable children.

Orphans as a burden and a resource for the household

A main function of a household is to provide food security for its members (Thiébaud, 1996). As a result, a common response among households with children orphaned by AIDS is to use the orphans as human resources to address food security, but at the same time deal with the problems of HIV-related orphanhood (Hunter et al., 1993; Tibaijuka, 1997; Bollinger et al., 1999; Foster and Williamson, 2000; Dewagt and Connolly, 2005). As we have seen, children's involvement in farming falls along age group divisions, however. This has been similarly reported by other scholars (e.g. Ruddle, 1993; Drew, Foster and Chitima, 1995; Zarger & Stepp, 2004). In Couffo, we observed that children were involved in farming as early age 7, and they were used for various activities entailing various degrees of difficulty.

A child's involvement in farming activities in the context of subsistence agriculture is said to be part of the child's socialization process, through tacit knowledge acquisition (learning by doing) (Ruddle, 1993; Ohmagari and Berkes, 1997; Setalaphruk and Price, 2007). In the face of HIV-related orphanhood and poverty, farming activities may be extended to cover commercial crops, as noted by Rugalema (1999b) and Haddad and Gillespie (2001). Accordingly, orphans can be valuable replacements for hired labor. Hence, not only do they sometimes contribute to the production of food for the household, but they can also contribute to an increase in agricultural surpluses for the market (SafAIDS/CFU, 1996; Tibaijuka, 1997; Rugalema, 1999b). In Couffo, the children in the age group 13-14 years were the ones most expected to complement the adults in their various household activities, ranging from domestic duties to farming activities. Should these children feel under too much pressure, it can be a turning point for them to search for freedom, live on their own, or live on the street.

This study found that gender-based land allocations in Couffo seemed to have a great influence on the observed dynamics of orphans' involvement in agriculture and their mobility. The patriarchal tradition confers land ownership to men; women who manage to farm on their own are often left with small

landholdings. Lack of money to hire paid-labor for important tasks like land-clearing, sowing and weeding can prompt female-headed households with orphans to rely on the children for help with farming and food production (Ankrah, 1993; Hunter et al., 1993; Mmari, 1995; Kamali et al., 1996; Mutangadura et al., 1999). Holding onto the land implies continuing to farm it, and this goes hand in hand with the orphans' involvement in the associated activities (Hunter et al., 1993; Haddad and Gillespie, 2001). Generally, in Benin, land is divided among a household's children, and, depending on their age, they contribute to weeding, sowing, hunting small wild animals and birds, and eliminating pests on the farm (Den Ouden, 1995). Ultimately, the points discussed here suggest that a care-provision strategy for orphans which does not incorporate these complexities may yield poor outcomes.

4.6 Conclusions and implications

To mitigate the impacts of the HIV/AIDS pandemic, the care arrangements created by donor organizations usually consist of providing funds to support initiatives at the local and household level. In order to deliver effective services, such projects should capture and anticipate diversity among their target audiences. Our study has shown that even a local census could conceal the dynamics of orphan diversity. Our subsequent investigation into orphan mobility has provided insights that deserve consideration by organizations providing care to children orphaned by AIDS.

The relevance of mobility in characterizing orphans

Mobility appears to be a household strategy to manage children orphaned by AIDS in Couffo. Mobility can be associated with tensions arising as a consequence of care arrangements within a household. For instance, conflicts about the management or sharing of resources can potentially harm a household's unity and lead to the formation of a new household. Orphan endorsement, which is meant to reduce the proportion of child-headed households, can also generate tension. When the endorser is not the main carer, orphan mobility may be accelerated, as endorsing an orphan is not necessarily a totally selfless endeavor. Another relevant point is that the loss of the male household head will have a serious effect on access to resources by orphans and widows. The death of a male household head often entails shifts in position and power within the household.

The study has also shown that a household's main source of livelihood has a great influence on orphan mobility in a rural area. However, the availability

of enough land for a farming household, and the means to hire paid labor, can help ease the burden of an orphan's involvement in farming activities. Non-tangible resources also play a role in orphan mobility: lack of affection and esteem are key factors that can destabilize orphans within a household and lead to household disruption.

In sum, orphan mobility in Couffo was a double-faceted social phenomenon: it helped HIV/AIDS-affected households to manage an increase in the number of orphans, and it gave orphans the opportunity to move to a 'safer' environment anytime they did not feel secure.

Implications for care-providing systems

The information gathered through quantitative and qualitative analyses of HIV-related orphanhood in the Couffo region in Benin highlights that children orphaned by AIDS are a specific category of orphans and vulnerable children and that it is justified to advocate for tailor-made care provision for them. We elaborate on some points we feel merit special consideration.

Going beyond static methods in trying to understand the dynamics in households with children orphaned by AIDS could greatly improve care provision. In this vein one must distinguish between the orphan's main care person and the endorser so as to prevent or manage possible intra-household tensions. In Couffo, conflicts were likely to occur once orphans reached the age of 10 and above. Children aged 10 to 14 often played an active role in the household's production of food. Hence, institutional care provision should pay special attention to this age group and define them as 'pre-adults.' These children would benefit from particular services like psychological coaching and informal agricultural training; these care services could help stabilize orphans within their households, and ultimately contribute to reducing the proportion of abandoned children and street children.

Although we provided only two case illustrations of the intra-household conflicts in the context of care provision to orphans, the facts of these cases suggest that some services need to be made available to the adult members of households with children orphaned by AIDS. Such services could include information or training on how to handle the orphans in their care and could include peer-to-peer community-based forums for family conflict resolution. These kinds of services would contribute to offering more stability to the orphans in the sense that household wholeness and unity would be better preserved. Particular attention should be paid to female care providers. The majority of the orphans counted in the Couffo census were under the wing of mothers or grandmothers, who often had difficulties with respect to resource

availability and allocation. This calls for care-provision institutions to design schemes that enable women to have better access to land and agricultural inputs, in addition to those managed by development agencies.

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Chapter 5

Uncovering pest knowledge differences through an ethno-biological approach using cultural salience

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Abstract

The erosion of local/indigenous farming knowledge in the face of HIV/AIDS deaths in Africa has been noted as a point of concern in the literature and by organizations such as the Food and Agriculture Organization of the United Nations. These concerns are for a break in the transmission of knowledge from adults (deceased parents) to children (orphans). Ultimately, erosion of farming knowledge is implied. This paper examines one aspect of knowledge using an ethnobiological approach that is language based. Free-listing elicitation of pests in maize fields were conducted with 45 child orphans, 15 non-orphan children, and 30 adults in rural Benin. A cognitive salience index (CSI) was developed and an advanced analysis of the CSI scores was conducted examining the score differences between child orphans and non-orphan children and adults. The results indicate that orphaned children are more knowledgeable than non-orphaned children. One-parent orphans residing with the surviving parent are more knowledgeable than double orphans farming on their own. Non-affected adults and their children scored significantly lower than AIDS-affected adults and children. Other variables including gender and age were further examined to explain some of the observed variation. The findings indicate that there is a need for rethinking the implications of HIV/AIDS on farming knowledge.

Introduction

The spreading of HIV/AIDS to farming communities has increased the precariousness of life for millions of smallholders (Jayne et al., 2004). Previous empirical observations note a shift movement towards an increasing number of rural children taking on adult responsibilities (Rugalema et al., 1999; Haddad and Gillespie, 2001). In difficult contexts such as HIV/AIDS with its depletive effect on rural livelihoods, agricultural knowledge is a very important resource for rural people (Barnett et al., 1995; Bollinger et al., 1999; Haddad and Gillespie, 2001; Dewagt and Connolly, 2005). However, the intergenerational knowledge gap is speculated to be profound in the face of HIV/AIDS, with the loss of assets and key resources (Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003). The knowledge gap in farming that AIDS-orphaned children have, is of growing international concern. The Junior Farmer Field and Life Schools programme, an initiative of the Food and Agriculture Organization of the United Nations (FAO) in partnership with the World Food Programme and other UN agencies designed to provide agricultural knowledge to these children, exemplifies how serious this issue is being taken in the international arena (Anonymus, 2005).

The loss of knowledge, however, is not yet firmly documented by systematic empirical studies of orphaned children's farming knowledge. The study presented in this paper examines agricultural knowledge (through the lens of crop pests in maize) of HIV/AIDS orphans relative to adults in HIV/AIDS affected/afflicted and non-affected households and children in non-afflicted/affected households. The study specifically examined the different sub-groups of farmers: orphan farmers who are girls and boys between the ages of 10 and 14 years old in comparison with adult men and women in the different kinds of households noted above. Pest knowledge differences were evaluated through an ethnobiological approach.

The research was conducted in the Couffo region of Benin among the Adja ethnic group. The Couffo region is one of the most HIV-affected regions in the country. Maize is the main staple food crop for the majority of the households in the Couffo region and is grown mainly for household food consumption. Crop pests are among the most important technical limitations to food security in this context of small-scale farming (Mulder, 2000; Saidou et al., 2004). Crop pests are well-bounded domains of agriculture folk and scientific knowledge on which agricultural research has abundantly worked (Smith et al., 1984; Jackai and Daoust, 1986; Bentley 1989; 1992; Setamou et al., 1998; Price, 2001; Oerke, 2006; Price and Gurung, 2006). However, HIV/AIDS, with its reported impact on adult mortality, appears to be a threat to

agricultural knowledge (Baylies, 2002; Loevinsohn and Gillespie, 2003). Conceptually, knowledge is situated as an element of culture in this paper. Culture is learned, thus making it distinct from people's biological heritage, and as such, knowledge is a product of learning (Barsh, 1997; Purcell, 1998; Grant and Miller, 2004). Traditional knowledge is linked to subjective experiences and rooted in the culture, history and biophysical environment of the group (Brosius et al., 1986; Purcell, 1998; Price, 2001). A major assumption in ethnobiology is based on language serving as a 'gateway to knowledge' (Price, 2001). Language is a key element in transmitting knowledge across generations, and naming living things allows for communication about these things. Naming reflects the cultural importance of different living things, their biological distinctiveness, as well as the significance of their utility (Ellen, 1982; Gatewood, 1983; Brown, 1984; Berlin, 1992; Grant and Miller, 2004; Price and Björnsen-Gurung, 2006).

Naming delineates semantic domains. A semantic domain is defined as an 'organized set of words, concepts or sentences, all of the same level of contrast, that jointly refer to a single conceptual sphere' (Weller and Romney, 1988). According to Price (2001), one important aspect to uncovering farmers' pest knowledge is through the salience of items named by the informants. Item salience is generally evaluated by submitting respondents to a free-list exercise.

Brewer (1995) tested intracultural variation of knowledge using free listing, and concluded that this technique is a reliable and strong indicator, and an assessment measure of the respondent's level of knowledge given a specific domain. According to Thompson and Zhang (2006), the free list can be successfully used to evaluate the cultural salience of a group (or sub-group), that is, a group aggregate value can be calculated based on agreement among informants about each item. The present study used Sutrop's Cognitive Salience index (CSI) (Sutrop, 2001) to reveal the cultural salience among the Adja people from HIV/AIDS-affected and non-affected households. Data collection was rooted in the following inquiry: 'what are the differences in salience of maize pests between adult and child farmers of the Adja in the Couffo region, and what could be the link to HIV/AIDS household status (afflicted/affected)?' To this end, it was anticipated that (1) the child farmers have different maize pest salience indexes; and that (2) the differences were linked to their HIV/AIDS-orphanage status, (3) gender, and (4) the adult teachers they followed for farming activities.

5.1 Materials and methods

5.1.1 Brief description of the Couffo region and the study population

Couffo is one of the twelve regions of the country. The Couffo region comprises six local governments (municipalities) namely: Aplahoue, Djakotomey, Dogbo, Klouékanmey, Lalo and Toviklin. The principal ethnic or cultural group is the Adja (88%), speaking a language of the same name. Agriculture and small business are the main occupations of the population. The total maize production in 2004 in the Couffo region was 47,741 tons for a total cultivated area of 49,197 hectares (Anonymus, 2004a). The third general population census in Benin (Anonymus, 2002), carried out in February 2002, and a census co-organized by IFAD-NGO and Plan International (Anonymus, 2004b), reported a total of 37,372 orphans (children up to age 18), which represents 12.63% of the population. The present study was conducted in two of the six municipalities: Aplahoue and Klouékanmey. Klouékanmey was chosen for the concentration of care-providing organizations targeting HIV/AIDS-affected households and Aplahoue for being the locality that has benefited from early and intense sensitization campaigns about HIV/AIDS. The campaigns as well as the care-providing institutions did not deal with agriculture.

Sampling and sample size

The main criterion for the selection was the presence of affected households, that is, villages that contained a high number of affected households and HIV/AIDS orphans, and where child-farmers were within non-affected households. HIV/AIDS orphans were living with a surviving parent or fostering parents. An affected household was characterized by having an HIV/AIDS orphan in residence irrespective of the infection status of the household members thus fostering households are included. All affected and non-affected households in the sample were farming households where adults and children were involved in maize cultivation.

The HIV/AIDS-affected household and orphan census conducted at the beginning of the study yielded 88 affected households and 322 orphans. The orphans fell into three categories: fatherless, motherless and double orphans. Orphans selected to participate in the study were randomly selected from among those children 10 to 14 years old. The choice of the age range of the children is rooted in findings from previous studies (Stross, 1973; Zarger and Stepp, 2004; Setalaphruk and Price, 2007). Fifteen orphans were randomly selected within each of the groups (double, motherless, and fatherless). In addition, 15 non-orphans were also randomly selected in the same villages.

Thirty adults farmers were randomly selected equally from the affected (15) households and non-affected (15) farm households (Table 1).

Table 1: Description of the study sample

Categories of respondents (farmers)	Male	Female	Total
Affected adults	7	8	15
Non-affected adults	7	8	15
Orphan children	24	21	45
Non orphan children	9	6	15
n = 90			

5.1.2 Methods and techniques of data collection

The research proceeded through several steps. First, an exploratory field visit was carried out and consisted of informal discussions with resource persons in the study area. Discussions with researchers such as agronomists and entomologists, and extension agents provided comprehensive information on maize pests in the Couffo region, and information on taxonomy and pest manifestations. Later on, focus group discussions were carried out with participants from affected and non-affected households. The information gathered was supplemented by individual semi-structured interviews with key informant farmers. The aim was to understand people's view, basic terms and meanings of pests in the Adja cultural setting. The approach also helped to avoid inappropriate translations, hence poor communication. Ultimately, the list task was conducted. Initial visits were conducted with some children who were not part of the study sample in order to test and adjust the focus grid as well as the list task question. As the study consisted of documenting knowledge stock exemplified by salience among the identified categories of farmers, the cultural domain, especially the sub-domain of pests related to maize was used. The present study used the free-listing technique. This functioned perfectly for evaluating group as well as individual item salience based on individual responses.

Free listing

The free listing method is applied through asking informants to list items in a domain (kinds of potatoes or kinds of plants used in medicinal remedies for

example). Free listing is a well-studied and well-established method to capture knowledge in a given domain (Romney and D'Andrade, 1964; Henley, 1969; Bolton et al., 1980). Quinlan (2005) clearly articulates the three assumptions of the method: (1) when people free list, they tend to list terms in order of familiarity, (2) individuals who know a lot about a subject list more terms than people who know less, and (3) terms that most respondents mention indicate locally prominent items...'(Quinlan, 2005).

Practically, the standard procedure consists of asking informants to list the kinds of X (s)he knows. Free listing was used in this study to account for types of pests. The main tool for the exercise is a list task. List tasks were conducted through oral interviews. The question was this: 'Please name all the maize pests that you know'. The list task technique has been described in detail by Weller & Romney (1988) and Borgatti (1999).

5.1.3 Data analysis methods

The data collected were analyzed by complementary techniques and tools, which are explained below.

Cognitive salience analysis

Analysis of data from the list task covers two parameters: term frequency and mean position in the individual list. The tendency for an item to occur at a given position of the elicited lists of terms corresponds to the mean position of a term, whereas the occurrence of a term across the lists of the informants corresponds to the frequency of that term (Weller and Romney, 1988; Sutrop, 2001). The combination of frequency and mean position across informants reflects the internal structure of the identified cultural domain and salience. Thus, the basic terms in a domain are the most salient. For the purpose of calculation, the most salient term always named first by all subjects, takes the value 1. The less salient terms have a value declining towards 0. Davies and Corbett (1995) incorporated the mean position of a term in a list in order to strengthen the term frequency parameter. Smith et al. (1995) developed a free-list salience index (see also Smith and Borgatti, 1997), and proposed a formula which captures frequency of mention and position in the list across informants. Sutrop (2001) reframed the salience index into a cognitive salience index (CSI) as applied in this paper whereby the number of items in a list is controlled for by using the mean position and can be validly applied with a small sample size. Finally, Thompson and Zhang (2006) note that cultural saliency can be used as a proxy for knowledge of a domain (at the group and individual level). The Sutrop's cognitive salience index (CSI) takes the value

0, for the least salient item, to 1, for the most salient item. The formula to calculate the CSI is as follows:

$$CSI = F / (NmP)$$

where F is the frequency of a term (the number of lists where a term is listed), N the total number of lists (number of participants), and mP the mean position of a term. The mean position of a term is calculated as follows:

$$mP = (\sum R_j) / F$$

where R_j is the rank of a term in list j ($j = 1, \dots, n$).

Now the cognitive salience index (CSI) can be written as:

$$CSI = F^2 / (N\sum R_j)$$

The CSI is an integrative salience index that takes into account the frequency of mention and the mean position (mean rank) of items mentioned across informant. Knowledge differences were evaluated by simple calculation as follows:

$$\Delta (CSI) = CSIF - CSIM$$

where $\Delta (CSI)$ represents the differences in the salience indexes by pests, and CSIF the salience for females and CSIM that of males.

Understanding the basis for pest salience differences across informants: the Tobit model

The Tobit model was chosen to explore the factors that could explain the differences in the CSI scores. The reason for choosing this model was dictated by the nature of the total individual CSI score, which varies between 0 and 1. Explanations on the model and its use have been reported elsewhere (McDonald & Moffitt, 1980; Amemiya, 1984; Greene, 2003; Rahman, 2005). The model assumes that there is an underlying latent variable, y_i , such that:

$$\begin{aligned} y_i &= X_i\beta + u_i && \text{if } X_i\beta + u_i > 0 \\ y_i &= 0 && \text{if } X_i\beta + u_i \leq 0 \\ &&& i = 1, 2, \dots, n \end{aligned}$$

where y_i is the dependent variable (cognitive salience index), n is the number of observations, X_i is a vector of independent variables, β is a vector of parameters to be estimated, and u_i is an independently distributed error term assumed to be normal with zero mean and constant variance σ^2 .

Definition of variables

Previous work on folk/indigenous agricultural knowledge emphasized the importance of the household type and composition on children's knowledge (Foster, 1978; Foster and Williamson, 2000; Haddad and Gillespie, 2001; Zarger and Stepp, 2004). Taking into account the fact that HIV/AIDS impacts farm household composition, the present study used several variables to explain the observed variation in pest knowledge, as revealed by the CSI scores. A total of five independent variables divided into sub-variables, and one dependent variable, were used to explain the salience indexes obtained by the respondents. The choice of these variables is based on previous research on HIV/AIDS impacts and on knowledge transmission (Ruddle, 1993; Ohmagari and Berkes, 1997; Bollinger et al., 1999; Rugalema et al., 1999; Baylies, 2002; Loevinsohn and Gillespie, 2003; McMenamy et al., 2005). These variables are defined as follows:

Gender

Gender divided into male and female, is the biological sex (representing learned gender role knowledge) used to categorize male and female adult and child farmers. It is a dummy variable taking the value 1 if female and 0 if male. The literature reports that knowledge and cultural value transmission follow gender lines (Little, 1987; Matthews, 1987; Saito and Spurling, 1995; Setalaphruk and Price, 2007).

Age group

Age group (agegrp) encompasses the sub-variables agegrp1 for children of 10-12 years, agegrp2 for children of 13-14 years, and agegrp3, which represents the adult group. Knowledge transmission from adult to children is reported to follow age group division (Ruddle, 1993; Ohmagari and Berkes, 1997; Setalaphruk and Price, 2007). Age is expected to correlate positively with the salience indexes.

The HIV/AIDS status

The HIV/AIDS status was divided in HivStat1 for HIV/AIDS orphans, HivStat2 for HIV/AIDS-affected adults, HivStat3 for non-orphans and HivStat4 for non-affected adults. Each sub-variable takes the value 1 where applicable, and 0 otherwise. With respect to the negative impact of HIV/AIDS, a negative sign is

expected (Haddad and Gillespie, 2001). This variable was complemented by the household status (*hsstatus*), which is the type of household the respondent was living in at the time of the study. It distinguishes between initial (parental) household and fostering household, and is delineated as *Hsstatus1* for children living in their initial households and *Hsstatus2* for fostering households. The household is termed 'initial' if the child is living with one or both of the biological parents, and 'fostering' if she/he has moved to another household. It is expected that children living with their own parents have higher salience indexes, and should have a positive sign (Loevinsohn and Gillespie, 2003). The presence of an adult teacher is assumed important in shaping children's indigenous farming knowledge (Ruddle, 1993). This variable is termed here *pSivre*, that is, person followed for farm activities. It is divided into *pSivre1* if the adult teacher is the respondent's own parent, *pSivre2* if it is a fostering teacher and *pSivre3* for those who are with no adult teacher. This variable denotes how knowledge is passed on from an adult 'model' to a child. Like the other variables, it takes the value 1 if applicable, 0 if not. Finally, the dependent variable cultural salience is termed *knowtot*, which is the sum of salience indexes of each individual. The variable *knowtot* is used here as a proxy to reflect how knowledgeable each respondent is (Thompson and Zhang, 2006).

In the light of the above-defined variables a correlation test was performed using Pearson's correlation coefficient. The aim was to test if the variables were linked in order to avoid multicollinearity. The variables that appeared not to be correlated were considered for advanced regression, and were then included in the model. Fitness and heteroscedasticity tests were also done.

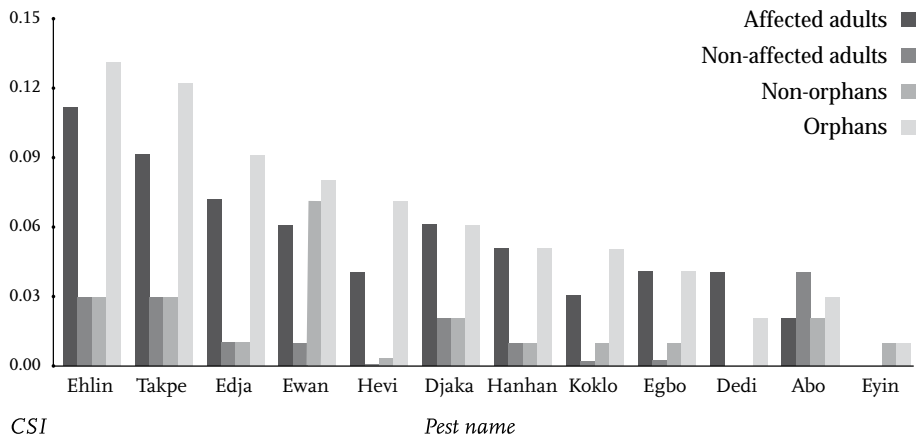
5.2 Results

The names of maize pests elicited from informants are listed in Table 2. A wide range of life forms including birds, rodents, insects, and domesticated livestock were elicited. The outcomes consisted of results from the Sutrop's CSI calculation, which includes individual as well as group aggregate values. The results from the Tobit regression (Table 3) substantiate the comparative interpretation of the CSI results.

