Impacts of HIV/AIDS on labour allocation and agrobiodiversity depend on the stage of the epidemic: case studies in Ethiopia

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Abstract

This paper examines the impact of HIV/AIDS on labour allocation, crop choice and agrobiodiversity in Jimma Zone, south-western Ethiopia. The study comprised a survey of 205 farm households and an in-depth analysis of four rural households. HIV/AIDS caused households to increase sharecropping their land and led to more crop species grown in the home garden. The results show that the impact of HIV/AIDS on labour allocation and crop diversity depends on the stage of the disease and on which family member is (or members are) affected. Also labour allocation plays an important role, because of the options of having sharecropping contracts or opportunities for off-farm labour. The role of land tenure system in expanding the labour allocation and income-generating options has implications for intervention strategies in the various phases of the disease, both for men and women.

Additional keywords: case study, crop diversity, labour organization

Introduction

Empirical evidence suggests that farm households adjust their resource allocation patterns in response to the HIV/AIDS epidemic. Households under HIV/AIDS stress tend to reallocate labour towards quick-return non-agricultural activities (Loevinsohn & Gillespie, 2003) and divert labour from productive activities to increased caregiving (Rugalema, 1999; Drimie, 2003; Loevinsohn & Gillespie, 2003). HIV/AIDS-affected households also resort to sharecropping their land (Drimie, 2003; Bishop-Sambrook *et al.*, 2006). Other effects include a decrease in number of crops grown as a result of a reduction in area cultivated (Barnett & Whiteside, 2002), abandonment or underutilization of land (Drimie, 2003; Loevinsohn & Gillespie, 2003; Gillespie & Kadiyala, 2005), favouring less

labour demanding crops (Haddad & Gillespie, 2001) and a change in choice of food crops after the death of a male household head (Yamano & Jayne, 2002). The change in crop choice towards limited food crops and the decrease in number of crops are likely to affect agrobiodiversity[1]. If labour availability is important for crop choice and agrobiodiversity, the stages of the disease are important for crop choice and agrobiodiversity decisions. However, little attention has been paid to how the effect of HIV/AIDS on labour organization and allocation, crop choice and agrobiodiversity may vary with the disease stages for each affected household member.

The allocation of male and female labour to the various farm and off-farm activities affects the income, food supply and nutrition status of the households. Beckmann & Wesseler (2003) have stressed the importance of labour organization for crop choice. Studies suggest that agrobiodiversity contributes to dietary diversity and improves nutrition (Anon., 2002; Johns, 2003; Gari, 2004; Johns & Eyzaguirre, 2006). Importantly, improved nutrition delays the progression of HIV into AIDS-related diseases (Gillespie *et al.*, 2001; Loevinsohn & Gillespie, 2003; Fawzi *et al.*, 2004; Gillespie & Kadiyala, 2005; Stillwaggon, 2006).

The objective of our study was to identify the effect of HIV/AIDS on labour organization and allocation patterns and through that on crop choice.

Our study is founded on two basic hypotheses regarding the short-run implications of the epidemic, which are analysed by employing two approaches. First, we expect that an increase in adult morbidity and mortality induces households to look for replacement labour, which makes sharecropping more relevant because of lower demand for supervision time and household expenditures in comparison with using hired labour. Second, in line with the first hypothesis, we expect that the stages of HIV/AIDS manifestation have an important effect on household labour allocation, crop choice and agrobiodiversity.

A survey of households was conducted in order to explain the labour allocation and agrobiodiversity implications of HIV/AIDS. Due to the difficulty of observing HIV/AIDS in a large survey, the survey analysis employed adult male morbidity and mortality as a proxy indicator for HIV/AIDS. Moreover, as it was based on cross-sectional data, it does not show the dynamics of the effects of HIV/AIDS within one household. We, therefore, found it important to back the survey results with in-depth case study analysis of confirmed HIV/AIDS-affected households. Although the case studies were few in numbers, they vividly illustrate the differential effects of the stages of HIV/AIDS. The in-depth analysis also helped to compare deviations, if any, from what had been observed in the larger survey. For this purpose, we selected four farm households with identified HIV/AIDS status.

[1] Agrobiodiversity consists of the variety and variability of animals, plants, and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries (Anon., 2004). In this paper, we focus on the diversity of useful plant species on the farm. In this setting, fields are more specialized with less variable crop species diversity (except in the event of abandonment) among adjacent community plots for several reasons, including customary crop choice to reduce crop loss to animal attack.

Research area

The study was conducted in the Jimma Zone in south-western Ethiopia, located at about 340 km south-west of Addis. Jimma Zone constitutes one of the 12 zones of Oromiya Regional State. The research sites are located in the Gomma and Kersa *woredas* (equivalent to districts). Gomma *woreda* is predominantly a coffee growing area whereas Kersa is primarily known for its cereal growing. The study covers the period 2004–2005. In the following we provide a more detailed description of the research area, which was generated through a preliminary survey.