The CSI scores

HIV/AIDS status and pest-naming ability differences between affected and non-affected adults and orphan and non-orphan children are depicted in Figure 1. Adults living in affected households and HIV/AIDS orphans showed that afflicted adults and orphans had higher CSI scores on 10 out of the 12

Figure 1



items compared with the non-affected adults and children. Figure 1 further illustrates that HIV/AIDS-orphaned children had higher scores than HIV/AIDS-affected adults for 5 of the 12 items and had the same score for 4 of the 12 items. HIV/AIDS orphans had higher CSI scores for 50% of the items than the HIV/AIDS-affected adults. Non-affected adults and their children similarly and over all scored significantly lower than the affected adults and children. The conclusion that can be drawn is that overall children are more like the adults they live with than like each other and that the knowledge of HIV/AIDS-orphaned children as measured by the CSI is greater than that of the HIV/AIDS-affected adults.

Figure 2

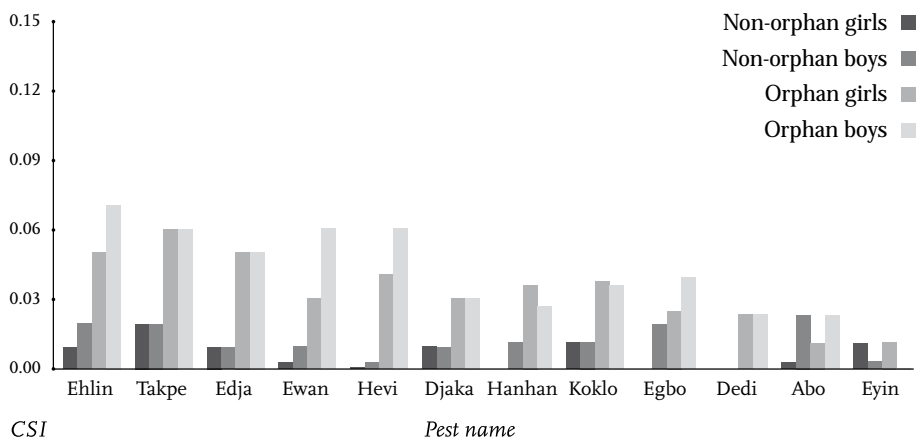


Table 2: Scientific names and damages associated to selected maize pests in the Couffo.

Local name in Adja	English name	Scientific name
Abo	Snail	<i>Achatina fulica</i>
Djaka	Rat	<i>Rattus rattus</i>
Edja	Locust/ Grasshopper	<i>Zonocerus variegatus</i>
Egbo	Goat	<i>Capra hircus</i>
Ehlin	Red-billed Quelea	<i>Quelea quelea</i>

Damages caused to maize and other observations

Scientific views

Snail meat is an important source of protein for the rural poor in Africa, replacing beef, pork, chicken and fish, and contain more protein. Undomesticated forms of snail are serious pests to crops and seedlings, and create financial prejudice to farmers. It is almost impossible to control them.

Black rats are omnivorous and capable of eating a wide range of plant and animal foods, ranging from beetles to fruit of many different plants. Bush rats rank among the world's worst invaders. Control methods are based on anticoagulant chemical pesticides.

Locust and grasshoppers are insect pests that decimate everything in their path. Locust and grasshoppers are mainly herbivores insects. Grain, corn, cotton, fruit and vegetable crops are their main targets. Researchers from various countries have been working together to find a more environmentally sound control options for the locust/grasshopper ravaging plagues.

Household livestock. Dangerous for crops when they escape their fences.

The birds are known as African weavers. They are very prolific, and arrive in large flocks wherever grain crops are grown, and eat every seed. Pest control measures have failed against *Quelea*. Recent discussions are directed towards harvesting *Quelea* bird as natural food resource.

Farmers' claims

Snails suck maize leaves and stems. When they attack the cobs, they make holes in them. The cobs are ugly and of poor market value when they are to be sold fresh. Snails are gathered by women and girls for household consumption, but mainly to be sold in the market for additional income.

Uproot maize seedlings and eat maize cobs and grains. A very threat to seed germination. Trapped or hunted by men and boys for household consumption.

Eat fresh maize leaves. Very devastating when they invade farms.

Eat maize plants, stems and cobs. Goat is a very important asset for small holders; raised by farmers for extra income.

Destroy maize cobs and eat the grains. They come in colonies, and can speedily remove all the grains from de farm. Farmers spend several hours to chase them from maize cobs, and sometimes hunt them as protein source.

Table 2: continued.

Local name in Adja	English name	Scientific name
Ewan	Borers (caterpillars/ larvae of moths and butterflies)	Lepidoptera
Eyin	Bee	Apis mellifera
Dedi	Ants	Formica rufa
Hanhan	Millipede	Trigoniulus corallinus
Hevi	Small birds	Aves sp.
Koklo	Chicken	Gallus domesticus
Takpe	Yellow-necked Spurfowl	Francolinus leucoscepus

Damages caused to maize and other observations

Scientific views	Farmers' claims
Stem and cob borers are important damaging insect pests, accounting among major limitations to maize production. They can cause incredible yield losses. They encompass several species, with various geographical distribution.	Destroys maize stems, fresh cobs and grains. Make holes in the stems and cobs, making them ugly and of poor market quality.
Apis species are insects of the order Hymenoptera which feed on pollen and nectar. Bees are important to achieving sufficient pollination of the plants. Bees are also natural enemies of several other insects found on plants' flowers.	They disturb maize flowers, and bite farmers during weeding and hunting activities.
Natural enemies of several insects. Eat other insects and larvae.	They bite farmers during weeding activities.
Millipedes are minor pest, but very dangerous when they attack emergent seedlings.	They twin around maize seedling and suck them.
-	They are of various kind, and they attack maize cobs in the farm.
Common and widespread domestic animal. Becomes a threat when it escapes fences.	Eat maize grains and uproots seed, thus a threat to seed germination.
Birds that feed on insects, plants and seeds. Very devastative for seedlings. Also used for human consumption.	Uproots seedlings and eat maize grains. Chased or trapped by farmers for household consumption. It is also sold in the market to generate additional income.

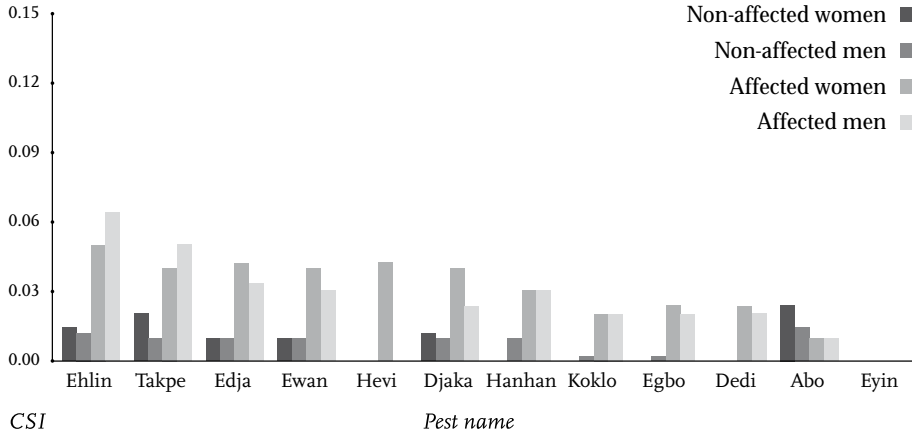
A disaggregation of the CSI scores by gender and HIV/AIDS status was conducted. Figure 2 depicts the pest-naming ability of boys and girls by HIV/AIDS-orphan status. The findings show that boy and girl orphans have higher CSI scores than boy and girl non-orphans. Gender-based similarities are to be found, however, in the overall pattern for 8 of the 12 items. Regarding the other four items, there were three where orphan girls had scores and no non-orphan girls scored at all. For the last item of the four, it was orphan boys who had a measurable CSI score for which non-orphan boys did not score at all. The conclusion that can be drawn here is that whereas HIV/AIDS orphan boys and girls show a very similar gender pattern in the CSI scoring, boy orphans scored higher than non-orphan boys and girl orphans scored higher than non-orphan girls. There are also indications of a gender shifting in knowledge where orphans are acquiring knowledge of pests that are not normally part of the domain of girls or boys who are in non-HIV/AIDS-affected intact families. Orphan girls and boys scoring in items where non-orphan children of the same gender did not (4 of the 12 items) evidenced this.

The further examination of the CSI scores by gender and HIV/AIDS status for adults is depicted in Figure 3. The overall gender patterning does not show a high level of consistency between HIV/AIDS-affected adults and non-affected adults, particularly for women. HIV/AIDS-affected women had CSI scores for 5 of the 12 items for which non-affected women did not score at all. HIV/AIDS-affected women scored higher than non-affected women (relative to patterns among non-affected men and women). Affected women also scored higher relative to affected men for three items in comparison with the pattern observed among non-affected men relative to non-affected women. For one item (hevi, generic for small birds) affected women were the only adult group that had a CSI score. For one item, both affected men and affected women had CSI scores where neither non-affected men nor non-affected women had a score (dedi, which are ants).

What we can conclude from the above is that there is also a gender difference between affected and non-affected adult men and women. Affected women had higher CSI scores and knew more pests than non-affected women. For affected men, the pattern was one of a higher CSI score compared with non-affected men rather than gender differences. For one item only did both affected women and affected men have a CSI score where both non-affected men and women did not. Ultimately, the pattern is one where affected men and affected women have higher scores but where the affected women are bringing more items into their knowledge domain with salience.

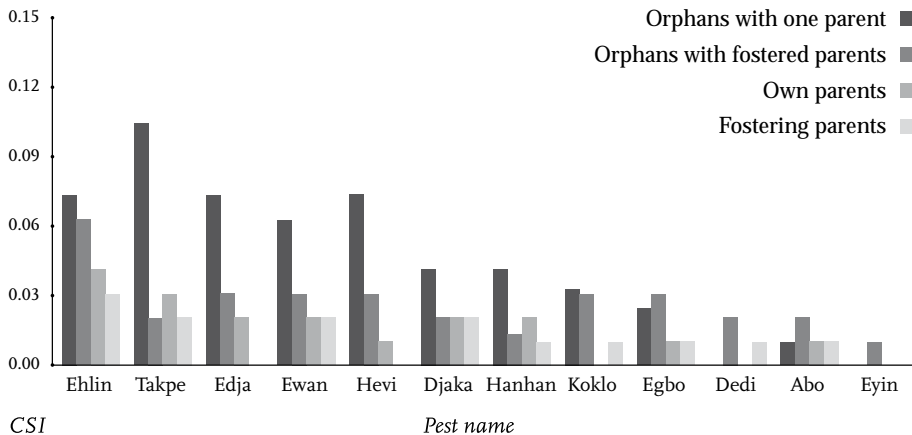
A closer examination of the CSI scores of HIV/AIDS orphan children age 10-14 based on the kind of adult they live with was conducted in order to

Figure 3



better understand the role of the adult ‘teacher’ in the CSI scores the children obtained. To accomplish this, we disaggregated the children’s scores into the following categories: (1) HIV/AIDS orphans that are still living with the one remaining parent, (2) orphans living in a fostering household, and (3) double orphans who are farming on their own (Figure 4). For 8 of the 12 items, one-parent orphans outperformed orphans in fostering households. Orphans in fostering households had the highest CSI scores on three items (but the value of the CSI scores were still low, meaning low saliency). Orphans without an adult teacher (double orphan children farming on their own) had significantly lower CSI scores than orphans who continued to reside with the surviving

Figure 4



parent. The orphan children without an adult teacher further scored on par or above orphans in fostering households for 5 of the 12 items and lower for 5 of the 12 items. Interesting also is that the only orphans that listed bees as pests were orphan children without an adult teacher.

Ehlin (Red-billed Quelea), Takpe (Yellow-necked Spurfowl), Djaka (rat) and Ewan (butterfly larvae - cob borers) are important crop pests in maize from a scientific standpoint and these items were the most salient. In sum, orphans and affected adults overall had a better ability to name maize pests. It should be noted that the knowledge children have is not fully comparable with adult knowledge. This is clearly in evidence for the item Eyin (bees) for a few children who named bees as maize pests. This was the item that had the lowest salience amongst all items and shows us that children are still in a learning process. The exception to this was that orphans residing with the remaining living parent were like adults in that none of them named bees as maize pests. For the most serious pests noted above, orphans residing with a surviving parent had the most impressive performance across all groups in their CSI scores.

The Tobit model

Outcomes of the Tobit model are displayed in Table 3. The model showed that most of the variables have statistically significant relationships with the total salience index. However, they explain differently the observed differences in pest salience among the respondents.

The two most statistically significant variables that explain the differences in the scores were an adult being HIV/AIDS affected ($p < 0.01$). This is the variable *hivstat2* that represents the category of affected adults, that is, adults who had one or more orphans in their care. It contributed significantly and positively to the knowledge differences. One-parent HIV/AIDS orphans who continued to reside with the surviving parent (the variable *psuivre1*) was the second variable that contributed significantly to variation observed in the total CSI scores ($p < 0.05$).

Three variables were negatively correlated with the CSI scores, out of which one was statistically significant at $p < 0.10$, and the two other ones at $p < 0.05$. These were, respectively, non-affected children living in complete households (non-orphans), gender, and children who were double orphans farming on their own without an adult teacher.

Table 3: Results of the Tobit model for differences between CSI scores.

Parameters	Total Individual CSI score as proxy to knowledge		
	Coefficient	SE ¹	P > t ²
Age of the respondent	-0.126	0.01	0.219
Gender	-0.016	0.008	0.045*
HIV-affected adults	0.132	0.012	0.000***
Non orphan farmer	-0.022	0.012	0.087*
Own parent as adult teacher	0.016	0.007	0.021**
Fostering parent as adult teacher	-0.01	0.007	0.158
No adult teacher	-0.020	0.008	0.014**
Constant	0.070	0.008	0.000

Log likelihood: 172.946

X² (7): 111.81

Number of observations: 90

¹ SE = standard error; ² * p < 0.10; ** p < 0.05; *** p < 0.01.

5.3 Discussion and conclusion

This study examined knowledge of maize crop pests among Adja farmers in an attempt to ascertain what the differences are between HIV/AIDS child orphans and affected adults, and between non-orphan children and non-affected adults. Sharp insights can be gained through the use of salience indexes as a proxy for knowledge of a domain. One of the main findings of this study is that children were more like the adults they live with than like each other. The results show that individuals (adults and children) living in HIV/AIDS-affected households had a better ability to name maize pests compared with the other respondents. In addition, HIV/AIDS orphans had higher CSI scores relative to all other respondents for the majority of items. This result was not anticipated. One-parent orphan children that continued to reside in the parental home with the surviving parent had higher CSI scores than orphans living in fostering

households and double orphans. Overall, orphans dramatically outperformed non-orphans living in two-parent maize farming households.

How can we explain the large difference between affected and non-affected adults as well as the fact that affected orphan children had higher CSI scores than affected adults? We would like to propose that one explanation for this higher ability in naming maize pests and the saliency of these pests could be the greater dependence on maize for food security (utility) for these families coupled with the greater responsibilities children must shoulder in crop production and crop protection (learning from adults and by direct field observation and work), particularly in one-parent HIV/AIDS families. One of the important implications is that the best channel for children to acquire agricultural knowledge is their closeness to their parents. But the huge differences observed in the CSI scores we believe to be poverty-induced differences, revolving around resource mobilization to face pest problems in the maize field (Rugalema et al., 1999). One can distinguish here between tangible and non-tangible resources. Non-affected household members (adults and children) are better off in terms of land, money and hired labor (Den Ouden, 1995). People in affected households, however, because of the depletion of their resources by necessity are more dependent on fewer resources. One of the resources they have is their agricultural knowledge (non tangible resource). In situations of shock and stress such as that caused by HIV/AIDS, knowledge of the agro-ecosystem is a primary resource (Barnett et al., 1995; Haddad and Gillespie, 2001).

The second major point to note from the results of this study is the relationship of gender to the CSI differences. Affected adult men and women had higher CSI scores overall compared with non-affected men and women. Affected women also had a larger domain in that they had additional pests they named compared with non-affected women. Affected women had substantially higher CSI scores than non-affected men as well as being on par with or surpassing affected men in their CSI scores (except for one of the 12 items). There were also indications of a gender shifting in knowledge where orphans were acquiring knowledge of pests that are not normally part of the domain of non-affected girls or boys. Orphan girls and boys had CSI scores for items that non-orphan children of the same gender had no scores for (4 of the 12 items). These results may indicate that there is a gender shift in knowledge occurring because the repertoire of women and girls is expanding. For affected boys and men, as with affected women and girls, the salience is deepening (higher CSI scores per item). Affected men and boys, however, are not expanding the domain to include more items identified by females.

We can only speculate that one of the factors involved in the differences we see with regard to gender and HIV/AIDS is linked to being either a better off commercial producer or a cultivator for domestic consumption. Maize in the study region is moving from a purely subsistence crop to one with commercial importance. It can be cultivated for sale to generate income by those who have sufficient resources to do so. Observations by several authors (Leach, 1994; Fagbemissi et al., 2002; Goebel, 2003) suggest that when a crop gains a commercial value, men tend to dominate in many aspects including skills and knowledge. But commercial farmers can also better afford both labor (for scaring off birds) and inputs (such as pesticides) and this might help explain the low CSI scores for maize pests among male and female non-affected farmers compared with those who are HIV/AIDS affected. Affected households have a real concern for maize as a subsistence crop and they tend to have a shortage of cash and labor (Haddad and Gillespie, 2001). We believe that the expansion of the domain of maize pests by HIV/AIDS-affected women and girls is linked to both the greater utility of the knowledge due to the importance of maize for food sufficiency and their expanded active participation and responsibility in the production of the crop and its protection. It can be inferred that since maize is mainly for household consumption, and also because adults of non-affected households have easier access to inputs such as fertilizer and high yielding maize varieties, they pay less attention to observing phenomenon in their fields, and this is reflected in their children's knowledge base as well (Stross, 1973; Ruddle, 1993). The existence of easy solutions such as pesticides to circumvent certain pest problems/constraints may also negatively impact adults perceiving some of the items as pests, that is, a threat to their maize farm and thus may result in a lack of salience (Bentley, 1989 and 1992).

An additional finding is that the field observation data show that people hunt birds for household consumption and thus birds have a positive utilitarian value (Hunn, 1982) at the same time a negative utilitarian value as a pest that attacks maize cobs (Anonymus, 2004). The two bird pests that fit this assertion are Ehlin (Red-billed Quelea) and Takpe (Yellow-necked Spurfowl). These two birds had the highest CSI scores for HIV/AIDS-affected adults and orphans. However, the bird pests that are not eaten are only described with the generic name Hevi, a term that is used for all small and difficult to name birds. We thus believe the salience of Ehlin and Takpe is not only related to them because both are very destructive pests but also because they are an important source of food for HIV/AIDS-affected households.

In conclusion, the assumption that HIV/AIDS has a negative impact on the knowledge of HIV/AIDS orphans is not supported by the results of this study. HIV/AIDS-affected adults had higher CSI scores, and affected women and

girls had more pest items in the domain than non-affected women and girls. Affected men and boys while having larger CSI scores than non-affected men and boys did not seem to expand the gender-based aspects of the domain to the same extent as affected women and girls. HIV/AIDS orphans had the highest CSI score and those residing with the surviving parent in the household of origin scored best followed by orphans in fostering households and lastly, double orphans on their own with no adult teacher. Non-orphans in intact households scored the lowest among the children, and like their parents, very poorly. The results of the Tobit analysis support the observed differences seen in the CSI scores discussed above. HIV/AIDS-affected adults (statistically significant at $p < 0.01$) and children who had their own parent as teacher (statistically significant at $p < 0.05$) are shown to have the highest saliency for major pests relative to other subjects of the study.

This outcome is in contradiction to the expectations in the literature that HIV/AIDS causes erosion of agricultural knowledge. The need to secure food for the household through maize farming and the shortage of resources emphasize a great utility of the harvest for the HIV/AIDS-affected household. Therefore, we speculate that one of the reasons we see this difference in scores is because HIV/AIDS-affected adults and orphans invest more in their farm in the form of labor and attention. It can be inferred then, that utility, necessity and experience have contributed to sharpening their observation skills. This in turn contributed to the knowledge differences revealed by the study. The guiding hand of the surviving parent of an orphan, however, is to be valorized. These findings indicate there is a need for careful thinking about the implications of HIV/AIDS on farming knowledge and to engage in further empirical research.

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Chapter 6

From novice to expert: The use of form and function in the way farm children orphaned by AIDS talk about agroecology compared to non-orphans

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Abstract

AIDS has created new vulnerabilities for rural African households due to prime-age adult mortality. The loss of adult productive labor in farming is associated with an increase in child farm work to meet consumption needs and is assumed to lead to impairment of the intergenerational transfer of farming knowledge. There has been scant research to date, however, on the impacts of parental death on farming knowledge of children made orphans by AIDS. The question we investigate in this paper is if there is a difference in agricultural expertise between AIDS-affected and non-affected adults and children in the way they describe pest problems in maize and cowpea cultivation.

Methods

The research was carried out among the Adja in the Couffo region in Benin. A total of 77 informants were randomly selected among six categories of farmers according to their AIDS affection status, namely: 13 affected and 13 non-affected adults; 13 paternal, 13 maternal and 13 double orphans; and 12 non-orphan children. Informants descriptions from pile sorting exercises of maize and cowpea pests were categorized into types of descriptor and then aggregated into descriptions based on form or based on function and expertise assessed based on the use of these descriptors. Form (morphology, and related aspects) and function (utility, and connected aspects) are used to determine who is novice or expert, and whether the moving from novice to expert is impaired by children being orphaned by AIDS. Informant differences and similarities in responses were determined using the Fisher exact test and the Cochran-Mantzel-Haenszel test. No significant differences were found between AIDS-affected and non-affected adults in the use of form and function descriptors. Results of the study do reveal differences in the use of form and function descriptors among the children. There is a statistically significant difference in the use of form descriptors between one-parent orphans and non-orphans, and in descriptors of specific damages to maize. One-parent paternal orphans were exactly like non-affected adults in their 50/50 balanced expertise in the use of both form and function descriptors. One-parent orphans also had the highest number of descriptors used by children overall and these descriptors are spread across the various aspects of the knowledge domain relative to non-orphans. Form and function descriptors are used to different degrees among the children of the different groups. These differences reflect the differences between being more of a novice or more of an expert. Ultimately, rather than a knowledge loss for one-parent orphans, particularly paternal orphans, what we are witnessing is an acceleration into adult knowledge frames. We believe this expertise of one-parent orphans may be a result of a combination of factors deserving further investigation, including enhanced hands-on work experience with the food resources providing greater observation opportunities and experience in pest management. Importantly, the expertise available from the surviving parent coupled with the value of the food resource to the household may play a critical role in the expertise outcomes evidenced in the research results presented in this paper.