HIV/AIDS

Oromiya Regional State is the largest of the major Regional States of Ethiopia. Of the zones of Oromiya Regional State, Jimma Zone ranks second in HIV/AIDS prevalence rate after Adama. Gomma *woreda* has the highest HIV/AIDS prevalence rate among the 13 *woredas* of Jimma Zone.

Farm land allocation and product markets

The farmland in the research area can be divided into three broad categories; namely, home garden, field, and coffee plots, in order of increasing distance from home. The home garden occupies about 20% of the average household farmland and is used for perennial and annual crops. The main perennial crops grown in the home garden include enset, coffee, fruit trees (orange, mango, avocado, guava, papaya), banana, pineapple, qat and sugarcane. The most important annual crops include cereals such as maize, sorghum, teff, barley and pearl millet, pulses such as common bean and cowpea, and root and vegetable crops such as taro, yam, kale, pepper, and cabbage. A household may have several field plots that are mainly cultivated for cereal growing with the major crops being maize and sorghum, followed by haricot beans, teff, barley and millet. Coffee plots are located mainly under shade trees. Coffee, followed by fruit trees, qat and sugarcane constitute the main cash crops in the area.

There are two types of market outlets for farm produce, namely, the local market and the major/town market. The local market is located nearby the farmers and is normally active on specific days (2–3 times a week) and hours. Produce sold in local markets generally fetches lower prices than those sold in major markets, and local markets normally offer farm produce in surplus during harvest seasons when lower prices are fetched than in other seasons. The town market, which is situated at about 5–14 km from the farmer areas, fetches relatively better prices for the farm produce than the local markets and continues to attract merchants.

Gendered farm labour

Female and male labour is allocated to the three farmland categories according to the crops planted. If qat and sugarcane dominate the home gardens male labour becomes important for operating the home garden. Even in the absence of qat and sugarcane, men

are involved in digging, and transplanting enset and other crops in the home garden. As in many other parts of the country, soil preparation is the domain of males. This situation often requires single female-headed households either to sharecrop their fields or to hire casual labour for soil preparation.

Labour markets

Households can increase labour supply through hiring casual labour or entering into a sharecropping contract. The role of a given household in sharecropping arrangements can be either as labour contributor or as land contributor. Although this implies that a given household must have either of these two inputs to qualify for a sharecropping contract, it does not mean that there is no exchange of other inputs such as seeds between the parties involved. The produce share of the landowner in a specific sharecropping arrangement ranges between 33% and 67% depending on the input contribution of the landowner.

Off-farm labour markets can be divided into off-farm farming (which involves working on others' farms on a daily basis), self-employed off-farm, and employed off-farm activities. The self-employed off-farm activities include petty trading, firewood and charcoal selling, brewing, running tea/coffee houses, housing construction, carpentry, and cattle trading. The participation in employed off-farm activities includes work such as a daily labourer at the local coffee pulpery, commission-based coffee collecting for the pulpery, working for the local Peasant Association, and the governmental local coffee project. Seasonal and permanent labour migrations are also common in the area.

Land and credit markets

Land is owned and distributed by the state and formally farmers are not allowed to trade land. Informal land transactions such as through contractual arrangements, however, do occur. The average land holding per household in the area is below 1.5 ha.

The formal source of credit available to the farmers is the input credit provided by the local Rural Development Office, which is a package containing seeds of improved maize varieties and fertilizer, and involving a down payment. Other than this, the farmers use informal moneylenders (mainly local merchants) for a substantial amount of lending with interest rates well above 150% on an annual basis.

Survey method and data

The survey was conducted among 205 farm households of which 45 households were selected because one or both parents were known to be tuberculosis positive; the rest were randomly selected. Household heads were the main respondents whereas spouses participated if necessary.

Case study method and data

Four HIV/AIDS-affected farm households were selected for the case study. The analysis of

the case studies paid attention to the household developments over time through historical recollections based on four disease stages identified as (1) pre-illness, (2) illness, (3) death, and (4) post-death, for each household member. By doing so, it was attempted to give an insight into the dynamics of the impact across the stages and affected household members.

Selection of case study families

The four cases were selected using a strategic sampling technique (Verschuren & Doorewaard, 1999). The criteria used for selecting included: (1) being HIV/AIDS positive, (2) being a farmer in the research area, and (3) willingness to participate in the in-depth study. Accordingly, the four households selected for the in-depth study and analysis consisted of the following: a single male headed (case 1), single female headed (case 2), single absentee male headed (case 3) and both parents deceased (case 4). Two of the families were selected when they came to Agaro town health centre to collect their monthly support from FIDA (a local NGO) through the collaboration of the Gomma *woreda* HIV/AIDS secretariat. The third was also identified through the collaboration of the Kersa *woreda* HIV/AIDS secretariat and his subsequent contacts were facilitated through OSSA (a local NGO). The no-parent household was identified through the research assistants during the period of collecting the survey data. The terms household and family are used interchangeably throughout the paper.