6.1 Background

6.1.1 AIDS, rural children and knowledge

AIDS has created a new category of vulnerable rural African household because its impact reduces food production and livelihood viability and creates a spiral of food decline (de Waal and Whiteside, 2003; Gillespie, 2006; Niehof and Price, 2008). This undermining of rural livelihoods is due to reductions in resources. Two of these farming resources, labor and knowledge, are interlinked in the case of parental death for rural children in Africa (Gillespie, 2006; Haddad and Gillespie, 2001). Both the loss of productive adult family farm labor and impairment in the intergenerational transfer of traditional food production knowledge are noted as core impacts of the pandemic that lead to more child labor, a greater emphasis on producing to meet food consumption needs, loss of role models for the young to learn from, reduction in the body of traditional knowledge, and loss of the experienced hand of parent as teacher of farming knowledge (Haddad and Gillespie, 2001). Bell et al. (2003) project that a breakdown in the transmission of traditional knowledge from one generation to the next leading to an erosion of the stock of human capital can have devastating economic effects and lead to economic collapse of nations severely affected by HIV and AIDS. 'The weakening of these transmission processes is insidious; for its effects are felt only over the longer run, as the poor education of children today translates into low productivity of adults a generation hence.' (Bell, 2003:8).

With the illness and death of one or both parents due to AIDS, children experience multiple life complications. In addition to psychosocial distress caused by the illness and death of one or both parents, they are faced with the family's economic problems, inadequate household food supplies, and taking on new responsibilities as food providers (FAO, 2006; Jayne et al., 2004; Levine, Foster and Williamson, 2006; Loevinsohn and Gillespie, 2003; Rugalema, 1999b). Twelve million children in sub-Saharan Africa are estimated to have lost one or both parents due to AIDS (UNAIDS, 2008). National and international agencies have shown increasing concern about food security in rural African communities faced with the pandemic (Bollinger et al., 1999; FAO, 2003; Gari, 2001). Some of the interventions to shore up local food production include support minimizing labor needs, improving harvests, and using local resources to reduce food shortages (de Waal and Whiteside, 2003; FAO, 2003; Gari, 2001; Müller, 2005).

A knowledge based intervention for child/adolescent farmers is the Junior Field and Life Schools covering agricultural knowledge and life skills for

orphans and other vulnerable children between the ages of 12 and 18 (FAO, 2007; FAO, 2005; Djeddah, Mavanga and Hendriks, 2006). This knowledge-based approach has its foundation in the well known Farmer Field School approach for adults that emphasizes learning about agricultural field ecology in a participatory manner (Braun and Duveskog, 2008). A number of scholars suggest the importance of assessing the impacts of the schools, but there are also indications that needs assessments should be undertaken prior to implementation of such programs (Fagbemissi and Price, 2008; FAO, 2003; Gari, 2001; Price and Björnsen-Gurung, 2006; Stillwagon, 2005; Vikan and Seeley 2009). Research in anthropology/ethnobiology has also shown it is difficult to generalize about the loss of knowledge, knowledge gaps, and transmission of environmental and food knowledge and thus indicate that educational interventions could better be supported by empirical studies (Fagbemissi and Price, 2008; Price, 2001; Cruz Garcia, 2006; Ohmagari and Berkes, 1997; Price and Björnsen-Gurung, 2006; Ross, 2002; Ruddle, 1993; Setalaphruk and Price, 2007; Zarger and Stepp, 2004; Zent, 2001). This is particularly the case with environmental knowledge of children in relation to the adults in their culture (Bluebond-Langner and Korbin, 2007; Cruz Garcia, 2006; Fagbemissi and Price, 2008; Munroe and Munroe, 1977; Ruddle, 1993; Setalaphruk and Price, 2007; Zarger and Stepp, 2004; Zent, 2001). Knowledge is an element of culture and is key to people doing what makes sense to them (Goodenough, 1964). Thus, knowledge is a critical component to the mental models people have that influences their interpretation of the world around them (Grant and Miller, 2004; Niehof and Price, 2008; Price, 2001; Purcell, 1998). Knowledge, however, is not static. Individuals constantly use the stimulus they receive from their surrounding environment to build their understandings of the world in a process that in the end generates a set of experiences and perceptions grounded in their culture and in particular life situation, which ultimately, shape expertise. The research findings of Reyes et al. (2005) illustrate that different activities exert different effects on knowledge competencies in the same culture group. Activities that demonstrate a greater dependency on forest products being positively correlated with greater knowledge of plants and likewise, activities that are farther removed from forests (such as wage labor) showing individuals having less plant knowledge. Not all activities exert the same effect on knowledge.

In this paper we examine the crop pest knowledge of farming adults and children in the HIV and AIDS context. We anticipate that AIDS will be associated with differences in life situations that would result in intracultural variation in agroecological knowledge. We examine how the parental presence

operates when the focus is on the agroecology - in this case knowledge of staple food pests (maize and cowpea). We investigate the differences associated with being a child orphaned by AIDS or non-orphan; and we examine the effect of being a child orphaned by AIDS or non-orphan living with one's own biological parent, or having no biological parent at all. We document the differences among adults, among children and between adults and children in relationship to being affected by AIDS in the Couffo region of Benin. Complementing an earlier study which examined knowledge differences by focussing on pest naming ability (see chapter 5; Fagbemissi & Price, 2008), the research reported in this chapter zooms in on the various kinds of descriptors that farmers use when talking about pests.

6.1.2 Intracultural variation of agroecological competence in an AIDS context

Intracultural variation in folk biological knowledge has been well-documented (Reyes et al., 2005; Boster and Johnson, 1989; Brewer, 1995). Individuals generally vary in their abilities, motivations, and opportunities to learn about living things. While there is contemporary acceptance of intracultural variation, work focused on the nature of folk biological classification and taxonomies has also played a role in the construction of methods to gauge competencies and knowledge. Berlin is well known for the emphasis on morphology in folk classification (form) (Berlin, 1992; Berlin et al., 1973). There has also been the position that supports the consideration of the importance of utilitarian factors (function) in how a given human population classifies organisms (Hunn, 1982). Boster and Johnson (1989), however, have elaborated a compromise position with respect to the foundation of people's rational in folk biology in their study of novice and expert judgments. According to these authors, 'humans are purposive beings; their activities and works, including classification systems, have to be understood as outcomes of their intentions' (Boster and Johnson, 1989:867). They also note that curiosity about the natural world also guides people in their acquisition of familiarity with biological diversity. Furthering their position, Boster and Johnson (1989) demonstrate the role of both form and function in similarity judgments made by experts (those working with a resource) compared to novices who emphasize form.

Form (morphology, and related aspects) and function (utility, and connected aspects) are used to determine who is novice or expert, and whether the moving from novice to expert is impaired by children being orphaned by AIDS. According to Hunn (1982), utilitarian classifications are rooted in patterns of use. While morphological information is available to anyone who

cares to observe natural organisms. Cultural knowledge of the utility of these organisms usually requires extensive experience and direct communication with those who know (the parents for instance). Consequently, the evaluation of the importance of the form-function duality could be uncovered through the analysis of the degree to which respondents' judgment of similarities of the living things are based on form and/or function.

AIDS and agroecological knowledge differences among child and adults farmers

The main objective of this paper is to present the differences we uncovered in agroecological knowledge between the AIDS-affected and non-affected adults and children (orphans and non-orphans), in terms of their use of form and function descriptors in relation to maize and cowpea pests. Consequently, we examine those particular living things labeled by farmers as 'enemy of the crops' for maize and cowpea. The paper uses the main assumption in ethnoecology, which is based on language as gateway to uncovering knowledge in that people's knowledge and beliefs will emerge through the way they talk about things and categorize them (Brosius et al., 1986; Fagbemissi and Price, 2008; Price, 2001; Purcell, 1998). Language, thoughts and culture are interlinked and we expect that there are overarching similarities among the respondents because the population of the study are the same culture group living in close proximity, are all farmers, and are speakers of the same language.

We anticipated that there would be differences based on the impacts AIDS has had on the study villages. Death of productive household members means an increase in children's on farm work and responsibility as well as surviving spouses, mostly women in our study communities, taking over responsibilities previously held by the deceased spouse. We also anticipated that the use value of the agricultural crops increases under the conditions of AIDS where resource decline and enhanced poverty give having a good harvest greater relative importance (de Waal and Whiteside, 2003; Gillespie, 2006; Goodenough, 1964; Loevinsohn and Gillespie, 2003; Niehof and Price, 2008; Rugalema, 1999b; Stillwagon, 2005). Ultimately, we expected that AIDS ushered in an element of intra-cultural variation that would be reflected in what people perceive and talk about as conditioned by their experiences.

Our enquiry proceeded by comparing child and adult language regarding pests that attack the maize and cowpea crops. The study combines both maize and cowpea pests based on the fact that farmers in the research area often cultivate maize and cowpea in association on the same piece of land.

6.1.3 Research area

The research was conducted in the Couffo region. This region is located in the southwest of Benin in West Africa. The region has one of the highest HIV prevalence in Benin (6% against the national average of 2%). Two representative communalities were chosen as study sites. The study was conducted among the Adja people, the ethnic majority of the Couffo.

The Adja have a reputation in the country as excellent farmers. Some of them also undertake small business activities as a means of additional income generation as well as raising small livestock. The crops present in the Adja landscape are mainly maize and cowpea, followed by tomato and pepper, citrus fruit, teak trees, and cotton (CERPA, 2004). Farming activities involve family labor for food crops, and hired labor for commercial crops. Adults and children are both involved in agricultural activities. Minimizing the agricultural production costs through use of the household labor is common among the Adja. Hence, involving children in farming is quite normal (den Ouden, 1995).

6.2 Methods

The field research was conducted in June, September and October 2006, and in March 2007. An initial phase consisted of a census of households that experienced the death of one or both parents due to AIDS and the subsequent presence of orphans. These orphans were accordingly characterized as paternal, maternal and double orphans (those who lost both parents). For the purpose of this study participants were randomly selected among each of the six categories of farmers, namely: affected and non-affected adult farmers; non-orphan child farmers (living with both their parents), paternal, maternal and double orphan farmers. AIDS-affected adults in this study are adults who lost their partner (wife or husband) or adults who foster orphans in their households and are providing care to them. The non-affected adults are those who have not experienced the loss of household members due to AIDS and were not fostering orphans. Eventually, 77 respondents participated to the study, among whom were 26 adults (13 AIDS-affected and 13 non-affected) and 51 children between the ages of ten and fourteen (13 paternal orphans, 13 maternal orphans, 13 double orphans, and 12 non-orphans).

The study consisted of comparing different categories of informants (children and adults, affected and non-affected) farmers views on maize and cowpea

pests using their semantics, and documenting differences, with the aim of showing whether AIDS status has any influence on the way the farmers talk about the similarities and differences among the pests (Brewer, 1995; Garro, 1986; Gatewood, 1983; Sherwood, 1997). In the generation of the data, we first proceeded to capture the cultural domain (Bernard, 2002; Borgatti, 1999). A free listing procedure was conducted using a separate list task for maize and for cowpea, that were administered on different days (Boster and Johnson, 1989; Quinlan, 2005). Participants were asked to 'name all living things you think are threats to your maize and cowpea on the farm'. The free listing was followed by a single pile sort, where informants were asked to put together items generated from the free lists that they thought were similar. They were asked to make as many piles as they liked, but there had to be at least more than one pile (see Bernard, 2002; Borgatti et al., 1999). These two procedures constituted the entry point of the study. After the pile sort exercise, follow-up conversations were conducted in which farmers were asked to explain as much as they could about the reasoning behind the groupings (the piles) they made. It is especially the outcomes of these follow-up conversations that form the central point of analysis in this article. Thus, these series of dialogues with Adja farmers (children and adults) helped us gather the detailed data that allowed us to further identify criteria farmers used in their discussions of pests (Boster and Johnson, 1989; McDade et al., 2007; Nazarea-Sandoval, 1995).

Analyzing farmers' maize and cowpea pests descriptors

Based on previous work (Price and Bjørnsen-Gurung, 2006; Borgatti, 1999; Boster and Johnson, 1989; McDade et al., 2007; Nazarea-Sandoval, 1995) the starting point was the use of key words to determine the main content of farmers' semantics. Hence, words that carried the same meaning were put together. The next step consisted of grouping those words/concepts into the categorized descriptors according to the message they conveyed. For instance, one farmer might say that her/his reason for putting two pests together was that they both are found on the maize plant and they make holes in the maize stem. These are examples of a farmer describing pests by referring to the habitat (found on maize plant) as well as the specific agronomic damage caused to maize (hole in the stem). These descriptor categories included both morphological and utilitarian groupings for analysis. This exercise was done for all the information collected from the interviews with the farmers. A second level of analysis was to uncover similarities and differences among farmers with respect to the descriptions. Thus, farmers' descriptions were analyzed and differences between the subgroups of farmers examined. Statistically

significant differences were assessed using a number of methods. The Fisher's exact test calculates the difference between the data observed and that expected and is appropriate to categorical data where the sample size is small and can be used regardless of the sample characteristics (non-parametric). To this end, the Fisher's Exact test based on testing the alternative hypothesis $H_1: P_1 \neq P_2$, as opposed to the null hypothesis $H_0: P_1 = P_2$ (no differences among groups of informants). P_1 and P_2 represent the probability of an individual of a given subgroup of farmers (categories) to use a given descriptor to express their perceptions about maize and cowpea pests.

The next step was to examine how much these observed differences in descriptions translated into differences in expertise among farmers. To this end, the descriptors were re-grouped into two major categories: on one hand we have characteristics linked to the form of the living things (kind of pests; morphology and locomotion), and on the other hand we have descriptors linked to the functional characteristics (agronomic aspects; management aspects and utility) (Boster and Johnson, 1989). Differences were examined by AIDS affection status and generation.

The overall combined effect of AIDS on respondents' perceptions was examined using the Cochran-Mantel-Haenszel test (Hsu and Prentice, 1996a and 1996b). This test determined whether there was a significant association between the descriptor used by a respondent given the fact that this person is a child or an adult, while adjusting for the effect of AIDS affection. The significance of the association depends on that of the odds ratio, and is reported using the conditional independence statistics. This statistic has three components: the Cochran-Mantel-Haenszel's (CMH) assumes a common odds ratio and tests the null hypothesis that the variables X (generation - child/adult) and Y (descriptors - form/function) are conditionally independent, given Z (AIDS affection); the Mantel-Haenszel (MH) test, which measures the strength of association between the variables by estimating their odds ratio for a $2 \times 2 \times 2$ contingency table, and Breslow-Day (B-D) statistic, which tests the homogeneity of the odds ratio. When CMH p-value is high, this means that the variables 'generation' and 'descriptor' are conditionally independent, given 'AIDS affection'. If the p-value for B-D test is high, it is possible to summarize their conditional association by a single odds ratio, which means there is a homogeneous association between AIDS status and generation. In the end, when the null hypothesis for the M-H test is accepted, the analysis of differences is done using 2 separate 2×2 contingency tables for X (generation) and Z (AIDS status) with respect to Y (types of descriptors).

The novice-expert test

Based on Boster and Johnson's (1989) findings on novice versus expert judgement of similarity, we assumed that an expert is a respondent who has a balance of form and function with respect to the descriptors they use. From our analytical standpoint, it is expected that superior expertise would result in a 50/50 ratio in the combined ability of respondents to use form and function descriptors. In this regard, an index of expertise (IE) was calculated by checking the number of mentions within a group of informants by the total number of items in each category, that is for form and function separately (Bernard, 2002; Bos, 2000). The quality of expertise is obtained by weighting group mean for form and function respectively, by the sum of means for form and function. This ratio was eventually used to map the distribution of respondent's expertise for form-function for each group of respondents (Santelli et al., 2007). The ratios of form-function distribution were then submitted to Fisher's exact test to check for the differences between the groups of respondents.

6.3 Results

Eight types of descriptors were extracted from the conversations with farmers that followed the pile sorting of maize and cowpea pests. Most numerous were descriptors of agronomic damages caused by the pests. Generic damages are the ones caused by pests that equally attack maize and cowpea according to farmers, causing similar damages on the two crops. Specific agronomic descriptors express that the pests are found or feed on one of the crops, not the other. For example, farmers use words such as 'remove seed from the soil' or 'cut the seedlings' to reflect generic damages, and 'attack maize cobs' or 'make holes in the cowpea pods' for damages specific to maize or cowpea respectively. In addition, there are also aspects linked to the habitat or ecology of the reported pests (Table 1).

AIDS affection and farmers perception of pests among child and adult farmers

There are, in general, two significant differences between orphan and non-orphan child farmers (Table 2). These are the differences in the use of generic descriptors (p-value 0.05), and damage to maize descriptors (p-value 0.05). In the case of both of these descriptors, non-orphans mentioned more than orphans.

If we look in greater detail at the categories of orphans we see that there are some differences based on the results of the Fisher's Exact test between

Table 1: Categorized descriptors of maize and cowpea pests elicited after pile sorting exercises.

Descriptor category	Farmers words
1. Kind of pest	They are domestic mammals; they are birds; they are wild animals
2. Morphology & locomotion	<ul style="list-style-type: none"> • Shape: have different shapes; have hairs or not; have a wavy body; have paws or not; have wings or not; have legs; • Size: big, small; invisible (they are only noticeable by their damages); • Motion: walk; jump • Color: red; green; white; black
Agronomic aspects	
3. Habitat/ecology	Live on the farm, live in the soil, found on maize, found on cowpea, found on leaves, found on stems, stay on the apex, live in maize cobs, found in maize grain, live on cowpea leaves, found in cowpea pods, found on cowpea grains.
4. Generic damages	Very dangerous for the plants, come in flocks, remove seed from soil, eat seeds, eat seed germ, block seed germination, eat seedlings, attack/cut plant roots, uproot seedlings, cut seedlings, cut plants, eat stems, make holes in the leaves, eat the leaves, remove the grains, eat the grains, make holes in the grains.
5. Specific damages to maize	Eat maize seeds, cut maize seedlings, eat maize leaves, cut maize plant, uproot maize plants, suck maize stems, eat maize stems, cut maize leaves, attack maize cobs, make hole in maize cobs, eat maize cobs, eat maize grains, make holes in maize grains.
6. Specific damages to cowpea	Cover cowpea plants, attack cowpea plants, destroy cowpea plants, stop cowpea growth, eat cowpea stems, cover cowpea stems, eat cowpea leaves, make holes in cowpea leaves, cause cowpea leaf loss, twist cowpea leaves, cut cowpea leaves, cover cowpea leaves, cover cowpea plant apex, cut cowpea flowers, make holes in cowpea pods, eat cowpea grains.
7. Managing the pests	easy to kill, they are troublesome, difficult to fight, need to use insecticide, resistant to insecticide, no need of insecticide.
8. Utility	We sell them; we eat them; they are our poultry
n = 77	

Table 2: Percentage of mentions of each descriptor by respondent group as a portion of of mentions by informant group.

Respondent Group (n = 77)			
	Kind of pest	Morphology/ locomotion	Form attributes
One parent orphans vs. double orphans			
Orphans with own parent	6	8	14
Double orphans	5	15	20
Fischer exact test (p-value) ^b	0.13	0.14	0.09
One parent orphans vs. non orphans			
Orphans with own parent	6	8	14
Non-orphans	0	6	6
Fischer exact test (p-value)	0.13	0.04*	0.02*
Double orphans vs. non orphans			
Double orphans	5	15	20
Non orphans	0	6	6
Fischer exact test (p-value)	0.26	0.11	0.02*
Effect of AIDS affection among the children: orphans vs. non orphans			
Orphans	6	11	17
Non orphans	0	6	6
Fischer exact test (p-value)	0.13	0.17	0.04*
Effect of generation: children vs. adults			
Children	5	10	15
Adults	3	11	14
Fischer exact test (p-value)	0.27	0.37	0.43

^a % of mentions of each type of descriptor out of total mentions by respondent group;

^b Fischer exact test significance level as: * $p \leq 0.05$; ^c There is no difference.

that group's total mentions, and results of the Fisher exact test applied to number

Descriptors ^a (%)							
Habitat/ecology	Agronomic aspects			Pest management	Utility	Function attributes	Total
	Generic damages	Specific damages to maize	Specific damages to cowpea				
7	17	21	20	7	14	86	100
5	23	15	23	0	10	80	100
0.33	0.18	0.14	0.15	0.05*	0.34	0.09	
7	17	21	20	7	14	86	100
3	31	31	29	0	0	94	100
0.19	0.13	0.02*	0.15	0.24	0.22	0.02*	
5	23	15	28	0	10	80	100
3	31	31	29	0	0	94	100
0.41	0.27	0.05*	0.5	(nd) ^c	0.32	0.02*	
6	18	18	23	5	13	83	100
3	31	31	29	0	0	94	100
0.29	0.05*	0.05*	0.3	0.18	0.25	0.02*	
5	21	21	24	4	10	85	100
8	24	22	29	3	0	86	100
0.29	0.21	0.25	0.21	0.32	0.32	0.48	

the one-parent orphans and double orphans as well as both of these kinds of orphans relative to non-orphans (Table 2). One-parent orphans used the descriptors of fighting the pests which no double orphans used (p-value 0.05). We find a statistically significant difference in the use of morphological descriptors (p-value 0.04), and in the use of descriptors of specific damages to maize (p-value 0.02) between one-parent orphans and non-orphans. One-parent orphans used more morphological descriptors and fewer maize damage descriptors relative to non-orphans. Results from the Fisher's Exact tests depicted in Table 2 also show that non orphans show a difference with double orphans, as well as with one-parent regarding their use of descriptors of damages caused on maize by pests respectively (p-value 0.05). One-parent orphans have the highest mean number of descriptors per child (3.19) compared to double orphans (3.07) and non-orphans (2.66). The frequency of responses (seen in Table 2) also illustrates that orphans have their mentions spread across all the descriptors and thus through several aspects of the agroecological knowledge, while non-orphans mentioned descriptors in fewer categories. Notably, non-orphans had no mentions of utility (use value) of the pests (those such as birds that can be eaten) nor did they mention aspects of pest management.

Table 3 provides deeper insight into the combined effects of AIDS and generation. The results presented in this table are the outcomes of the Mantel-Haenszel test of partial independence between AIDS affection status (i.e. affected/non- affected) and generation (i.e. child/adult).

In the first half of the table, the descriptive statistics show that non-affected adults and orphans have the same distribution of form and function descriptors of pests, while non-orphans use function descriptors more (see also Table 2). In the second half of Table 3, the Breslow-Day test of the odds ratio shows a statistically non-significant value, which means that the value of the odds ratio can be used to interpret the internal variations in the use of descriptors among the respondents, that is, their expertise. Thus, the respective estimate of the odds ratio, which is 2.97 for form descriptors and 1.399 for function ones, shows that there is almost 3 times the likelihood for a child, if affected by AIDS (that is, orphan) to mention a form descriptor compared to the other respondents. There is also almost 1 and half times greater likelihood that an orphan mentions a function-related attribute of pests.

A closer look at the first part of Table 3 (and the results presented in Table 2) on the differences in the use of form and function among the respondents shows that Adja farmers, being affected by AIDS or not, seem to all use functional descriptors which is the primary indicator of expertise in a cultural

Table 3: Testing the combined effect of generation and AIDS on farmers' cultural expertise in the Couffo given the percentages of mentions of form and function descriptors.

Group of respondents	Descriptors (%) ^a	
	Form	Function
Orphans	17	83
Non orphans	6	94
Affected adults	11	89
Non-affected adults	17	83
Test of association: B-D's homogeneity of the odds ratio ^b	0.66 (ns)	0.08 (ns)
M-H conditional independence ^c	0.05*	0.05*
Estimate of the odds ratio	2.97	1.399
p-value (2-sided)	0.05*	0.09 (ns)
95% confidence interval (CI)	(0.6 - 6.5)	(0.5 - 3.8)
Number of observations = 77		

^a % of mention within each category of descriptors; ^b Breslow-Day test significance; ^c Mantel-Haenszel test, with * $p \leq 0.05$ and (ns) = not significant.

group. Hence, the point is the examination of the quality of their expertise to gain more insights on the value of this expertise and the related intracultural distribution of the agroecological knowledge among the respondents. Table 4 and 5 show the results of a further analysis of the differences in expertise.

The analysis of respondents expertise in the use of descriptors aggregated into form and function showed no statistically significant difference between adults and children (Table 4).

The results of the Fisher's exact test of the index of expertise for form and function, however, do show a significant and inverted difference between orphans and non-orphans (at the 0.05 level). Non-orphans used significantly fewer descriptors of form and significantly more of function than orphans (see Table 4) compared to orphans. From Table 4, it appears that globally, orphans and affected adults had a better expertise with respect to their ability to use a

Table 4: Distribution of the quality of expertise among Adja farmers given the ratios of form and function of their aggregated index of expertise, and the Fisher exact test for the ratios.

Groups of respondents (n = 77)	Descriptors Index ^a	
	form	function
Adults and children		
Children	40	60
Adults	41	59
p-value	0.17 (ns)	0.13 (ns) ^b
Children		
Orphans	45	55
Non-orphans	22	78
p-value	0.05*	0.05* (ns)
Adults		
Affected	45	55
Non-affected	50	50
p-value	0.36 (ns)	0.08 (ns)

^a Values represent weighted proportions of form and function in the indexes of expertise; ^b Fisher exact significance, with * = $p \leq 0.05$; (ns) = not significant.

balance of form and function to reflect on their perceptions about maize and cowpea pests. In fact, their ratio of form-function expertise was 45/55, which was close to the 50/50 that was anticipated.

The differences in expertise for the use of form and function descriptors between orphans and non-orphans were further investigated by disaggregating the category of orphans (Table 5). We found a significant difference in expertise for the use of function descriptors between one-parent orphans and double orphans in the use of form descriptors (p-value 0.05). We also found a difference in expertise between double and non-orphans (p-value 0.05) for the use of form.

Table 5: Distribution of the quality of expertise among child farmers given the ratios of form and function of their aggregated index of expertise, and the Fisher exact test for the ratios.

Groups of respondents (n = 51)	Descriptors Index ^a	
	form	function
One parent orphans		
Paternal	50	50
Maternal	30	70
p-value	0.15 (ns)	0.28 (ns) ^b
One parent orphans / No parent		
Paternal/maternal	40	60
Double orphans	58	42
p-value	0.09 (ns)	0.05*
No parent / two parents		
Double orphans	58	42
Non-orphans	22	78
p-value	0.05*	0.07 (ns)

^a Values represent weighted proportions of the indexes of expertise; ^b Fisher exact significance, with * = $p \leq 0.05$ and (ns) = not significant.

The examination of the ratio form-function in each group shows, first, that there is no significant difference between AIDS-affected and non-affected adults, and second, that double orphans rely more on form and less on function relative to the other children that still have at least one of their parents. Precisely, and in the light of the results in Tables 4 and 5, it appears that children orphaned by AIDS, and especially one-parent orphans, have a more balanced expertise in the use of form and function descriptors for crop pest. The distribution of the agroecological expertise, as reflected in the ratio of form-function for non-affected adult farmers shows the closest expertise (a split of 50/50) to that of the orphans (a split of 45/55), and is identical to that of paternal orphans (a split of 50/50) (see Tables 4 and 5). This information,

combined with the findings in Table 3 indicates that the combined effects of AIDS and generation on expertise is one of AIDS hastening the acquisition of agroecological knowledge among children orphaned by AIDS in the Couffo. Thus, the most important conclusion to be made based on the above results is that there is a positive effect of having at least one biological parent on the competence of a child farmer with respect to the function based agroecological knowledge of pests.

6.4 Discussion and conclusion

This study examined the differences between AIDS-affected and non-affected adults and children in the way they describe pest problems in maize and cowpea. We did not discover any significant difference between AIDS-affected and non-affected adults. Nor did we find differences overall between adults and children (irrespective of AIDS affection status). There are, however, some areas of statistically significant differences in the kinds of descriptors AIDS-affected farm children and non-affected farm children use, falling into the categories of 'form' which was based on morphology and locomotion and 'function' that included habitat and ecology, generic and crop specific damages caused by pests, pest management, and utility (use value for e.g. consumption). Ultimately, there is a statistically significant difference in the use of form and function, and the respective expertise attached to their use, between non-orphans and orphans with non-orphans using form less and function more. However, orphans, like adults, have a more balanced expertise in the use of form and function with fatherless orphans having a balance of 50/50 in the descriptors they used, exactly like non-affected adults.

We believe these differences between being more of a novice or more of an expert (Boster and Johnson, 1986) are potentially related to how much the children interact with an adult and the quality of that interaction. Importantly, we suggest the children's level of interaction with the resources/items under study was vital to the differences we uncovered (Reyes-García et al., 2005). The results show, however, that there are no novices in the strictest sense, that is, totally dependent on visual cues only from observations of form. Both form and function were present in the descriptors of both AIDS-affected and non-affected adults and children. The degree to which each kind of descriptor was present in the responses is of particular interest.

In their study, Boster and Johnson (1989) found that experts are actually intermediate between the two models of judgment, using form and function

aspects fairly equally. In connection to this, an important point to highlight is the observed difference in expertise in evidence between paternal orphans and other categories of children. It appears that in this study, the child farmers with the most adult-like expertise, that is, the paternal orphans, did not abandon early models of understandings of the living things for later ones, but seem to have accumulated alternative models. This is in accordance with the position defended earlier by Boster and Johnson (1989) who argued that novices become experts by starting with readily available models, which are generally superficial (e.g., morphologically based) and gradually acquiring the more abstract ones (e.g., functionally based). We have indications that we witness a similar pattern here. Paternal orphans (i.e. those living with a surviving mother) have been shown to be more engaged in farming through the application of their own labor in the fields, and thus have the opportunity to gain more in-field expertise and make more observations (see chapter 4; Fagbemissi et al., 2009). We believe that our results reflect paternal orphans having new responsibilities, conducting more work in the agricultural fields, and having one surviving parent to obtain needed knowledge from (Kaschula, 2008; Richter, 2004). Rather than a knowledge loss for paternal orphans, what appears is that we are witnessing an acceleration into adult knowledge frames.

Ethnobiological knowledge and practices within any culture vary according to people's social status and context, relations and social networks, income, age and gender, among other attributes (Moreno-Black and Somnasang, 2000; Pfeiffer and Butz, 2005). We argue that the enculturation of children as young farmers is affected by the combined effect of specific parent-child relationships and the type or level of involvement in farming activities. These dimensions have important implications for gaining expertise in agroecological knowledge. In addition to having one biological parent we believe that selected children probably have more tacit knowledge from engaging in the farm activities (Setalaphruk and Price, 2007). Furthermore, the present study highlights the importance of parent as teacher and role-model to farm household children's acquisition of agroecological knowledge and expertise. Kadiyala and Gillespie (2004) found that AIDS has not only deepened vulnerability, but has also impacted the capacity of the extended family to accurately respond to the challenges posed by the pandemic to farm households. Our study furthers this observation by showing that fostered families appear to not be the best channels for environmental knowledge transfer to double orphans. In this study, double orphans were being raised mainly by grandparents. In addition, some of the double orphans farm on their own (see Fagbemissi and Price, 2008). Richter (2004) shows that children become more vulnerable when

they are cared for by aged relatives due to the conditions of mutual dependency that often exist between adult and child. This mutual dependency could also jeopardize parenting and thus, the acquisition of the agroecological knowledge by double orphans.

The situation of AIDS-affected child farmers is one of a mixture of vulnerability and agency, dependency and being depended upon. Our findings indicate that rather than a loss of agroecological knowledge, we may be witnessing a strengthening of knowledge among selected children who happen to be orphans. Thus, our findings indicate a need to rethink the issue of farming knowledge and its loss in AIDS affected communities.

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Chapter 7

Children and adults' strategies to mobilize knowledge and resources to solve cowpea pest problems in an AIDS context in the Couffo, Benin

A slightly modified version of this chapter is to be submitted as:
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Abstract

In this chapter, we uncover how children and adults of various AIDS-affection status use their knowledge to solve cowpea pest problems in the Couffo region in Benin, using a problem solving framework. The study was conducted among 90 cowpea farmers of the Adja culture group, and reveals important differences among farmers at each stage of the problem solving process. The results show that adults and children use different strategies and networks to access knowledge and non knowledge resources which are needed to address pest problems. The study highlights that orphan farmers often use connections that offer space of human interactions to mobilize resources. Orphans also seem to be more responsible and trustworthy in their relations with other members of their community compared to adult farmers. This facilitates access to knowledge and other resources. However, there are still concerns about the quality of the knowledge used by orphans to solve pest problems because some of the solutions they opt for could be harmful.

Introduction

There are different ways of assessing farmers' agricultural knowledge (Leeuwis, 2004; Price, 2001). In this chapter, two of them are examined side by side. The first consists of evaluating the knowledge stocks, that is, the knowledge base that the Couffo farmers possess (at individual or group level). The second examines how these farmers put their stocks of knowledge into action in a specific situation, for instance, solving pest problems. In chapter 5, we chose maize, as an example of staple food, to assess the differences in agricultural stocks of knowledge (Fagbemissi & Price, 2008). In so doing, we compared several subgroups: children orphaned by AIDS versus non orphan farmers, and AIDS-affected versus non-affected adult farmers. We also compared various groups of orphan farmers²¹ farmers. The main finding was that, in spite of concerns about erosion of knowledge and its transfer from one generation to the other, orphans living with their surviving parents had a higher cognitive salience index (the proxy used to assess farmers cultural knowledge of maize pests) compared to other categories of farmers (see Fagbemissi & Price, 2008).

In the present study conducted among cowpea growers in the Couffo region in Benin, we expand on this finding, and test another way of examining the impact of AIDS on traditional agroecological knowledge within farming communities of the Couffo (see Rugalema, 1999a; Haddad and Gillespie, 2001). We tested the hypothesis that AIDS not only impairs or modifies farmers' agroecological knowledge base, but also impairs/modifies their strategies to mobilize the needed knowledge and resources to successfully control pest damages in their cowpea farms. In this line, we examined the ways different categories of farmers (affected/non affected; child/adults) use their knowledge when confronted with pest problems, and the subsequent strategies they use to achieve their goal of successfully control pests in cowpea farms.

A problem solving process is dynamic and encompasses steps that are not always linear. Navigating through this process includes the mobilization of other resources through active networks. This, eventually, results in particular farming practices (Leeuwis, 2004; Bentley, 1989; Bentley, 1992).

Cowpea is a very important crop for the farmers of the Couffo. It has a high economic and market value. However, the crop is attacked by numerous pests, especially the insect pests (Fatokun et al., 2000). The study focuses on the way farmers come to know that they face with an insect pest problem, how they identify the causal agent, and how they mobilize non-knowledge resources

21 The term 'orphans' throughout this chapter refers to children orphaned by AIDS.

as well as how they use connections to do so. Ultimately, the study put more emphasis on the differential ways solutions and actions are implemented in the pest problem solving process.

Our approach is justified by the fact that pest management is one of the domains where farmers frequently test and apply the knowledge they bear (Allogni, 2004; Nathaniels, 2005). This, we believe, is a valuable avenue to examine another dimension of the intersection of AIDS and agriculture. In addition, an important part of the orphans of this region is engaged in agricultural activities and cultivates various plants among which cowpea is of high importance. Therefore, it gives an opportunity to analyze the generational differences in strategies and pest control practices.

To learn more about these issues, we first conducted a field research among different subgroups of cowpea farmers (children orphaned by AIDS and non-orphans, AIDS affected and non-affected adults). The analysis of the information gathered gave us valuable insights that served as a basis for a survey. The results of the survey elucidated the pathways the farmers followed in solving their problems. The present chapter reports on our main findings and is structured along the following lines. We first briefly describe the importance of cowpea for the people of Couffo and provide a short justification for our specific interest in insect pests problem solving processes in cowpea cultivation. Next, we expand on the problem solving process itself and discuss the role of social networks in that process. Following this, the methodology used for data collection and analysis is described for aspects that were not fully discussed in chapter 3. Results of the study are then presented and discussed. We conclude with some implications for communication scientists and rural development practitioners.

7.1 Importance of cowpea in the Couffo region

The Couffo region is one of Benin's food production hubs. Cowpea is grown in Benin across various agro-ecologies and the Couffo region is one of its well-established production zones (Pronaf-Benin, 2003; Nathaniels, 2005).

Cowpea has a prominent position in the Couffo for its importance in household revenue generation (Agli et al., 2001; CERPA, 2004; Nathaniels, 2005). Cowpea is also a good protein source and meat substitute, especially for the poorest (Barrett, 1990; Okike et al., 2002). Meanwhile, AIDS has a very important connection to poverty and food insecurity (de Waal and Whiteside, 2003; Foster, 2007; Nombo, 2007; Whiteside, 2002). People of the Couffo grow cowpea basically for two purposes. The first and most common one

consists of producing cowpea for cash. The cash is then used to meet financial needs such as labor hiring for more household food production oriented crop such as maize. The second purpose consists of using part of the harvest as household source of protein. A portion of this part may be allocated to gift giving during visits to family members or friends (Nathaniels, 2005). Cowpea grains also serve as food compensation for hired labor. Thus, cowpea grains help to significantly curb household spending, boost household savings, pay school fees and fulfill other basic needs (Agli et al., 2001; Allogni, 2004; Pronaf, 2003).

In the Couffo, cowpea is mainly intercropped with maize and/or cassava, but in some cases it is also grown in monoculture. Meanwhile, statistics show an overall cowpea production of 7,451 tons for 12,922 hectares (CERPA, 2004). Cowpea cultivation is very suitable for the Couffo farming landscape, which is characterized by small size farms and low fertility soil (Saidou et al., 2004). However, cowpea is attacked by several pests in the field, among which insect pests are the most important (Jakai & Daoust, 1986; Pronaf, 2003). The presence of insect pests in a cowpea farm generally prompts farmers to take actions (Agli et al., 2001; Tovignan, et al., 2001).

7.2 Fighting insect pests in cowpea cultivation: the problem solving process

A problem is generally perceived as a difficult situation that people have to overcome. It usually costs time, thinking, investment and, finally, knowledge for taking appropriate action. Problem solving is a process in which observations, questions and responses are involved, and whereby different kinds of knowledge and information are needed in different stages (Leeuwis, 2004). Although there are various stages in the problem solving process, we focus in this chapter on how cowpea farmers identify a pest problem and explain its causes, what solutions they choose, what means they use to access those solutions and what actions they take to address the problem.

Identifying the problem and diagnosing its cause(s)

Farmers define the problem they face and elaborate strategies to solve it according to their perceptions of its causes and manifestations (Gachimbi et al., 2002; Davidson-Hunt and Berkes, 2003). Several parameters can influence how farmers define a given pest problem and their understanding of its causes. Among those parameters are farmers' knowledge of the physical environment, cultural values, belief and experience and perception of the

problem (Chambers et al., 1989; Björnsen-Gurung, 2002; Bernard, 2002; Price, 2001). In addition to this, the extent to which the phenomenon is easily observable is also important (Bentley, 1989 and 1992; Ellen, 1982; Sherwood, 1997). In the next section, we examine other aspects of the problem solving process, namely choosing solutions and implementing actions.

Solutions space and actions in the problem solving process

According to Harris (2002) there are two basic types of solutions in problem solving processes. The first one addresses the cause or source of the problem, and the second one deals with the effects or symptoms of the problem. Both approaches may be combined, and generally solutions to address pest problems in cowpea cultivation reflect the diversity among the farmers. As problem solvers, farmers set their minds and make decisions about solutions (Lunneryd, 2003). In doing so, farmers use several criteria such as the perceived effectiveness, availability, affordability, or cultural acceptability (Leeuwis, 2004; Nazarea-Sandoval, 1995). In fact, farmers' options to solve a problem depends on how they define and understand the cause-effect relationships, and their assessment of the chance of success for each option (see Leeuwis, 2004; Price, 2001; Rogers, 1983). Solutions vary according to individuals, the cultural values of the group they belong to (for instance the Adja farming communities), their social status, but also according to the physical environment in which the problem occurs. In the case of this study, the environment is shaped by Adja cultural values. However, variability is reported to occur even within a homogenous culture (see also Brewer, 1995; and Gatewood, 1983). Thus, variability occurs within sets of possible solutions for a given problem.

In short, farmers' choices of solutions depend on their knowledge (technical skills as well as the capacity to process information) and the resources they have on-hands. Consequently, actions taken and pest control practices are shaped, among other factors, by farmers' ability to use existing connections or create their own ones in order to mobilize key resources to address the problem (Engels and Salomon, 1997). This ultimately delimits the solution space (Leeuwis, 2004). The next section elaborates on social networks and their importance in mobilizing those resources that are needed to take action against cowpea pest problems.

Social networks and agricultural resource mobilization in an HIV/AIDS context

Agricultural resources mobilized by farmers include knowledge and non knowledge resources. In this study, emphasis was put on knowledge,

information and advice, land, agricultural tools, and inputs such as seeds, fertilizers and pesticides. Networks play an important role in accessing various agricultural resources. An example is the fact that in subsistence agriculture, farmers generally acquire agricultural knowledge via kinship networks (Bandiera and Rasul, 2006; De Waal and Whiteside, 2003; Nathaniels, 2005; Palis et al., 2002).

A network consists of people or actors who have some patterns of interactions or 'ties' between them, based on trust and reciprocity (Wasserman and Faust, 1994, Trotter II, 1999). Thus, social networks may enable solidarity among members of a community if there is valuation and trust. In characterizing social networks, Putnam (1993) argues that networks shared by people of equal status provide a sound support background for exchange of goods and information. In the same vein, Foster (2007) adds that extended families and communities are the most effective channels that enable access to support for households undergoing crises such as HIV pandemic. These kinship ties are important in the household's food production strategies and in the production of care (Rugalema, 2000). It is shown that people in difficult situations tend to turn to each other, rather than to outsiders for assistance given that the relationships are based on trust (Foster, 2007; Trotter II, 1999). Literature reports that important changes occur within these ties because of AIDS. Still, there are conflicting accounts of these changes, as some scholars depict their collapse while others talk of the resilience of community support (Foster, 2007; Nombo, 2007). However, very little is known about how those networks operate in terms of facilitating access to agricultural skills and other resources with respect to farm households affected by AIDS, and specifically for orphans of such households. Orphans are increasingly taking on adult responsibilities as a result of the death of their parents. Therefore, information is needed about how these child farmers use existing ties (or create new ones) when carrying out their farming activities.

7.3 Data collection and analysis

The study was carried out from September to December 2006 and from April to May 2007. Techniques and strategies of investigation consisted of semi-structured interviews and discussions with key informants (farmers, agronomists, entomologists and extension workers). Four focus groups (two for adults and two for children) were conducted on community perceptions and definitions of damages on cowpea plants and the specific pests that caused

them. In these focus groups, propositions on causes of pest problems were collected. Complementary individual interviews with twelve key informants helped to build a matrix of propositions as community correct answers. In addition, we conducted direct observations and short participant observations. Individuals were interviewed on their strategies and practices to solve pest problems. Information gathered within farm households and through direct field observations are reported here through cases illustrations. Thus, we followed individuals during some important daily events that were linked to their farming activities. This was also a good opportunity to trace how farmers mobilize various types of resources, including knowledge, and provide a broad picture of the process. Later on, we proceeded with a larger data collection using a questionnaire.

The collected data about the identification of manifestations of problems were first analyzed by looking at the variation among the categories of farmers. Farmers were assessed on their capacity to link the observed manifestation to a specific causal agent. In a final phase, aggregate individual answers were checked against the community correct answers. We then checked for variations by comparing mean group correct answers. With respect to the use of networks by cowpea farmers, the types of connections used by each informant were examined and compared across informants. This was complemented with a detailed analysis of the types of resources that are mobilized through the different ties. Differences were assessed using the Chi square test, which was reinforced by Fisher exact statistics. Illustrations were added to show-case of farmers' differential agencies in the problem-solving process.

The unit of analysis was the individually selected child or adult member of a given farm household. A household was labeled as affected or non affected according to whether there is one or more orphans (for the affected one), and non orphan (for the non affected one). In a first stage, a randomly selected child farmer was used to index the household and the adult s/he followed for daily farming activities. In a second stage, a total of 11 cases were selected and examined, using also children (orphans and non orphans of 10 to 14 years old) as the entry point. Information gained through the case studies help to purposively select 90 participants distributed within two major categories: 60 children and 30 adults. Three levels of analysis were then used: children (orphans and non-orphans), adults (affected and non-affected) and between generation (children - adults) to reflect the intrahousehold distribution of pest control roles and subsequent knowledge and practices.

7.4 Results

7.4.1 Identification of pest problems and their causes

Table 1 shows differential pest problem identification practices among cowpea farmers. These results show an important difference between orphan and non orphan child farmers regarding disturbances of plant growth as an indicator of a pest problem ($p < 0.01$). Comparison within the category of adults farmers shows two significant differences ($p < 0.05$ each). Non-affected adults put more emphasis on seedling's damages while affected adults highlight pest attacks on cowpea pods. In sum, four major indicators/manifestations are used by farmers (children and adults) to identify pest problems in their cowpea farms. While orphans are distinct from non-orphans by emphasizing more the plant inadequate growth, affected adults highlight more the damages on pods compared to non-affected adults, who, in turn, mention more often the destruction of seedlings as an indicator of a pest problem. The intergenerational comparison did not show any significant variation between adults and children in cowpea problem identification.

Table 2 shows 20 community propositions which meaning and validity are rooted in the Adja culture related to their understanding of cowpea pests. This is a matrix which was built from information gathered during focus group discussion sessions with key resource persons in the study zone.

From this point, Table 3 shows results of comparison between individual and community competences of understanding of the causes of pest problems. The table shows the number of correct answers (in light of all the community propositions) an individual farmer could give.

The results show that individual/sub-groups of farmers' scores in identifying causes are relatively low as individual farmers did only score an average of 2 or 3 community validated causes. This, probably because Couffo cowpea farmers do not pay much attention to understanding the causes of the problems they face. Nevertheless, there are differences between orphans and non orphans ($p < 0.05$), between affected and non affected adults ($p < 0.01$), and between generations ($p < 0.01$) (see Table 3). Non orphans have higher scores on community correct answers compared to orphans, and affected adults scored higher than non affected adults. With respect to generation, differences between child and adult farmers are probably linked to children still in the learning process.

7.4.2 Choosing among solutions and taking action to solve the problem

This section starts with reporting on the main solution options and the choices made by cowpea farmers.

Table 1: Identification of manifestations of cowpea pests problems by child and adult farmers.

Manifestations used by farmers to identify pest problems	Categories of farmers ^a								
	Children			Adults			Generation		
	Orphans n = 45	Non orphans n = 15	χ^2	Affected n = 15	Non affected n = 15	χ^2	Children n = 60	Adults n = 30	χ^2
There are holes in the leaves	84	87	1.87	93	100	1.10	85	97	1.74
The plant growth has stopped	73	33	6.18**	80	60	2.07	63	70	1.40
The seedlings are cut	36	53	1.89	47	73	2.88*	40	30	1.30
The pods are attacked	36	27	0.50	47	13	2.60*	33	30	0.04
The seeds did not germinate well	4	20	1.68	3	0	1.96	5	3	0.30
The leaves are yellow	9	7	0.28	2	0	0.90	5	2	0.01
n = 90									

^a Values are percentages of respondents of each sub-category of farmers; **p < 0.01; *p < 0.05.

The solutions basket and farmers' criteria for choices

Table 4 recapitulates solution options available to Couffo cowpea farmers as entioned in their responses on what was at their disposal to act against pest infestation. Those options included spraying of cotton insecticide, sowing seeds with fertilizer, making noise using old cassette threads, and, using plant extracts. Other solutions consisted of the use of recommended cowpea insecticide, the utilization of black powder from used radio batteries, and weeding cowpea farm on time.

Sowing seeds with fertilizer to deal with insect pests consists of pouring one teaspoon of fertilizer (N or NPK) before putting the seeds in the hole. The

Table 2: Adja farming communities' understanding of causes of pest problems.

Community correct answers ^b
Ehui attacks cowpea leaves, eats or makes holes in them.
Ehui attacks the plant, sucks and stops its growth.
Eyue stops plant growth.
Eyue attacks cowpea leaves, covers them and makes holes in them.
Eyue covers the apex of cowpea plant.
Eyue covers the stem of the plant.
Eyue covers the whole plant.
Edja attacks cowpea seedling, cuts and eats them.
Edja attacks cowpea leaves, eats them and makes holes in them.
Ewan attacks the flowers, cuts and eats them.
Ewan eats the leaves and makes holes in them.
Ewan attacks cowpea pods and grains.
Ewan makes holes in the stems.
Ewan sucks the roots, kills the seeds and seedlings and reduces germination.
Other insects attack cowpea leaves.
Takpe and other birds uproot the seedlings and eat them.
Takpe and other birds remove the seeds from the soil and eat them.
Takpe and other birds attack the pods and eat the grains.
Djaka removes the seeds from the soil and eats them.
Djaka eat the pods and the grains.

Total propositions = 20

^b Glossary of pest names: Djaka = rats; Edja = locusts/grasshoppers; Ehui = thrips; Ewan = insect larvae/nematodes; Eyue = aphids; Takpe = partridge.

Table 3: Individual answers checked against community correct answers.

Category of farmers	Number of individual correct answers given the community propositions ^c
Children	
Orphans (n = 45)	2.42
Non orphans (n = 15)	2.77
χ^2	10.84*
Adults	
Affected adults (n = 15)	3.21
Non affected adults (n = 15)	2.86
χ^2	14.91**
Between generations	
Children (n = 60)	2.44
Adults (30)	3.06
χ^2	9.94**
Mean (total)	2.68
Total n = 90	

^c Values are means of each category of respondents; **p < 0.01; *p < 0.05.

fertilizer is expected to kill all larvae (worms and any soil-born enemy) so that the seeds can germinate well. Cassette threads are attached to pickets or trees, and stretched in the farm so that when the wind passes through the threads, it produces noise that scares birds, grasshoppers and rats. Old radio batteries are collected and crushed to collect their content, which is in the form of a black powder. This powder is mixed to the seeds before they are sown. This option is chosen to minimize the cost of cotton pesticide or fertilizer. The concern about such options is however the lack of protective measures to avoid poisoning. Table 4 below, provides details on the solutions as they are used by each category of farmers.

At the time the study was conducted, cotton insecticide appeared to be used by all the respondents. Non-orphans and non-affected adults, as opposed to orphans and affected adults, did neither apply chemical fertilizer nor did they use cassette thread in their farms. Plant extracts were applied by an equal

Table 4: Methods used by child and adult farmers to address cowpea pests problems.

Solution options ^d	Categories of farmers (%)			
	Children		Adults	
	Orphans	Non orphans	Affected	Non affected
Cotton insecticide	93	100	100	80
Chemical fertilizer	98	0	73	0
Cassette thread	30	0	87	0
Plants extracts (neem, hyptis)	0	0	13	13
Cowpea insecticide	0	0	20	0
Old battery powder	7	0	7	0
Weeding on time	7	0	7	0
n = 90				

^d Farmers may use a combination of more of these solutions to fight cowpea pests.

proportion of affected and non- affected adults, while orphans and non-orphans did not use such solutions as individual farmers. In addition, only the AIDS-affected adult farmers (one fifth of them) use insecticides that are specifically recommended in cowpea plants protection. In short, the solutions basket of the affected adults, and, to some extent, that of the orphans, has a more diverse content, compared to that of non affected farmers.

Farmers choice of solution is based on their perception of the identified pest problem, and their expectations (motivations for growing cowpea). They, therefore, use relevant criteria among the available options. Box 1 and 2 below illuminate on farmers' rational and pest control decisions.

Box 1: Farmers' sense of urgency: perception of the need to act quickly and kill all the insects without distinction

'Insects are like brothers and sisters. When one finds food somewhere, it calls all the group.'

Roger, 45 years, male, non-affected, Avegandji, Klouékanmey

'During my visit to the farm, I noticed that the plants have been bitten by some insects. I did not waste any time before I decided to spray the farm.'

Ouinsou, 62 years, male, affected, Touvou, Aplahoué

'Last time I saw our neighbors spraying their fields. I went to check our cowpea farm and there were those insects that jump from plant to plant, and those that look like worm. I reported to my parents. My father gave me money to buy the pesticide and he sprayed the farm quickly.'

Stanislas, 10 years boy, non-orphans, Djotto, Klouékanmey

'It is good to use neem leaves, but sometimes, our neighbors are too fast to collect the leaves and my father must carry the leaves with his motorcycle from another village. So, to avoid waist of time, it is easier to use cotton insecticide, which anyone can buy in the market.'

Florence, 13 years, non-orphans girl, Avegandji, Klouékanmey

These are examples of the pressure faced by cowpea farmers and the importance of timing in making decisions to address pest problems that occur in their farms. These illustrations are followed by that of the rationale behind farmers' choice of solutions.

Box 2: Solutions preferences and rationale behind farmers' choices

'When you want to be sure you will really spare your cowpea seedlings, you must treat the seeds with the cotton insecticide, or if you do not have money to buy the insecticide, you can use the black powder from old batteries. This will kill the rats, partridge and even the birds. It is also good if you can spray the cotton insecticide all around your farm borders. Then, you do not have any surprise.'

Vicky, 32 years, AIDS-affected widow, Touvou, Aplahoué

'Well, in this village, we mainly choose among two options: either you buy the cotton insecticide in the market, or you collect neem leaves and pound them to make the extract. For me, I am living with my wife and two of my grand children. I do not have enough assistance, so I used the cotton insecticide. I always consider first the availability of the solution, its effectiveness, the cost and the time it takes to get it ready for the treatment.'

Ouinsou, 62 years, affected male farmer, Touvou, Aplahoué

'We have to spray the farm once a week to protect the pods., We can combine neem leaves extract and small amount of cotton insecticide when we do not have money to buy enough

insecticide. We can choose solutions that are less expensive but we prefer those that are the most effective and immediately available.’

Kafui, 13 years, double orphan girl, Azove

‘I do not have criteria. I do what we do here, which is to use less cotton insecticide on the leaves, as we eat them, and to use more powerful solutions to treat any assault to the pods. For the holes on the leaves, last week, I used neem leaves extract to which I added some cotton insecticide. But later, for the insects that attack the pods, there are no other more effective solutions than the cotton insecticide if you need your harvest. The only difficulty is how to protect the pods against the birds; nothing works against them except if you can harvest your cowpea very early and dry the pods in the house.’

Yao, 40 years, non-affected male farmer, Davihoué, Klouékanmey

‘We have two solutions options: pounding the neem leaves and fruits and spray the farm, or buy the cotton insecticide and hire someone to spray it for us. The choice depends on the money we have, and the number of insects that are on the plants’. So, this time, cotton insecticide was the best choice.’

Florence, 13 years, non orphan girl, Avegandji, Klouékanmey

Illustrations from Box 1 and 2 show that the solutions chosen by the farmers are rooted in their perception of the risk of not taking prompt actions, their perceived efficacy and availability of the solution(s), their capacity to afford the solution, and eventually, their perceived (anticipated) cost-benefit outcome.

7.4.3 Mobilizing resources and taking action to control cowpea pests

Taking action to solve cowpea pest problems depends largely on the type of resources farmers have or are able to mobilize. We also provide information on the main resources, and the differential connections the farmers use to acquire them (see Table 5). The analysis focuses mainly on source of knowledge (e.g. control practices and information), and non knowledge resources (land, farming tools, seeds, insecticide spraying tools, fertilizer and pesticides).

Main resources used by farmers in cowpea farming

Results presented in this section relate to 3 types of resources (land, farming tools and spraying tools). Resource mobilization already starts with the access to land. The results in Table 5 show that sharecropping as land tenure is not available for affected farmers (adults and children). The main reason for this could be that AIDS-affection has rendered the affected farmers non reliable

Table 5: Type of resources used by child and adult farmers.

Types of resources ^e	Category of farmers (%)								
	Children			Adults			Generation		
	Orphans	Non-orphans	χ^2	Affected adults	Non affected adults	χ^2	Children	Adults	χ^2
1. Land tenure									
Inherited	100	83	3.57	100	88	1.49	94	96	0.07
Hired	55	50	0.7	65	63	1.71	53	65	0.9
Share cropped	0	25	6.80*	0	25	2.15*	9	9	(nd)
2. Farming tools									
Hoe and machete	95	100	1.68	100	100	2.95	97	100	1.05
3. Spraying tools									
Small sprayer ^f	50	8	6.51*	33	13	1.12	35	26	0.545
Sprayer with pump	55	42	2.67	7	54	3.10*	50	30	2.19
Basin and palm tree branches	0	25	5.35*	7	13	5.68	9	9	(nd)
n = 90									

^e Seeds are not reported on here as farmers cultivate a combination of varieties on the same farm, and this makes the table too long; ^f This sprayer functions with 6 or 8 ordinary batteries. It contains 1 liter of spraying solution. It is the cheapest and the most common spraying tool among cowpea growers; * $p < 0.05$.

vis-à-vis the land owners. In addition to land issues, Table 5 also provides information on differential access to farming tools and spraying equipments.

There are no significant differences found with respect to the use of farming tools. However, farmers do show several interesting differences in the type of spraying material they have/use. Orphans predominantly reported the possession of small sprayers ($p < 0.05$), while some of the non-orphans simply

use domestic containers such as basins and palm tree branches to spray the insecticide trees ($p < 0.05$). In the same time non-affected adults enjoy the privilege of having bigger sprayers (sprayers with a pump), compared to affected adults ($p < 0.05$).

Connections used to mobilize knowledge and non knowledge resources

Table 6 is a recapitulation of the main connections used by different farmers during resources mobilization. Differential access to six types of resources are presented. There are significant difference between children with respect to the access to seeds. In fact, while orphans seem to resort to their neighbors ($p < 0.01$), non-orphans mostly secure seeds from the last harvest ($p < 0.01$), as do affected adults compared to non- affected adults ($p < 0.05$).

The results further show that more diversified connections are used to access inputs such as fertilizer and pesticide, and the knowledge needed for their utilization. For instance, non-orphan farmers use more than orphans the nearest shop as a connection to access fertilizer and pesticide ($p < 0.01$). The use of the open market and ambulant vendors are important differences between orphans and non-orphans in the purchase of fertilizer and pesticide ($p < 0.01$). The ambulant vendor is also a differential feature of connections to access insecticide. Most of these resources are paid in cash. However, some of the orphan farmers can get credit possibilities compared to other categories of farmer ($p < 0.01$). The conditions set for payments are not in the scope of this chapter.

In all, Box 3 gives some vivid illustrations of strategies and connections used by cowpea farmers to access knowledge and non knowledge resources.

Box 3: Differential types of connections used to mobilize pest control resources

Pauline, a 30 years old widow living with her three children, managed to get help from her friend who lent her the money she needed to buy the chemical pesticide from an ambulant vendor in short of cash, while her father-in-law was helpless. Pauline was then able to spray her farm against the pests.

Mathieu, a 14 years old maternal orphan living with his sick father and two brothers preferred to buy the chemical pesticide at the roadside instead of going to the extension service. The main reasons were the proximity and the possibility to get the product in credit.

Jean, a 13 years old double orphan living with his two sisters mobilized money from his grandmother and buy the chemical pesticide at the nearby shop. He also hired a

sprayer to treat his cowpea farm. He had cash money and the product was available in his immediate neighborhood.

The main point that could be made from these illustrations is that the proximity and ease of access is an important factor in the types of connections used by farmers. It can also be inferred that there is a more important use of non kin networks.

Box 4 below shows an evidence of the increased responsibility of the orphans, and an increased trust from the community members towards these orphans.

Box 4: Orphan farmers showing more responsibility and deserving community trust

Rodondo, a 12 years old paternal orphan (Pauline' son - see Box 3) was in charge of observing cowpea plants in the farm and reporting pest attacks while his elder brother negotiated and scheduled a spraying timetable with the laborers. Far from being a simple tasks division, this is an example of children being serious in participating to running the household.

Jean (see Box 3) is a hard working and reliable boy. That is why his grandmother did not hesitate to provide him with the money he needed to buy the chemical and hire the sprayer he needed. Also, despite the presence of their grandmother, Jean and his two sisters organized and run the household and all the activities.

Mathieu, the double orphan (see Box 3) succeeded to obtain a chemical pesticide while the seller did not want any deal with Mathieu's father. Mathieu put his own credibility in the balance and it worked. He promised the seller to pay on time and the latter trusted him. Back home from the negotiation, Mathieu took steps towards how to secure the money to reimburse the debt he had just contracted.

Differential access to knowledge and information about pest control methods

It also appears from Table 6 that farmers use several ways to get knowledge and information. One of these channels consists of being trained on fertilizer and pesticide. In this respect, differences have been seen between orphans and non orphans ($p < 0.01$), and between affected and non affected adult farmers ($p < 0.05$). More of the affected adults received training compared to the non-affected adults for fertilizer and pesticide ($p < 0.05$). Farmers reported that the

Table 6: Connections used to mobilize knowledge and non knowledge resources by child and adult farmers

Resources and access	Category of farmers (%)								
	Children			Adults			Generation		
	Orphans	Non-orphans	χ^2	Affected adults	Non affected adults	χ^2	Children	Adults	χ^2
1. Source of tools									
From parents or purchased	100	83	0.6	100	88	1.01	82	74	0.59
Borrowed	55	50	0.6	67	63	0.9	52	62	0.55
2. Source of seeds									
Market	32	33	1.71	27	13	2.13	32	21	1.64
Neighbors	23	0	6.85**	0	0	(nd)	15	0	5.49*
Last harvest	0	50	11.42**	33	23	4.53*	27	26	2.1
3. Access to fertilizer									
Nearest shop	18	67	30.45**	100	88	24.57*	35	65	20.77**
Roadside	0	25	5.83*	0	13	1.49	12	8	0.45
Open market	77	17	34.103**	0	0	(nd)	56	0	25.9**
Public extension services bureau	14	0	3.54	0	0	(nd)	9	0	3.21
4. Access to pesticide									
Nearest shop	24	67	13.38**	60	75	9.58*	46	61	5.64**
Roadside	14	0	1.36	13	13	(nd)	6	13	0.86
Ambulant vendor	62	8	9.14**	33	25	7.06*	41	30	0.67
Open market	65	8	16.18**	13	13	(nd)	44	13	6.62**
Public extension services bureau	0	25	5.83**	25	0	7.06*	12	12	(nd)

Table 6: continued.

Resources and access	Category of farmers (%)								
	Children			Adults			Generation		
	Orphans	Non-orphans	χ^2	Affected adults	Non affected adults	χ^2	Children	Adults	χ^2
5. Conditions for access to inputs for cowpea cultivation									
Cash	100	100	(nd)	100	100	(nd)	0	0	(nd)
Credit	27	8	4.44**	0	0	(nd)	15	0	5.49*
6. Source of knowledge and information on pest control									
Training on fertilizer	17	29	4.67	53	7	4.24*	47	53	1.58
Training on pesticide	30	17	2.18**	52	4	4.08*	48	52	2.24
Public extension services	23	25	1.55	53	13	1.88	24	39	1.6
Local NGO	36	8	5.65**	0	0	(nd)	21	0	3.53*
Village farmers' group	9	33	5.33**	7	33	5.95*	21	20	2.55
Ambulant vendor	9	0	1.36	13	33	1.78	6	13	0.88
Parents and neighbors	73	75	0.5	53	88	1.08	74	65	0.45
Local radio	46	33	10.95**	7	0	11.15**	41	4	11.41**
n = 90									

** p = < 0.01; * p = < 0.05; (nd) = no difference.

local NGOs do provide information and basic agricultural skills to orphans compared to non-orphans ($p < 0.01$). On the opposite, the village-based farmers' organization is a handy information link for non-affected farmers-children and adults alike ($p < 0.05$). Finally, orphans were those who resorted more to the local radio as source of information/knowledge compared to non-orphans ($p < 0.01$), while very few of the adults did so.

Globally, from the results of the study, it appears that farmers of different AIDS affection statuses use diverse connections to mobilize resources to address pest problems. This, eventually, results in differential abilities to understand and address pest problems. In the next section these differential social realities and agencies in pest control practices are discussed.

7.5 Discussion

The study conducted among adult and child farmers of the Couffo enlightens us on the major phases of the pest problem solving process and on the actions that are carried out in each of the phases. Actually, the investigation yields insights on how differently farmers identify a given pest problem and diagnose its cause(s), examine the solution options they have as well as the set of criteria they use to choose the one(s) they perceive to be the most appropriate. The findings also highlight that cowpea plays an important role for farming households in the Couffo, and this role is the main underlying motivation behind farmers' strategies and choices in protecting the plant against pests. Several authors elaborated on the importance of cowpea production for farm households in the Couffo (Nathaniels, 2005; Aitchedji, 2003). However, this study found that non-affected households mostly cultivate cowpea for market purposes, while affected households give it an additional weight in household's food resources. This single versus dual purpose (although we do not pretend that the split is absolute) needs to be linked to the combination of poverty and AIDS (see de Waal and Whiteside 2003; Gillies et al., 1996; Haddad and Gillespie, 2001; Nombo, 2007; Whiteside, 2002). This is a very important point as it underlies all major differences that were found among farmers of different AIDS status. We elaborate on the striking differences.

7.5.1 Differential problem identification

The study found a differential use of indicators between affected and non affected cowpea farmers to identify the occurrence of pest infestation. For instance, referring more to damages on seedlings (seedlings are cut)

could reflect farmers' concern (mostly among non-affected farmers) for the relationship between the number of cowpea plants in the farm and the expected harvest. This issue was raised and studied by productivity-oriented agronomists who have researched the optimal plant density to maximize the cowpea production (Ntare and Williams, 1992; Ofori and Stern, 1987b). Plant density is particularly relevant given the increased demand for cowpea on the market and the fact that cowpea cultivation requires a significant investment in cash, time and knowledge (Okike et al., 2002; Pronaf-Benin, 2003). Meanwhile, orphan farmers pay more attention to plant growth, which requires excellent observation skills. Seemingly, affected adults are more concerned by protecting the pods, which shows the importance of the harvest for household food stocks (and the generation of extra income when possible). These points were already mentioned in a previous study by Fagbemissi and Price (2008). This study found precisely that orphan farmers paid more attention to phenomena that occurred in their maize fields. When farmers' hope for extra cash is ever fulfilled, the money is often used to meet other household basic needs such as paying school fees, or simply buying soap or shoes (see Fagbemissi and Price, 2008; and Kakuru 2006).

7.5.2 Differential competences in accurately understanding the causes of a pest problem

The Couffo as a community could be considered as having expertise in terms of understanding and linking a given pest problem to a specific causal agent. However, the findings also show a low level of individual competence in this kind of precision. One possible explanation of this finding could be the fact that cowpea is now well-established as a commercial crop in the Couffo. As a consequence, farmers rely on, and have confidence in the use of homogenous technological packages to deal with pest infestation (Agli et al., 2001; Nathaniels, 2005; see also Nederlof and Odonkor, 2006). Consequently, farmers are less engaged in observing and understanding biological processes that happen in their farms. Previous studies on rice, for instance, have shown that farming of commercial crops often results not only in the weakening of indigenous/traditional knowledge, but also causes farmers' high dependence on external knowledge and productive inputs (Bentley, 1989; Price, 2001). For such a crop that needs an important outside knowledge, the gap between community and individual competences in pest management, is a confirmation that, even in a relatively homogenous cultural environment such as that of the Adja cowpea farmers, different people often hold different portions of knowledge of crop pest. Thus, in spite of the heavy extension programs and trainings in the Couffo, there seems to exist a limited exchange of knowledge and information

among individual farmers. This is in accordance with findings from previous studies in Benin (Nathaniels, 2005; Togbe, 2005) on farmers' participation to farmers field schools (FFS). Those scholars observed that participation to FFS had only empowered a small number of the community members who often withhold part of the knowledge they gained instead of sharing it. Hence, the fact that orphan farmers in the Couffo use non-kin connections such as radio or ambulant vendors to access knowledge and information could be seen as a strategy to overcome the lack of fluidity in knowledge exchange. Hence, this social reality calls for innovative extension and learning approaches in order to enhance young farmers abilities with respect to the agroecology.

7.5.3 Differential rationale in the choice of solutions and actions to address pest problems

The study shows that, no matter the pathway taken by a farmer to address a given pest problem, there is a common feature which consists of spraying either chemical or natural pesticide or a mixture of both during the vegetative phase of the crop till the maturation of the pods. However, affected and non-affected farmers have a differential rationale behind their spraying behaviors. For instance, the fact that affected farmers give an important weight to cowpea in household food security architecture commands them to be cautious with the use of harmful solutions such as spraying cotton insecticide on cowpea plants. The Couffo is among the regions where pesticide misuse has claimed some deaths in farming communities in Benin (Tovignan et al., 2001; Pedune, 1999). Another point is that farmers, irrespective of AIDS-affected, use criteria related to the level of efficacy they expect from the solution, and its availability (easy to find in their neighborhood and ready for use). These aspects as determinants of farming practices have been discussed by Leeuwis (2004) who already argued farmers' choices being embedded in their perception of risk (what is seen in the Couffo as a certain sense of emergency to treat the cowpea farm to avoid losing the harvests), as well as in the evaluation of their chances to successfully control the pest problem with the solution(s) they opt for (see also Van der Ploeg, 1990). In the Couffo, the study showed that farmers' differential strategies and their anticipated appreciation of level of success largely conditioned their choice of solutions and spraying behaviors (see also Bentley, 1989).

7.5.4 Differential strategies in mobilizing resources and solving pest problems

The study indicates the existence of community trust towards children. For instance, orphans were able to get some products on credit whereby adults could

not. This could be seen as orphans being taken more seriously by community members. In the same time, it could be also argued that orphan farmers are active and taking responsibility towards themselves and their households. Thus, they have agency as they develop strategies to find solutions to their own problems, and are not willing to be a burden to the community. This finding is in opposition with previous studies that portrayed orphans as being in a very weak position (Foster, 2000; Ntozi, 1997b; Sengendo and Nambi, 1997). However, there is much to do in terms of adequate interventions to strengthen orphan farmers' social position, aspirations and competencies (Loevinsohn and Gillespie, 2003; Swift and Maher, 2008).

In the process of mobilizing resources, it was found that orphans actively engage in informal contacts. This is shown by the types of the networks child farmers use to access productive resources (e.g. use of open market as a connection to access agricultural input). It should be noted that, first, in an open market (in Benin, and throughout Africa) people can bargain and save some financial resources. Second, the market is also a place of interactions and broader choices of items. Third, it is a place where customers can buy small quantities of agricultural inputs, which fits the limited financial resources of the orphans. The major limitation is that transactions are in cash: no credit, as opposed to buying in nearby shops or at the roadside sellers'.

There was a differential use of extension services to solve pest problems. At this point, there was a contradictory use of the public extension services depending on whether it is fertilizer or pesticide that is of concern. Orphans probably found it not convenient for them to use this connection to access pesticide because they would be asked many questions and might be forced to buy the recommended cowpea pesticide, which is not only more expensive but also perceived as not effective as cotton pesticide. Thus, orphans would rather choose links such as the open market or the ambulant vendor as we mentioned above. The main point is that orphans prefer flexible/dynamic space of interactions, probably because they need to build and maintain networks in order to share experiences and get advice. These kind of connections need to be explored by agricultural researchers and rural development practitioners with respect to the opportunities they could offer in bringing about change in crop pest problem solving behaviors. Several scholars who worked in other contexts advocated for innovative approaches in agricultural development (Bandiera and Rasul, 2006; Bentley, 1992; Engel and Salomon, 1997; Manzollilo-Nightingale, 2000; Newman, M. 2001; Palis et al., 2002; Röling and van de Fliert, 1994). This is also needed in the context of HIV/AIDS which shows children being more involved in household food security. The transformative power of childhood in societies severely affected by AIDS

is increasingly researched and the need to act urgently is also proposed by several scholars (Swift and Mayer, 2008; Van Dijk, 2008). Despite the observed ability of orphans to build up strategies in relation to their goals, there are, however, some constraints: for instance, orphans (and affected adults) have no access to sharecropping in the affected communities of the Couffo. One of the possible explanations could be linked to the fact that first, the perception of the community that affected adults' capacities as farmers are weakened by the disease. Consequently, it is impossible to count on their hard work to meet the conditions of sharecropping as they may fall sick or die. Secondly, access to land via sharecropping is not possible for orphans because they probably eat an important part of their production even before the harvest; hence, there is not much left to share with the landlords. Likewise, they resort to members of their neighborhood for seeds, food and other basic needs. It is therefore unsecure for land owners to have sharecropping arrangements with orphans. Some of the children might be lucky enough to borrow land, but there is already an acute land crisis in the Couffo, which limits community solidarity in this regards.

7.6 Conclusions

As detailed in the previous discussion, this study has revealed meaningful differences between children and adult farmers in Couffo regarding different aspects of solving pest problems in cowpea. Such differences were also identified between different categories of children (orphans versus non-orphans) and adults (affected versus non-affected by AIDS). In the identification of pest problems, non-orphan child farmers and non-affected adults perceived pests mostly in relation to the damages they caused to seedlings on the farms, while orphans paid more attention to the dynamics of plant growth, which requires more sophisticated observation skills. In contrast, affected adults mainly mentioned indicators linked to the damages to the harvests. Moreover, both orphans and affected adults tend to use a greater variety of pest management strategies than others, who resort mainly to the use of pesticides. It is plausible that the observed differences are associated with differential involvement in agriculture, differential availability of resources and the main purpose of cowpea production (provision of household food versus selling on the market). Furthermore, the study shows that the Adja society as a whole, is quite knowledgeable about cowpea pests, but that individual competence tends to be low. We have also seen that orphans in Couffo resort more than others to non-kin and informal connections (such as the open market and

ambulant vendors) to access productive resources. For orphans, local radio broadcasts were also a much more important source to access information and agricultural knowledge than for adults.

Although orphans actively create and use connections to secure food, and have apparently developed considerable skills and abilities, farming households affected by AIDS in Couffo (and elsewhere) are still struggling for resilience. In this line, there is a need to formulate a good policy that can help to implement relevant community-based platforms in which several interventions can be grounded. Precisely, innovative solutions in which conventional care to vulnerable children and improvement of child and youth capacities and agency go side by side need to be promoted.

There is evidence, based on this study of the problem solving process, that orphan farmers have a strong willingness and ability to negotiate and create their space for maneuvering in their search for the resources (knowledge and non knowledge) they need in order not only to produce food for the household, but also to have a surplus to sell for cash. This study revealed also the readiness of the Adja community members to provide assistance to these fragile agents, who are at the same time important actors with respect to any policy that intends to mitigate the effect of AIDS on food production systems. With the rampant poverty, the call for these sound community-based interventions is even more urgent than ever before. In connection to this, orphans have proven their ability to expand beyond the networks used by adult farmers. In this line, and with respect to agricultural development and food security concerns in an AIDS context, rural development scientists and practitioners have an upfront role to play in elaborating and implementing those innovative and culturally appropriate options that could help enhancing rural youth capabilities to take over where the adults could not, due to AIDS illness and other constraints that intersect with the pandemic.

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Chapter 8

General discussion and conclusions

Introduction

This thesis has focused on particular aspects of AIDS-related problems and challenges in Benin. Previous work from several regions in Africa provided evidence that an increasing number of children is involved in adult agricultural activities. At the same time these children are thought to lack the appropriate agricultural knowledge because of an AIDS-induced break in inter-generational knowledge transfer (Loevinsohn, 2003; Haddad and Gillespie, 2001; FAO, 2004; Dewagt and Connolly, 2005). However, this assumed erosion of agricultural knowledge in AIDS-affected communities had not been systematically studied and tested in the West-African context. This study has made an effort to do so in the context of the Couffo region in Benin. Since pest problems are often reported as an important threat to farm productivity and food security (IITA, 1996 and 2000; FAO, 1999), this study zoomed in on knowledge related to pest management in cowpea and maize production. The overall research question posed in chapter 1 was:

Are there any differences between what child farmers orphaned by AIDS know and do, compared to non-orphan and adult farmers in addressing maize and cowpea pests, and what are the foundations of these differences, if any?

This chapter first integrates findings from different chapters to answer this overall question, and then continues to discuss some broader issues that have emerged, as well as the implications of the findings for care providers and rural development practitioners.

8.1 Differences in knowledge and pest management practices

The study investigated farmers' knowledge of pest in the Couffo region by examining both the stocks of this knowledge and the way they use these stocks in dealing with pest problems in their farms. These stocks represent what farmers have and can draw upon in dealing with pest problems.

Stocks of agricultural knowledge refer to what farmers have accumulated during the enculturation process as well as through every day life as an individual farmer. Uncovering the stocks of knowledge was done via the analysis of farmer's ability to name pests among maize and cowpea farmers, and how they talked about them, according to their age group and the AIDS-affection status of their respective household.

Putting knowledge into use evolves into a dynamic process. Hence, the

dynamic aspects of farmers knowledge were examined by describing and explaining the way in which various categories of farmers use their knowledge in the face of pest problems in cowpea production. This involved a study of problem solving processes, which included analysis of the ways in which farmers (adults and children) identify the problem(s), how they determine the cause(s), examine the alternative solutions, and choose the one(s) they think are the most appropriate to the situation. The role of networks through which knowledge and non-knowledge resources were mobilized to solve pest problems was of particular interest. Below, the differences found between several categories of farmers are synthesized.

8.1.1 Comparing children orphaned by AIDS with adults farmers

In chapter 5 it was demonstrated that orphan farmers have a better ability to name maize pests when compared with adult farmers. Moreover, non-affected adult farmers appeared to have the least ability in this respect. The semantic analysis in chapter 7 showed that orphans used a more diversified vocabulary to talk about the way in which they experienced pests when compared to adults. For instance, orphan farmers used descriptors which reflected their concerns for the plant growth, while affected adults mentioned mainly of indicators linked to the damages to the harvests (see also chapter 7), and non-affected adults appeared to be relatively more productivity-oriented when referring to their day-to-day experience of pests (chapter 6). Another finding to be mentioned relates to the differential use of networks for accessing knowledge and non-knowledge resources. Chapter 7 showed that orphans, when compared to adults, tend to use more 'loose ties'. Orphans resort more to non-kin and informal connections to gain access to resources. Among those connections, the open market and the ambulant vendors are the most important. For orphans, local radio broadcasts were also a much more important source to access information and agricultural knowledge than for adults.

8.1.2 Comparing orphans with non-orphan child farmers

As shown in chapter 7, non-orphan child farmers perceived pests in relation to the damages they caused to seedlings on the farms, while orphans paid more attention to the dynamics of plant growth, which requires more sophisticated observation skills. Also, orphans show more cultural competence compared to non-orphans with respect to naming the pests (see chapter 5). In contrast, non-orphans seem to perform somewhat better than orphans in accurately diagnosing the causes of a pest problem (see chapter 7). Another relevant finding is that non-orphans mostly secure cowpea seeds from the last harvest,

and orphans resort to neighbors for cowpea seeds (see chapter 7). Also, orphan farmers appear to have a relatively strong willingness and ability to negotiate and create their space for maneuvering in their search for knowledge and non-knowledge resources. Non-orphan farmers make greater use of formal networks that are often linked to official agricultural extension services in gaining access to pesticides, while orphans tend to make greater use of the open market, ambulant vendors and non-kin networks to access non-knowledge resources (see chapter 7).

8.1.3 Differences and similarities among orphan farmers

The group of orphan farmers is not homogenous. There are variations in some respects among them. For instance, chapter 5 shows that in terms of naming ability, double orphans seemed to have the most imperfect ability among the orphans (e.g. naming of bees as pest). Double orphans frequently shared some characteristics with non-orphans rather than with single-parent orphans (chapter 5 and 6), and sometimes showed similarity to non-affected adults rather than children on aspects such as solutions used to treat pests (chapter 7).

Orphans residing with a surviving parent had the most impressive performance either on naming of pests and using descriptors to depict their daily interactions with pests (chapter 5 and 6). Specifically one-parent orphan farmers living with their surviving parent had a better ability to name pests than orphans living in fostering households, and double orphans who most of the time were farming on their own (see chapter 4 and 5). There was no significant difference between paternal and maternal orphans with respect to the types of descriptors used. The one-parent orphans residing with the remaining living parent were like adults in most of their competences or outperformed them (chapter 5, 6 and 7). Most striking in this respect are the findings on paternal orphans' agroecological competences. In fact, paternal (more than maternal) orphans had the ability to use indicators linked to the form and function of the pest almost equally, which is indicative of their expertise in cultural knowledge of the agroecology. paternal orphans tended to be more involved in farming (in a household with their mother, headed by a female with small land size) and were the most involved in carrying out adult responsibilities. This often implied more work to help mothers and grandmothers in terms of caring for the plants, protecting the harvests and planning of other connected farming activities (chapter 4, 5 and 6). Meanwhile, double orphans, the majority residing with their grandmother, tended to refer more to the form, which may be regarded as typical for a novice farmer building his/her knowledge from the observation of the natural order (see chapter 6).

8.1.4 Gender dimensions in agricultural knowledge

This study found two instances where gender-based agricultural knowledge seemed to shift with AIDS. Chapter 5 showed orphan boys and girls have higher naming ability when compared to non-orphan boys and girls, illustrated by their respective cognitive salience indexes (CSI) for many of the pests. However, there were some internal variations. For instance, it was shown that orphan girls have scores for some of the items for which non-orphan girls did not. Seemingly, there were items for which only orphan boys scored while other children did not. In addition, orphan boys scored higher than non-orphan boys, and orphan girls scored higher than non-orphan girls. A gender shift was thus observed whereby orphans were acquiring knowledge of pests that did not appear to be part of a usual pest knowledge domain of girls and boys living with non-affected adults in intact farm households (see chapter 5). Second, and with respect to the adults, the general pattern is that of affected women and affected men also having higher CSI scores than non-affected women and non-affected men. There were also variations such as affected adult women and men scoring for items for which non-affected adult women and men did not, and affected women only scoring for items for which no member of the other groups did. The results indicate that affected women enlarged their domain of pests. In sum, it can be said that AIDS was linked to a shift in gender-based knowledge in the sense that the repertoire of AIDS affected women and girls expanded when that of affected men and boys did not (see chapter 5).

8.1.5 Factors explaining knowledge differences

Several interrelated factors and influences have been identified that help to explain the identified variations in knowledge and pest management practices within Adja farming communities. They are discussed below.

Household composition and responsibilities in farming

Actual involvement of children in farm activities is an important factor shaping their agricultural knowledge and practices, and is closely intertwined with the kind of household of which they are part. Chapter 4, for example, shows that there is a clear link between the agricultural activities carried out by children and their farming knowledge. This is not very surprising, as actual experience is generally known to be an important source of learning and knowledge (Kolb, 1984). Chapter 4 also indicates that involvement in farming is associated with greater stability (i.e. less mobility) in the household configuration. Such stability may also be important in the process of enculturation of the agro-ecological knowledge for a child. The degree of stability (and mobility) was shown to

be associated, in turn, with whether or not there was a remaining parent (single or double orphanage) and the age (and labor potential) of the orphan. Secondly, other determinants included the sex of the main care provider or endorser, and whether agriculture constituted the main household livelihood activity. More specifically, the findings in chapter 4 suggest that children with their surviving mother as care provider are often more involved than other children in farm activities. As a result, for instance, it was noted that paternal orphans were in residence with their surviving mothers, who are also their main care providers and adult teacher. Hence, the interactions between those orphans and their mother could favor a better transmission of agroecological knowledge about maize and cowpea pests (chapter 6).

It was also shown that orphans in farming households experienced less mobility than other orphans, especially when the household could produce a relatively large amount of food from the available land resources. Thus, differences in knowledge should be understood in the context of children's involvement in farming (chapter 4), in conjunction with the type of adults followed to the farm (chapter 5). Through actual involvement, orphan farmers are likely to have built-up their knowledge through various models of obtaining knowledge/knowing (see Boster and Johnson, 1988). Furthermore, it appeared that continued residence with the surviving parent had a positive effect on the one-parent orphans' expertise and agro-ecological knowledge, which suggests that agricultural involvement in such households is combined with intensified transfer of knowledge. The phenomenon of greater responsibility and involvement in agriculture on the side of orphans, also leads them to be generally more knowledgeable than their non-orphan peers (see chapters 5, 6 and 7).

Livelihood strategies, resource availability and utility

It was indicated in the previous section that the role of agriculture in the livelihood of the household is relevant to understanding knowledge differences. Within the agricultural domain, there appear to be several conditions and circumstances which impinge on knowledge differences. These have to do with specific livelihood strategies, as intertwined with issues of resource availability and wealth. The finding that non-affected adults appear to have a relatively limited understanding/expression about the connection between living things and plants on their farms (chapters 5 and 6), is likely to be related to the fact that they are better off and have relatively easy access to on-hand solutions such as pesticides (see chapter 7). Consequently, non-affected adults can afford to pay less attention to observing phenomenon in their fields. In contrast, the interaction between AIDS and poverty which is amplified within

affected households as a result of the erosion of their asset base (see de Waal and Whiteside, 2003; Gillies et al., 1996; Haddad and Gillespie, 2001; Nombo, 2007; Whiteside, 2000) seems to have increased the reliance on harvests among affected Adja farm households. It may be this greater dependence that leads affected adults (and orphans) to use more varied and more 'tailored' pest management options in cowpea than others (see chapter 7). This is in line with the finding that non-affected households mostly cultivate cowpea for market purposes, while affected households give this crop an additional importance as household food.

Another interesting observation in this respect is that children orphaned by AIDS and affected adults had greater knowledge of several bird pests, and especially those that could serve as food (see chapter 5). Observations in the field indicated that several bird pests are now hunted and consumed by orphans especially as a replacement of the ordinary meat or fish-based sauces. These birds were associated with high salience among the items reported as pests of maize and cowpea. The bird pests not connected with use as a food resource did not have a specific name. The utilitarian value of living things as a main factor of their being known and named by a given human population, has been reported and theorized by Hunn (1982). The intimate relationship between HIV and AIDS and food insecurity/famine was also elaborated by several scholars (e.g. Waal and Whiteside 2003). It can then be inferred, that the higher the necessity of satisfying individual and household basic needs, the sharper will be the expertise of child farmers made orphan by AIDS. This results for instance in paying more attention to phenomena occurring on their farms, given that the hope of having enough grain should be kept alive. Consequently, the way they conceptualize pests and deal with them would therefore be a product of their day-to-day encounters with those living things. It is also important to note that the vital role played by the guiding hand of the surviving parent can assist in making sense of observations. The intra-cultural variations of the agro-ecological knowledge within a farming community are then partly a function of the level of erosion of the household assets and the dynamics of negotiating the needed knowledge and non-knowledge resources.

8.1.6 Experts from necessity?

Taking together the findings presented above and in the various chapters of this thesis, there is little evidence to confirm the hypothesis of knowledge decline and/or a break in inter-generational knowledge transfer. In fact, the overall pattern suggested by this study is that orphans in Couffo tend to be

more knowledgeable in the domain of pest management than both their non-orphan peers and adults. This conclusion is more pronounced for single orphans, especially for paternal orphans, than for double orphans, who seem to be in a relatively more vulnerable position with respect to the acquisition of agroecological knowledge. As explained in 8.1.5, need and necessity, and the quality of interactions with an adult teacher, are important explanations for this finding. In essence, we see that children orphaned by AIDS tend to actively engage with the challenges and lack of resources with which they are confronted, and in the process of doing so acquire relevant knowledge that is at times more sophisticated than that of others. To call orphans 'experts from necessity', however, should not be taken to mean that their knowledge is always the optimum or that there is no room for improvement. In fact, we have seen in chapter 7 that both orphans and adults make inferences that scientists would find questionable, and that they engage in practices that can pose risks to both human health and the environment. But in comparison to other children and adults, the term 'experts' is warranted in several specific knowledge domains.

8.2 Additional findings and implications

While studying knowledge differences between orphans, non-orphans and adults, some broader insights and issues emerged in relation to the life and livelihood of orphans. They are discussed in this section, along with some implications for professional care provision and intervention.

8.2.1 The significance and implications of orphan mobility

Chapter 4 illustrates that household care arrangements around orphans can change, and that orphans may move from one household to another. In this, orphans' mobility is a social phenomenon with two faces. Firstly, it is a deliberate inter-household strategy to manage and ease the burden of the increase in the number of children orphaned by AIDS. Secondly, mobility is a strategy used by orphans themselves to move to a 'safer' environment if they do not feel at ease. As elaborated in chapter 4, many circumstances and factors may influence mobility, ranging from sudden events, care provision arrangements, livelihood characteristics, and intra-household dynamics and conflict. The death of a male household head, for example, often has serious consequences for the position of orphans and widows within the household, and can affect their access to resources and the capacity of the household to provide for the basic needs of the orphans. We have also seen that orphans

who are living with a female care giver are less likely to be mobile than others. Similarly, orphans who live in households which depend mainly on farming tend to be relatively less mobile. In addition, lack of affection and esteem can destabilize orphans within a household, impairs their learning skills, and eventually leads to household disruption. Finally, chapter 4 indicates that mobility can be associated with tensions arising as a consequence of care arrangements within the household. For instance, the management or the sharing of resources can potentially harm the household's unity and lead to new household formation.

The finding that mobility is a household strategy to manage orphanhood that resulted from AIDS in Couffo implies that conventional ways of categorizing orphans according to demographic variables may be too simplistic, and are not sufficiently indicative for assessing orphans' needs for support. Thus, professional care providers must move beyond static ways of characterizing orphans and incorporate relevant configurations and dynamics inside the households. The information gathered through the analysis of orphanhood in relation to AIDS in the Couffo region in Benin seems to be very useful. For instance, orphan endorsement, which is meant to reduce the proportion of child-headed households, can also generate tensions. As indicated in chapter 4, the probability of mobility occurring is often high when the endorser is different from the main care-giver because endorsing an orphan is not totally selfless. Thus, it appears to be important to distinguish between the main care person and the endorser (see section 8.2.2 for elaboration) in order to prevent and/or manage possible intra-household tensions.

The illustrations provided in chapter 4 on the intra-household conflicts surrounding care provision to orphans suggest that conflicts are likely to occur when the orphans reach the age of 10 and begin to play an active role in the household's production of care and food. This period requires special attention. Care services such as psychological coaching and informal agricultural training may be usefully provided and may help to stabilize the orphans within their households.

One of the lessons learned from the Couffo is that some services also need to be made available to adult members of households with orphans. Such services could include information and training on how to handle the orphans under their wing, as well as establishing peer-to-peer community-based fora for conflict resolution. These kinds of services would contribute to offering more stability to the orphans in the sense that household wholeness and

unity might be preserved. Particular attention should be paid to female care providers. In fact, it emerges from the study that the majority of the orphans are under the wing of mothers and grandmothers, and these women have difficulties with respect to resource availability and allocation. This calls for the care provision institutions to design schemes that enable better access for women to land and agricultural inputs in addition to the existing schemes managed by development agencies. Ultimately, the study of the orphans' mobility in the Couffo confirms that orphans are a specific category of orphans and vulnerable children, and that, it is justified to advocate for a more tailor-made care provision for them.

8.2.2 Differentiating between care giver and endorser

Children appeared as capable actors who were able to make decisions. However, in the society of the Adja, a child always needs an adult umbrella (a shield, one who vouches for you) even if the child makes decisions on her/his own about how to make a living. Hence, the arrangement of care for children who are below 15 always involves the presence (physical or remote) of an adult. This adult has a moral obligation of ensuring a roof for the orphans and arranging for a main care provider. The main point is to confer a kind of legitimacy to the household where the children are living (generally that of the grandmother or the mother). The endorser (male, and female in certain cases) is responsible for ensuring good behavior of the children, and to be their covert in order to reduce stigmatization that often occurs when the neighborhood knows that AIDS was the cause of death of the biological parent(s). Van Dijk (2008), through her study in South Africa, highlighted the fact that the orphans who were running their own households felt themselves the absence of an adult as a void that needed to be filled. The novelty of the study in the Couffo is the duality of adult function: on the one hand there is a basic needs and affection care person and on the other hand there is a social umbrella person, a warrant who is necessary for social acceptance by the community and who is responsible for facilitating resource entitlement or access.

Contrary to the general cultural rules that oblige children to obey and respect adults (Van Dijk, 2008, op-cit; see also Swift and Maher, 2008), this situation has slightly changed in the Couffo with respect to the orphan situation that results from HIV and AIDS affection. Chapter 4 on orphan diversity and mobility showed that these orphans are not willing to compromise indefinitely in their search for an affective and 'secure' environment. In many cases, orphans who had some resources left by their late parent (s) were able to organize or set new arrangements of care that subordinate them less vis-à-vis their care giver or their endorser. Intra-household tensions surrounding the arrangement of

care constitute one of the factors that put orphans of the Couffo on the move until they find what is acceptable to them as a better life. Until now, endorsers have operated in a sort of shadow, and are often not explicitly considered or addressed by care providing organizations. They come in the spotlight when there is tension surrounding the orphans, and frequently they are part of those tensions. Thus, while offering a social umbrella, they can also complicate life for orphans and their main care-givers. More research is needed to improve our understanding of why the relations between endorsers, orphans and the main care persons frequently evolve into tensions.

8.2.3 Redefining childhood

There are on-going discussions about how to define childhood, especially in the face of the HIV and AIDS pandemic. As pointed out by Van Dijk (2008) in her study on children orphaned by AIDS in South Africa, most of these children are living in situations beyond their age. This raised a legitimate debate on the relevance of biological age in that circumstance. Already in 1994, Nieuwenhuys (1994) raised concerns about the universal validity of age categories, and noted that in several settings, age has a social and cultural meaning. With reference to the study in the Couffo region, the notion of 'social age' is perhaps more suitable. For instance, the study shows that although the orphans of the age groups covered by our study were not household heads, they were nonetheless 'powerful' decision makers. They speedily matured, and expressed a high willingness to be responsible for themselves, or to exercise their capabilities to participate in household decisions, especially in female headed households. This maturing happens at a period in their lives when adults still tend to consider them as children. This 'disconnect' between social and biological age frequently went along with intra-household tensions, which were further aggravated by the fact that orphans of 10 to 14 years (ages when they are able to take on some adult responsibilities) become a 'resource at stake' for which members in the extended family may 'compete'. The fact that the majority of these children took on adult roles reinforces the need to go beyond biological age boundaries in defining childhood, and think in terms of 'social age' as well.

In connection with the issue of childhood there is a need to increase research on childhood and youth development. Studies on children are still a marginal subject in development studies as well as in many social science disciplines. Apparently, it is often considered that children are an extension of the adults, and therefore they do not need to be studied separately. The study on the Couffo children, and others conducted by fellow scholars, have shown that children

(orphans and non-orphans) have their own conceptions and understanding of the world, their own motivations, and provide their own meanings to what they do in their day-to-day life. Thus, there is every reason to devote special attention to them in research related to rural and/or urban development.

8.2.4 The other side of vulnerability: HIV/AIDS as opportunity?

In addition to the age issue, the study has demonstrated that orphans should not be viewed only as vulnerable dependents or as a burden on the community. In many cases, these children show signs of maturity and great responsibility, and are valuable human resources as well. This was also pointed out elsewhere (Henderson, 2006). In the present study, orphan farmers showed signs of 'control' of their lives and a certain level of 'capability' to elaborate strategies in using or constructing networks to access resources where possible and carry out farm livelihood activities (see chapter 7). Thus, they did not always position themselves as passive victims as several authors and institutions tend to depict them (Dewagt and Connolly, 2005; Hunter, 1990). However, their capacities to create space for maneuvering is highly dependent on their life circumstances, which tend to be diverse (see chapter 4 and also Swift and Maher, 2008). In this respect, analyzing the 'other side' of vulnerability could be important. Throughout the study orphans have shown that they bear within them the seeds of the transformative power of the youngsters. This, when fully investigated and supported could become a source and opportunity for social change and poverty reduction in rural communities (see Drimie and Mullins, 2006). In this sense, AIDS could be turned into a chance for starting a new life and improving one's position in society. This is consistent with other literature that elaborates on diseases as an opportunity for altering pre-existing conditions and pathways in life (Edwards and Endler, 1989; Müller, 2004; Pizzi and Bunz, 2008). Thus, policy makers in Benin (and elsewhere) might want to think about how to capitalize on this, and develop strategies to not just mitigate the impacts of the AIDS pandemic on rural children, but also to build on emerging capacities of orphans to strengthen economic and social development. In the next section this is further elaborated in connection with agriculture.

8.2.5 Children orphaned by AIDS as farmers, and agricultural development

We currently witness that the HIV problematic shifts from urban to rural areas (Baylies, 2002; FAO, 2004). Because of this, HIV is jeopardizing a decade of progress in agricultural development. Literature often refers to changes in farming patterns as one of the impacts of AIDS on agriculture

and rural livelihoods (Baylies, 2002; Haddad and Gillespie, 2001; Loevinsohn and Gillespie, 2003; Slater and Wiggins, 2005). AIDS tends to undermine household economies and is likely to deepen poverty (Baylies, 2002; de Waal and Whiteside, 2003; Slater and Wiggins, 2005). In addition, the loss of assets associated with AIDS prolonged illness may be worsened by the actual global trends of recession and enhance rural poverty (de Waal and Whiteside, 2003; Writtle, 2009). Harper et al. (2003) and Kelly (2005) have elaborated on the social transformation capacities of children, which may be relevant to addressing the situation. However, for the social changes brought by the HIV pandemic to be transformed from problem and vulnerability into opportunity for orphans and affected rural communities, sound policies are needed. Building an appropriate care provision strategy that enhances individuals and community participation in the recovery of their ability to carry out their livelihood activities must top the priorities of decision makers, enable institutional and local responses to roll back the negative impact of the pandemic on rural livelihoods (see Drimie & Mullins, 2006). Some suggestions for such a strategy are developed below.

The need to mainstream AIDS and children orphaned by AIDS in agricultural development

Early responses to AIDS places a great deal of emphasis on health and sensitization for behavioral change. However, it has been clearly demonstrated that HIV and AIDS constitutes a broader development issue (Barnett, Whiteside and Decosas, 2000; Foster and Williamson, 2000) which requires an integrated and coordinated strategy and response. Thus, one of the approaches needed is to mainstream children orphaned by AIDS in rural livelihood development programs in which different agencies analyze and bring together their comparative advantages in terms of expertise (Drimie and Mullins, 2006). Generally, there are four components in mainstreaming AIDS in livelihoods: prevention, positive living, treatment support, and mitigation of social and economic aspects (Drimie and Mullins, 2006). This study tried to contribute to the last aspect, which consists, among others, to provide practioners with information that can be useful for intervention aimed at increasing resilience of affected rural communities and farm household members with respect to surrounding food and resources.

As highlighted by the findings of this study, the connection of AIDS to rural livelihoods may result in significant changes in role distributions. In this context it is important to protect the future of young orphans by ensuring they obtain the different forms of care (nutrition, education, and valuation, among others) that will give them equal chances with other children. Of particular

importance are strategies that focus on providing alternative (formal and informal) education possibilities and curricula that link to the everyday realities of the children. A platform that offers alternative educational schemes to rural children who dropped out of school could be a possibility to explore. These types of platforms could also serve as networks of agro-ecological knowledge transmission and acquisition, and as a space that offers security and affection to vulnerable children in general. As demonstrated in chapter 4, 5 and 7 there is also a need to strengthen access and control over resources for widows, orphans and extended family members (especially grandmothers) who provide care for them, for instance through the use of existing networks to implement a community-based platform for care and capacity building.

Going beyond the present care provision policies and strategies: the need to work through existing networks

It is worth noting that in Benin like in other countries in Africa, there are policies at the national level that propose several measures in favor of young children, orphans and vulnerable children. In many of these countries, the national responses to the AIDS pandemic are in the scaling-up phase. An important barrier in this endeavor is stigmatization. In fact, the intersection of stigma and poverty often worsen the impact of the pandemic, and jeopardizes AIDS prevention and care programs (Caillods et al., 2008; Drimie and Mullins, 2006; Foster, 2007; Foster and Williamson, 2000). As also pointed out by Swift and Maher (2008), the practical implementation of interventions or plans at the grassroots level poses enormous challenges since becoming associated with AIDS programs is likely to cause stigmatization. This study is of a great relevance as it provides information on children orphaned by AIDS' 'coping' strategies in Benin context. In doing so, it sheds light on the types of connections and space of interactions these orphans use the most when making a living in the farming context. In general, networks are arguably very important in community-based support programs (see Foster, 2000 and 2007; Levine, 2001; Subbarao et al., 1997; World Bank, 2001). Linking to the existing networks that vulnerable children already use and prefer in mobilizing resources and support for themselves (see chapter 7) can be a strategy to reach children with fewer risks of causing stigmatization. Thus, strengthening existing networks and support environments is likely to increase the success of relief and lifting efforts initiated or implemented by national and/or international actors.

8.3 Methodological reflections and future research

This section reflects on methodological particularities of this study, notably the fact that two different methodological strategies were used to get a better understanding of knowledge differences. In addition, some issues for future research are identified.

8.3.1 Researching knowledge: value of different methods and approaches

This investigation was inspired by other scholars who examined knowledge differences among farmers in the domain of crop protection (Bentley, 1989; Price, 2001; Sherwood, 1997). In this study, we focused on naming ability, perception of living things, causal associations, experience of pests management, information and technical farming practices among Adja farmers. All these dimensions were combined and studied in two ways. The first relates to the stocks of knowledge that people have, and represents a relatively static perspective. Here an ethno-ecological approach was used to evaluate farmers' differential stocks of knowledge. Farmers' ability to name pests was used to uncover their knowledge of these living things, followed by an analysis of farmers' words to give account of their conception of pests, and the way they experience them. The second relates to knowledge in action. Here a problem solving perspective was used to uncover the ways in which Adja farmers search for knowledge and information, and to identify the actual practices and solutions that farmers choose for their pest management.

As was hoped at the outset, both approaches have been useful and indeed highlight different dimensions and aspects of knowledge. The 'stocks of knowledge' perspective provided a very rich and detailed account of how aware (different categories of) adults and children are of their ecological environment (including the interactions between crops and pests), as reflected mainly in the language and vocabularies people use. The 'knowledge in action' perspective gave a clearer insight into knowledge relevant to dealing with agronomic problems, and in the networks and conditions that shape the way such knowledge is eventually put into use. Interestingly, both research strategies led to essentially similar patterns and results regarding the existence of differences in knowledge and expertise among orphans, non-orphans and adults (see section 8.1). Both research strategies lead to specific insights about what people know and do not know, and in what areas support by research and extension may be needed.

Another observation is that it is not always easy to separate the static and the dynamic ways of studying knowledge. Analyzing the way people put their knowledge into action, for example, simultaneously requires the researcher

to look at what knowledge is there. Similarly, examining the static aspect of knowledge starts usually by seeing for oneself what is out there (i.e. what the farmer does on his/her farm, and what is observable), and frequently involves reference to issues of utility and action. Consequently, the separation between 'knowledge as stock' and 'knowledge in action' is also difficult and somewhat artificial, both from a research perspective as well as from a farmer's perspective. Ultimately, there is scope (and room) for developing a research strategy that is more efficient in combining and integrating the two perspectives.

8.3.2 Areas for future research

The study of the intergenerational gap in agro-ecological knowledge in the face of AIDS, in sum, has led us on a journey into the understanding of some of the social realities that fuel differential vulnerabilities in relation to AIDS within farming communities in Benin. The point is that addressing agricultural knowledge differences among people of various AIDS-affection categories in rural areas should be approached in a holistic manner that takes into account a wider range of problems and issues around AIDS as well as strengths and weaknesses of the social environment. Further research is needed especially on how existing networks can be mobilized and used to support orphans, and capitalize on the capacities that children orphaned by AIDS develop out of necessity.

Another area of future research could be the study of the cultural agro-ecological knowledge flow within both farm households and the larger community through the analysis of acculturation and enculturation processes. It would be interesting to link this to a study of the formalized delivery of agricultural knowledge and information delivery within AIDS-affected farming communities. This would imply the study of agricultural networks, and the way the content of formal training agendas are adapted (or not) to incorporate AIDS-related impacts and/or to processes of enculturation and acculturation in the community.

Some of the limitations of the present study should also be addressed. For instance, although the involvement of orphans in securing food resources was clearly demonstrated, there is a need to further examine the extent to which orphan farmers participate in making decisions about farming and connected activities. Equally, their aspirations and feelings as farmers should be elucidated further in order to better address their needs and strengthen their agency.

With respect to care provision, it is important to point out that the notion of endorser needs to be further investigated. Hence, additional research is needed to clarify role divisions and functions between endorsers, care givers and the formal care provision system.

8.4 Conclusion

This study of the impact of AIDS on agricultural knowledge in the domain of maize and cowpea pests does not support earlier claims of knowledge erosion and/or a break in inter-generational knowledge transfer due to AIDS. Significant differences were found among various groups of farmers, whereby the overall pattern is that orphans in Couffo tend to be more knowledgeable in the domain of pest management than both their non-orphan peers and adults. The analysis of these variations in knowledge showed that there are several determinants to the observed differences, relating to e.g. household composition, livelihood activities and access to resources. Actual involvement of children in farm activities is an important factor shaping their agricultural knowledge and practices. Furthermore, it appeared that continuous residence with the surviving parent is positively associated to knowledge about pest management. One-parent orphans seem to have access to a broader set of sources for knowledge generation and transfer than double orphans. The latter are similar to non-orphans in various respects, but also seem to depend more on building their knowledge from the observation of the natural order. The study has also shown that orphans should not be seen as passive victims of the AIDS pandemic. Many orphans develop valuable capacities and strategize actively to support themselves and/or other household members. In doing so they seem to partly use different networks to access knowledge and non-knowledge resources than adults and non-orphans. The orphans' entitlements to aid (food and tuition), their capacities and their contribution to household food security can turn them into resources for which members of the extended family compete. More in general, the study suggests that several sources of tension may emerge in the triangle of orphans, care givers and endorsers. Such tensions contribute to the widely observed phenomenon of orphan mobility in Couffo region. A practical implication of the study is that professional care organizations should in part rethink the kinds of care they provide. They may, for example, pay more attention to informal agricultural training, mediation in conflict situations and strengthening the networks that orphans already use to mobilize resources.

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Summary

Chapter 1 sketches the general background of the study. The study tests the hypothesis that HIV and AIDS not only impairs or modifies farmers' agroecological knowledge base, but also impairs or modifies their strategies to mobilize knowledge and resources. The research mainly aims to understand agricultural knowledge and practices among children orphaned by AIDS, consecutive to widespread interest in and concern about erosion of agricultural knowledge in AIDS-affected communities. Such a possible loss of knowledge could be detrimental for the children of farm households. Therefore, the focus is on studying possible intergenerational differences in knowledge between categories of child farmers and those of adult farmers, and analyze various causes that could explain these differences. The study is situated in the Couffo region, in south-west Benin. This region has a relatively high HIV prevalence rate. Chapter 2 presents the conceptual framework for the study, and introduces the main concepts, namely agricultural knowledge, problem-solving processes and the linkages between social networks, resources and agricultural practices. The design of the study is articulated around the concepts of 'knowledge in stock' and 'knowledge in action.' Knowledge as a stock represents the contents of people's minds while knowledge as action makes refers to the way knowledge is applied in solving agricultural problems. This is reflected in how people understand a problem and develop practices to solve it. The chapter highlights that the way people solve a problem depends on their stocks of knowledge and on their capacity to develop different kind of strategies to effectively solve that problem. Chapter 3 provides an overview of the study design and the methodology used in the research process. The overall methodology, which was used is a mixed model approach. This approach combines qualitative and quantitative methods for data collection and analyses. It draws upon methods and techniques in ethnobiology and ethnoecology.

Chapter 4 examines the magnitude of AIDS-related orphanhood in the Couffo by focusing on the demographic and livelihood characteristics of households containing children orphaned by AIDS. The aim is to understand orphans' everyday life situations and to provide insights into the diversity of orphans and the way this diversity affects various responses to mitigating the impact of AIDS. Basic typologies, which are used by the care organizations, formed the entry point for conducting a household census. The result of the census shows the diversity among the children orphaned by AIDS. Particularly, it is shown that the majority of the orphans live in small households, which comprise of four or fewer members, and that most of these households are headed by

female adults who are often the main care providers to the orphans. The main livelihood activities of the orphaned households consist of farming (mainly maize, cowpea and cassava) or small business, and in very few cases, livestock raising and off-farm labor. The census found a total of 322 AIDS-related orphans, aged from 0 to 14 years, and living within 88 households. Seventy-one percent of them are under the care of their mothers and grandmothers, 68% are paternal orphans, 58% are between the ages of 7 and 12, and 68% are in primary school. These households are, to a large extent registered within local platforms for that offer direct or indirect access to formal care services implemented by national and international institutions. Support from the extended family includes more affective components such as frequent visits, or providing help during an intensive farm activity period or offering moral caution to borrow money. During the study of orphans' typologies, it was noted that an important part of the children that had been counted were no longer living in their initial households. The investigation of these movements of the children shows that orphan mobility is rooted in various factors among which are the main livelihood activity of the household, the gender of the orphan's main care giver, the amount of the household's farm land, the age of the orphan and his/her contribution to farming activities. These parameters play an important role within the phenomena of orphans' mobility and must be taken into consideration when designing appropriate care for rural orphans and their households. It is also found that some specific services are needed for the community members, with respect to managing conflict and tensions that could arise with the management of orphanhood, and that female caregivers deserve special attention and protection with respect to their access to land and other productive resources.

Chapter 5 and 6 report on the differences in stocks of pests knowledge among maize and cowpea child and adult farmers. The ethnoecological perspective is used to uncover and explain child and adult farmers' ability to name maize pests, through the analysis of their cognitive salience index (Sutrop's CSI). Farmers' perceptions and experiences of maize and cowpea pests are also investigated through the analysis of their life words. The intention is to systematically check the assumption of intergenerational loss of traditional agricultural knowledge linked to the impact of AIDS on farming communities. The results of the CSI analysis in Chapter 5 indicate that children orphaned by AIDS are more knowledgeable than non-orphaned. One-parent orphans residing with the surviving parent are more knowledgeable than double orphans farming on their own. Non-affected adults and their children are the ones with the lowest CSI scores compared to affected adults and orphans. These are rather positive findings in opposition to what was assumed. Results

in Chapter 6 show that Adja farmers use various descriptors to reflect on their perceptions and experiences about pests in maize and cowpea farms. Precisely, eight types of descriptors are extracted from pile sort exercises and the consecutive follow-up conversations with farmers according to the groups they belong to (AIDS affection status and generations, that is, affected/non-affected and child/adult). These descriptors are constructed from a rich and diverse body of semantics, that proves to be related to AIDS affection status, especially among the children. Further analysis shows that these descriptors are generally based on the form and/or function associated to the pests, and reflect individual farmer's expertise about their agroecology. In fact, not only do these descriptors reveal farmers' knowledge of pests, but they also enlighten us on farmers' day-to-day relations with those pests while struggling to protect their harvest. One of the findings is the importance of the proximity of at least one biological parent and the quality of the relationship adult-child in the formation of child expertise. The disaggregated analysis of the domains of child expertise given their use of descriptors shows that double orphans are less expert compared to non-orphans with respect to pest damages on maize ($p < 0.05$), and compared to one-parent orphans for aspects linked to pest control ($p < 0.05$). In all, non-orphans seem to have similarities with affected adults, and use more functional items in their perceptions of pests, while orphans, especially one-parent orphans seem to have commonalities with non-affected adults with an equal use of form and function. This last point suggests that there could be an alternative route of expertise building among the one-parent orphans. Meanwhile, double orphans, making more use of form descriptors, seem to build their expertise from the observation of the natural order.

Chapter 7 uncovers differential strategies used by farmers, especially the orphans, to access and use agricultural knowledge and their pest control practices. The aim is to examine the process through which farmers of various AIDS-affection statuses solve pest problems. In this process, the emphasis is put on how they identify the pest problem, diagnose its cause, choose among available solutions, and on the actions they eventually take to solve the pest problem. The study shows significant differences between affected and non-affected adults, between orphans and non-orphans, and between adults and children in many aspects. The results show that individual farmers are more competent in identifying a pest problem than understanding the causes of that problem. With respect to causes identification, there are differences between orphans and non-orphans, between affected and non-affected adults, and between adults and children. Farmers' choices of solutions are based on their perceptions of the causes, and their expectations (motivations for

growing cowpea). They, therefore, use criteria accordingly to choose among the available options. Although Adja cowpea farmers often rely on, and have confidence in the use of existing homogenous technological packages to deal with pest infestation, it is important to note that the solutions basket of the affected adults has a more diverse content. The study also found differences in the types of material resources and equipment of farmers given their AIDS status and generation. While the orphans predominantly report the possession of small sprayers, some of the non-orphans simply use domestic containers such as basins together with branches of palm trees to spray insecticide on their cowpea farms. Non-affected adults have bigger sprayers (sprayers with a pump) at their disposal, compared to affected adults. Farmers use several ways to get knowledge and information. The important role of cowpea for farm households justifies farmers' strategies to mobilize knowledge and non knowledge resources for managing cowpea pests. However, it is important to signal that non-affected households mostly cultivate cowpea for market purposes, while affected households give this crop an important weight in household's food stocks, in addition to the possible sale of surplus on the market. This apparent single versus dual purpose is to be linked to the combination of poverty and AIDS. Hence, affected and non-affected farmers' strategies to solve cowpea pest problem is linked to the importance they confer to it as either means of generating income or that of diversifying household food resources. For instance, the fact that affected farmers give an important weight to cowpea in household food security architecture obliges them to be cautious with the use of harmful solutions such as spraying cotton insecticide on cowpea plants. In this line, it is found that one fifth of the AIDS- affected adult farmers only report the use of insecticides that are specifically recommended to be applied on cowpea plants. Further results show that farmers of different AIDS statuses use diverse connections to mobilize resources to address pest problems. This eventually evolves into differential perceptions and abilities in understanding the kind of pests in the farms, identifying the causes, and addressing pest problems based on their differential social realities and agency.

Chapter 8 reflects on the most important findings and presents some general implications of the study for scholars, rural development agents and care providing institutions. The overall conclusion from the thesis is that there is little evidence to confirm the hypothesis of knowledge decline and/or a break in inter-generational knowledge transfer. In fact, the pattern suggested by this study is that orphans in Couffo tend to be more knowledgeable in the domain of pest management than both their non-orphan peers and adults. This conclusion is more pronounced for single orphans, especially for paternal orphans, than for double orphans, who seem to be in a relatively

more vulnerable position with respect to the acquisition of agroecological knowledge. The need and necessity of being engaged in agricultural practices, and the quality of interactions with an adult teacher, are important explanations for this.

The chapter further elaborates on the need to redefine childhood and to consider orphans in the 10 to 14 years age range as pre-adults given that they have specific needs and are drawn into adult responsibilities. The existence of AIDS is also analyzed as a possible door of opportunities for improving rural livelihoods. Analyzing vulnerability can also consist of examining what works and how to strengthen those existing local responses, with a special attention to the orphans and their guardians. This leads to examining innovative approaches that could help to effectively mainstream children orphaned by AIDS within rural development policies and agendas.

Samenvatting

Hoofdstuk 1 schetst de algemene achtergrond van het onderzoek. In dit onderzoek wordt de hypothese getest dat niet alleen de agro-ecologische kennisbasis van boeren, maar ook de strategieën om kennis en hulpbronnen te mobiliseren onder invloed van de AIDS epidemie worden ondermijnd of veranderd. Het onderzoek heeft hoofdzakelijk tot doel om meer inzicht te krijgen in de agrarische kennis en werkmethoden van AIDS-wezen en in bredere zin in het belang van agrarische kennis en bezorgdheid over de erosie van agrarische kennis binnen gemeenschappen die door AIDS getroffen zijn. Een dergelijk verlies van kennis zou nadelige gevolgen kunnen hebben voor de kinderen binnen boerengezinnen. De focus ligt daarom op het bestuderen van eventuele intergenerationele verschillen in kennis bij groepen jeugdige boeren en volwassen boeren en het analyseren van de diverse oorzaken die deze verschillen zouden kunnen verklaren. Het onderzoek vindt plaats in de plattelandsprovincie Couffo in het zuidwesten van Benin. Deze regio wordt gekenmerkt door een relatief hoge verspreiding van HIV. In hoofdstuk 2 worden de conceptuele fundamenteën gepresenteerd. Het analytische ontwerp is samengesteld uit de volgende hoofdconcepten: agrarische kennis, het proces van probleemoplossing en het verband tussen sociale netwerken en agrarische werkmethoden. Het ontwerp van de studie wordt geformuleerd rondom de concepten 'kennis op voorraad' en 'kennis in actie'. 'Kennis op voorraad' staat voor de kennis die mensen bezitten en 'kennis in actie' refereert aan de concrete toepassing van kennis bij het oplossen van landbouwkundige problemen. Dit komt tot uitdrukking in de manier waarop mensen een probleem opvatten en methoden ontwikkelen om het probleem aan te pakken. Het hoofdstuk laat zien dat de manier waarop mensen een probleem oplossen, afhangt van hun voorraad aan kennis en van hun vermogen verschillende soorten strategieën te ontwikkelen om het probleem effectief te verhelpen. Hoofdstuk 3 geeft een overzicht van het onderzoeksontwerp en de methodologie die in het onderzoeksproces is gebruikt. Als algemene methodologie is een gemengde modelbenadering gebruikt. Deze benadering combineert de kwalitatieve en kwantitatieve methoden van gegevensverzameling en -analyse en bouwt voort op methoden en technieken uit de etnobiologie en etno-ecologie.

In hoofdstuk 4 wordt onderzoek verricht naar de omvang van het aantal AIDS-wezen in Couffo door te kijken naar de demografische kenmerken en de manier van levensonderhoud van huishoudens met kinderen die hun ouders aan AIDS hebben verloren. Het doel is om een beter begrip te krijgen van de dagelijkse leefomstandigheden van deze wezen en om meer

inzicht te krijgen in de diversiteit van weeskinderen en de manier waarop deze diversiteit invloed heeft op de verschillende manieren om het effect van AIDS te verzachten. De basistypologieën die door de zorgorganisaties worden gebruikt, vormden het uitgangspunt bij het tellen van deze huishoudens. Het resultaat van de telling toont de diversiteit onder AIDS-wezen aan. Er wordt met name aangetoond dat de meerderheid van de wezen deel uitmaakt van kleinere huishoudens met vier of minder gezinsleden en dat de meeste van deze huishoudens worden gerund door volwassen vrouwen, die in veel gevallen de belangrijkste verzorgers van deze weeskinderen zijn. Om in hun levensonderhoud te voorzien, verbouwen deze huishoudens voornamelijk maïs, ogenbonen en cassave of hebben ze kleinschalige bedrijfjes. In een zeer gering aantal gevallen houden deze huishoudens vee of verrichten ze werk buiten de boerderij. De telling kwam in totaal uit op 315 AIDS-wezen in de leeftijd van 0 tot 14 jaar binnen 88 huishoudens. 71% van deze kinderen werd verzorgd door hun moeder en grootmoeder, 68% had hun vader verloren, 58% was tussen de 7 en 12 jaar oud en 68% ging naar de lagere school. Veel van deze huishoudens zijn bij lokale platforms geregistreerd teneinde directe of indirecte toegang te krijgen tot de formele zorg die door nationale en internationale instellingen wordt geboden. Ondersteuning door overige familieleden bestaat uit immateriële steun, zoals regelmatige bezoeken, het bieden van hulp tijdens drukke periodes op de boerderij of morele raadgeving. Daarnaast wordt ook hulp geboden in de vorm van geldleningen. Tijdens het onderzoek naar de typologie van de weeskinderen viel op dat een groot aantal kinderen die waren geteld, niet langer in hun oorspronkelijke huishouden woonden. Uit onderzoek naar dit gegeven komt naar voren dat deze gedwongen verplaatsing van weeskinderen meerdere redenen heeft, waaronder de voornaamste activiteiten van het huishouden om in het levensonderhoud te voorzien, het geslacht van de belangrijkste verzorger binnen het gezin, de hoeveelheid landbouwgrond van het huishouden, de leeftijd van de wees en zijn of haar bijdrage aan de werkzaamheden op het land. Deze factoren spelen een belangrijke rol bij het feit dat weeskinderen vaak noodgedwongen het gezin moeten verlaten. Deze factoren dienen dan ook in ogenschouw te worden genomen bij het creëren van de juiste zorg voor weeskinderen en hun pleeggezinnen op het platteland. Verder kwam uit het onderzoek naar voren dat de leden van de gemeenschap behoefte hebben aan enkele specifieke handvaten waarmee ze het hoofd kunnen bieden aan conflicten en spanningen die door de zorg voor deze weeskinderen kunnen ontstaan. Bovendien verdienen de vrouwelijke verzorgers speciale aandacht en bescherming met betrekking tot hun aanspraak op land en andere productiemiddelen.

Hoofdstuk 5 en 6 maken melding van de verschillen in kennis over ongedierte en ziekte bij maïs en ogenbonen tussen jeugdige en volwassen boeren. Het vermogen van beide groepen om ongedierte en ziekte bij maïs te benoemen, wordt vanuit het etno-ecologische perspectief bekeken en aan de hand van hun Cognitive Saliency Index (CSI van Sutrop) verklaard. Ook de perceptie van en ervaring met ongedierte en ziekte bij maïs en ogenbonen worden onderzocht door de benamingen die boeren hieraan geven te analyseren. Het doel hiervan is de aanname van intergenerationeel verlies van traditionele agrarische kennis binnen agrarische gemeenschappen door toedoen van AIDS aan een systematische controle te onderwerpen. De resultaten van de CSI-analyse in hoofdstuk 5 wijzen erop dat wezen hiervan meer kennis hebben dan niet-wezen. Halfwezen die bij hun vader of moeder wonen, beschikken over meer kennis dan volle wezen die beide ouders hebben verloren en in hun eentje het land bewerken. Volwassenen die niet door AIDS zijn getroffen en hun kinderen zijn degenen met de laagste CSI-scores ten opzichte van volwassenen en wezen die wel met AIDS te maken hebben (gehad). In tegenstelling tot hetgeen eerder werd aangenomen, vallen de resultaten verrassend positief uit. De resultaten in hoofdstuk 6 geven aan dat Adja boeren gebruikmaken van verschillende trefwoorden om hun perceptie van en ervaring met ongedierte en ziekte bij maïs en ogenbonen te omschrijven. Er kwamen meer bepaald acht typen trefwoorden naar voren uit sorteeroefeningen en de vervolggesperken met boeren in navolging van de groepen waartoe ze behoren (AIDS-status - wel/niet getroffen door AIDS; generatie - kind/volwassen). Deze trefwoorden komen voort uit een rijke semantische bron met een grote diversiteit aan benamingen en blijken, vooral bij de kinderen, verband te houden met hun AIDS-status. Verdere analyse toont aan dat deze trefwoorden over het algemeen zijn gebaseerd op de vorm en/of functie die met het ongedierte wordt geassocieerd en dat ze een weerspiegeling vormen van de ervaring die de individuele boer op agro-ecologische gebied bezit. In feite typeren deze trefwoorden niet alleen de kennis over ongedierte en ziekte waarover de boeren beschikken, maar geven ze ook meer informatie over de dagelijkse strijd die de boeren tegen dit ongedierte moeten leveren om hun oogst te beschermen. Een van de bevindingen is het belang van de nabijheid van ten minste één biologische ouder en de kwaliteit van de relatie tussen volwassene en kind bij het opdoen van ervaring door het kind. Uit de uitgesplitste analyse van de ervaring van kinderen op basis van hun gebruik van trefwoorden blijkt dat volle weeskinderen minder ervaring hebben dan niet-wezen op het gebied van schade aan maïs door ongedierte en ziekte ($p < 0,05$) en minder dan halfwezen op het gebied van ongediertebestrijding ($p < 0,05$). Door de bank genomen geldt dat niet-wezen overeenkomsten vertonen met door AIDS getroffen volwassenen

en dat ze meer functionele items gebruiken in hun perceptie van ongedierte en ziekte. Wezen, vooral halfwezen, lijken daarentegen gemeenschappelijke kenmerken te vertonen met niet-getroffen volwassenen met eenzelfde gebruik van vorm en functie. Dit laatste punt suggereert dat halfwezen op een alternatieve manier ervaring zouden kunnen opdoen. Tegelijkertijd geldt dat volle wezen die meer gebruikmaken van vormtrefwoorden, ervaring lijken op te doen door observatie van de natuurlijke orde.

Hoofdstuk 7 onthult de differentiële strategieën die door boeren, en vooral door de weeskinderen, worden gebruikt om toegang te krijgen tot en gebruik te maken van agrarische kennis en ongediertebestrijdingsmethoden. Het doel is het proces te onderzoeken waarmee boeren met een uiteenlopende AIDS-status problemen met ongedierte oplossen. In dit proces wordt de nadruk gelegd op de manier waarop zij het ongedierte probleem vaststellen, de oorzaak ervan aanwijzen, een keuze maken uit de beschikbare oplossingen en op de acties die zij uiteindelijk ondernemen om het ongedierte probleem te verhelpen. Het onderzoek duidt op een groot aantal belangrijke verschillen tussen getroffen en niet-getroffen volwassenen, tussen wezen en niet-wezen en tussen volwassenen en kinderen. De resultaten tonen aan dat individuele boeren beter in staat zijn een ongedierte probleem vast te stellen en minder goed in staat zijn om te begrijpen wat de oorzaken van het probleem zijn. Wat betreft het vaststellen van de oorzaken bestaan er verschillen tussen wezen en niet-wezen, tussen getroffen en niet-getroffen volwassenen en tussen volwassenen en kinderen. De oplossingen die de boeren kiezen, zijn gebaseerd op hun perceptie van de oorzaken en hun verwachtingen (motivatie voor het verbouwen van ogenbonen). Daarom maken zij dienovereenkomstig gebruik van criteria om uit de beschikbare opties te kiezen. Adja ogenbonentelers nemen vaak hun toevlucht tot bestaande homogene technologische pakketten om een ongedierte plaag te bestrijden. Er dient echter te worden opgemerkt dat de getroffen volwassenen andersoortige oplossingen tot hun beschikking hebben. Het onderzoek ontdekte ook verschillen in het soort materiaal en gereedschappen van de boeren naar gelang hun AIDS-status en generatie. De wezen maken overwegend gebruik van kleinere spuitbussen, terwijl enkele van de niet-wezen eenvoudige containers of afvalbakken met palmtakken gebruiken om daarmee insecticiden op de ogenbonen te spuiten. In tegenstelling tot de door AIDS getroffen volwassenen hebben niet-getroffen volwassenen de beschikking over grotere spuitbussen (met een pomp). Boeren bewandelen meerdere wegen om kennis en informatie te vergaren. De belangrijke rol van ogenbonen voor de boerenhuishoudens rechtvaardigt de strategieën van de boeren om kennis en andersoortige hulpbronnen te mobiliseren teneinde ongedierte in het ogenbonengewas te bestrijden. Het is echter belangrijk op

te merken dat niet-getroffen huishoudens hun ogenbonen voornamelijk voor de verkoop telen, terwijl dit gewas bij getroffen huishoudens een belangrijk deel uitmaakt van de voedselvoorraad, waarbij eventuele overschotten op de markt worden verkocht. Dit dubbelgebruik van het gewas heeft te maken met een combinatie van armoede en AIDS. Vandaar zijn de strategieën van getroffen en niet-getroffen boeren om het ongedierteprobleem bij ogenbonen te verhelpen gekoppeld aan het belang dat zij aan het gewas hechten, hetzij als inkomstenbron hetzij als voedingsmiddel dat ter afwisseling van het voedselaanbod in het huishouden dient. Het feit dat ogenbonen bij getroffen boeren een belangrijk onderdeel van een gegarandeerde voedselvoorraad binnen het huishouden vormt, noodzaakt hen er bijvoorbeeld toe voorzichtig te zijn met het gebruik van schadelijke oplossingen, zoals het spuiten van katoeninsecticide op ogenbonengewas. Dit heeft tot gevolg dat 20% van de door AIDS getroffen volwassen boeren alleen gebruikmaakt van insecticiden die specifiek worden aanbevolen voor toepassing op ogenbonen. Verdere resultaten laten zien dat boeren met verschillende AIDS-statussen gebruikmaken van uiteenlopende connecties om middelen te mobiliseren waarmee ze ongedierteproblemen kunnen aanpakken. Dit verschil in sociale realiteit en hulpbronnen onder de boeren leidt uiteindelijk tot een verschil in perceptie en vermogen om het soort ongedierte en ziekte op de boerderijen te onderscheiden, de oorzaken ervan te benoemen en het ongedierteprobleem aan te pakken.

In hoofdstuk 8 wordt teruggeblikt op de belangrijkste bevindingen en worden er enkele algemene implicaties van het onderzoek aangereikt aan wetenschappers, landbouwontwikkelingsorganisaties en zorginstellingen. De overkoepelende conclusie van de dissertatie is dat er weinig bewijs is voor de aanname dat er sprake is van achteruitgang van landbouwkundige kennis, of van een breuk in de overdracht van kennis tussen generaties. Integendeel. De verschillende deelstudies suggereren dat AIDS wezen in Couffo juist meer kennis hebben in de sfeer van de bestrijding van ziekten en plagen dan volwassenen en leeftijdsgenoten die geen wees zijn. Deze conclusie geldt vooral halfwezen, en vooral degenen die alleen hun vader verloren. Volle wezen lijken in een relatief meer kwetsbare positie te verkeren als het gaat om het verwerven van agro-ecologische kennis. Verklaringen voor dit patroon zijn gelegen in de behoefte en noodzaak van wezen om actief te zijn in de sfeer van landbouw. Ook de kwaliteit van interactie met volwassen lijkt een rol te spelen.

Het slothoofdstuk gaat verder in op de noodzaak tot herdefiniëring van het begrip 'jeugd' en de noodzaak om wezen in de leeftijdscategorie van 10 tot 14 jaar als jongvolwassenen te beschouwen, gezien het feit dat zij specifieke

behoefden hebben en reeds vroeg in hun leven belast worden met volwassen verantwoordelijkheden. Het bestaan van AIDS wordt tevens als een nieuw aangrijpingspunt beschouwd om de leefomstandigheden op het platteland te verbeteren. Het analyseren van de kwetsbaarheid van de agrarische gemeenschappen kan ook bestaan uit de zoektocht naar haalbare en werkbare methoden en manieren waarop de bestaande plaatselijke respons kan worden versterkt, waarbij speciale aandacht aan weeskinderen en hun opvoeders wordt besteed. Dit leidt tot onderzoek naar innovatieve manieren om AIDS-gevoeligheden op effectieve wijze te laten meeprofiteren van nieuw beleid en nieuwe programma's op het gebied van landbouwontwikkeling.

Annexes

Completed Training and Supervision Plan

R.C.O. Fagbemissi



Description	Organisers	Month/year	Credits
I. General			
CERES orientation programme	CERES, Utrecht	April-May 2005	5
CERES presentation tutorials	CERES, Utrecht	May 2005	5
II. Research Methods and Techniques and Domain Specific Theories			
HIV/AIDS and Food Security in Africa	MGS, Wageningen	October 2004	3
Socio-cultural field research methods	CERES/MGS	Jan-Feb 2005	3
III. Academic Skills			
Academic writing	CENTA	Nov 2004 - Feb 2005	2
Scientific writing	CENTA	April 2005	2
IV. Presentations of research results			
Proposal presentation	MGS (SCH seminars)	Sept 2005	1.5
Presentation at the international seminar on HIV/AIDS and agriculture Title: Does AIDS cause agricultural knowledge loss among children made orphan by AIDS in the Couffo, Benin?	International Institute of Tropical Agriculture-Benin station (IITA-Benin)	8 June 2006	4
Presentation of research results at the 11th International Conference on Ethnobiology (ICE) Title: AIDS-orphans as farmers: Uncovering pest knowledge differences through an ethnobiological approach in Benin - A pre-intervention assessment	International Society of Ethnobiology (ISE), Cusco, Peru	22-30 June 2008	4
Presentation of research results at Netherlands African Studies Association (NVAS) conference on 'African children in focus: A paradigm shift in methodology and theory?'	Leiden University, Leiden, the Netherlands	18-19 September 2008	4
Total			33.5

AWLAE: African Women Leaders in Agriculture and the Environment

The present thesis is one of a series. It represents the fruits of a collaboration between African Women Leaders in Agriculture and the Environment (AWLAE), Winrock International (WI), and Wageningen University and Research Centre (WUR). AWLAE is a pan-African program that aims at training women professionals in the fields of agriculture and environment, to redress the existing gap between male and female representation in professions relating to these fields. AWLAE was initiated by Winrock International in 1989. Its headquarters are in Nairobi, Kenya.

Between AWLAE, WI, and WUR a project was formulated that was submitted for funding to the Minister for Development Cooperation of the Netherlands Ministry of Foreign Affairs. The goal of the project was to build a cadre of well-trained African women professionals working in agriculture, environment and related sectors to enhance their academic standing and capacity to contribute to gender-relevant research and policy-making on the role of women in food systems and the gendered impacts of HIV/AIDS on food security and rural livelihoods in sub-Saharan Africa. In April 2002 the project was granted. The Ministry agreed to fund twenty PhD scholarships at Wageningen University and the additional leadership-in-change training for twenty women from eleven African countries, ranging from East to West and Southern Africa. In June 2002 an agreement was signed between AWLAE, represented by its Regional Director, and the Director of the WUR Social Sciences Group, after which implementation of the project could start. The participating scholars were carefully selected from a large number of applications. The scholarships were widely advertised in relevant media in countries with AWLAE chapters, and the chapters concerned were actively involved in the recruitment and selection of the candidates.

The following women participate(d) in the AWLAE scholarship project:

Susana Akrofi (Ghana)	Stephanie Duku (Ghana)
Mariame Maiga (Ivory Coast)	Regina Ntumngia Nchang (Cameroon)
Hirut Bekele (Ethiopia)	Rose Fagbemissi (Benin)
Lydia Ndirangu (Kenya)	Daisy Onyige (Nigeria)
Namizate Binata Fofana (Ivory Coast)	Kidist Gebreselassi (Ethiopia)
Aifa Fatimata Ndoeye Niane (Senegal)	Gaynor Paradza (Zimbabwe)
Joyce Challe (Tanzania)	Monica Karuhanga (Uganda)
Faith Nguthi (Kenya)	Corrie du Preez (South Africa)
Fatimata Dia Sow (Senegal)	Doris Kakuru (Uganda)
Carolyne Nombo (Tanzania)	Ekaete Udong (Nigeria)

Curriculum Vitae

Rose Chekoun-Ola Fagbemissi was born in Benin in 1965. She holds a Master's degree in Sociology from the University of Lomé, Togo in 2001 through a fellowship awarded by the International Institute of Tropical Agriculture (IITA) funded by the Ford Foundation for women capacity building and the Danish International Development Agency (DANIDA). She also holds a Bachelor degree in Sociology-Anthropology from the University of Abomey-Calavi, Benin in 1999.

Rose was awarded a fellowship by the Netherlands Ministry of Foreign Affairs (DGIS) through the African Women Leaders in Agriculture and the Environment (AWLAE) to conduct her PhD on the interactions between HIV and AIDS and generation on traditional/local agricultural knowledge at the Social Sciences Department of Wageningen University in the Netherlands. Before she started her PhD study, Rose was a staff of the International Institute of Tropical Agriculture (IITA), Benin station, where she worked on agricultural innovations and capacity building through various projects that covered several countries in West Africa.

Her research interests include participatory agricultural innovations development, ethnobiology and ethnoecology, vulnerable children studies, gender studies and youth capacity-building.

Rose is presently a research fellow at CIRAD, a French public research center on Agriculture and Development.

List of Publications (published)

- Achigan-Dako, E. G., R. Fagbemissi, H. T. Avohou, R. S. Vodouhe, O. Coulibaly, A. Ahanchede (2008). Importance and practices of Egusi crops [*Citrullus lanatus* (Thunb.) Matsum. & Nakai, *Cucumeropsis mannii* Naudin and *Lagenaria siceraria* (Molina) Standl. cv. Aklamkpa] in sociolinguistic areas in Benin. In: *Biotechnologie, Agronomie, Société et Environnement* 12 (4): 393-403.
- Fagbemissi, R., Lie, R and Leeuwis, C. (2009). Diversity and mobility in households with children orphaned by AIDS in Couffo, Benin. In: *African Journal of AIDS Research* 8(3): 261-274.
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