Frequency of contacts

Each case study was conducted in three phases representing three important seasons of the year, i.e., (1) harvesting and marketing, (2) land preparation and sowing, and (3) weeding and crop protection. Each family was contacted for 5 consecutive days during the first season and for 3 consecutive days during the second and third season.

Specific activities during the visits

The main activities conducted during the visits of the research families included structured interviews, recording of current and past activities, farm walks and measurement of key variables. Observing current daily activities included recording the day-to-day activities of household members to identify allocation of tasks between men and women at specific times. These activities can be summarized as interviewing, participatory analysis, farm visits, and measurement activities.

Labour organization and agrobiodiversity

Summary of the survey results

The effect of the male household head's death and degree of illness on sharecropping intensity and the effect of sharecropping intensity on the degree of agrobiodiversity has been reported in detail elsewhere (Gebreselassie *et al.*, 2007). For the purpose of this paper,

Table 1. Increase in number of crop species in the home garden of households over the period 1999–2004/5 in relation to parenthood, health status of parenthood and the household's labour organization.

Category	All households		Households where species had increased			
	No.	% of total	No.	% of category	% of total	% of households with species increase
PARENTHOOD (2004/5)						
Single male	18	8.8	6	33.3	2.9	6.5
Single female [1]	43	20.9	22	51.2	10.7	23.7
2 parents	141	68.8	64	45.4	31.2	68.8
No parent	3	1.5	1	33.3	0.5	1.1
Total	205	100.0	93	45.4	45.4	100.0
HEALTH STATUS PARENTHOOD (2004/5)						
Illness (> 30 days)						
Single male	9	4.4	5	55.6	2.4	5.4
Single female	20	9.7	13	65.0	6.3	14.0
2-parent male	40	19.5	26	65.0	12.7	28.0
2-parent female	26	12.7	23	88.5	11.2	24.7
2-parent both	17	8.3	7	41.2	3.4	7.5
Total	112	54.6	74	66.1	36.1	79.6
No illness						
Single male	9	4.4	1	11.1	0.5	1.1
Single female	23	11.2	9	39.1	4.4	9.7
2-parent	58	28.3	8	13.8	3.9	8.6
No parent	3	1.5	1	33.3	0.5	1.1
Total	93	45.4	19	20.4	9.3	20.4
Total death	35	17.1	11	31.4	5.4	11.8
Illness + death	147	71.7	85	57.8	41.5	91.4
No illness, no death	58	28.3	8	13.8	3.9	8.6
LABOUR ORGANIZATION (2004/5)						
Sharecrop-out land	61	29.7	28	45.9	13.6	30.1
Sharecrop-out, no hired labour	42	20.0	21	50.0	10.2	22.6
Hired labour	59	28.8	20	33.9	9.7	21.5
Hired labour + sharecrop-out	19	9.3	7	36.8	3.4	7.5
Hired labour, no sharecrop-out	40	19.5	12	30.0	5.8	12.9

[1] About 88% of single female parenthood is due to spousal death.

selected outcomes from the survey will be used for reflecting on the case studies.

On a descriptive level, the survey results from the 205 farm households indicate that 45.4% of the households – of which 36.1% were affected and 9.3% were not affected by adult illness – had increased the number of crop species growing in their home gardens (see Table 1). Over the last 5 years prior to the survey 57 to 66% of the households with illness or death had increased the number of crop species in the home garden compared with 13.8% of those without illness or death. Of the surveyed households, 29.7% had sharecropped at least part of their fields and 28.8% had hired labour. Of the households that had sharecropped their land but had not hired labour, 50% had increased the number of species grown in the home garden whereas of the households that only had hired labour 30% had increased the number of crop species grown in the home garden. This suggests a stronger link between the likelihood of sharecropping and home garden agrobiodiversity.

The agrobiodiversity decisions were estimated for the annual, the perennial and for all crops in the home garden (Gebreselassie *et al.*, 2007). The authors employed the IVTobit model for estimating agrobiodiversity decisions for the annual crops because the variable capturing the effect of hired labour intensity was found to be endogenous to annual-crop diversity decisions. Analysis of the effect of adult illness and death on the sharecropping intensity and the effect of sharecropping intensity on the degree of agrobiodiversity showed that sharecropping intensity was statistically higher among single female-headed households ($P < 0.05$) and increased with an increase in duration of male illness ($P < 0.10$). The results also showed that a higher sharecropping intensity tended to increase agrobiodiversity in perennial crops ($P < 0.01$) and in all crops ($P < 0.01$) in the home garden. Furthermore, female participation in informal agricultural training also increased agrobiodiversity in perennial crops and all crops ($P < 0.10$) whereas male participation only increased agrobiodiversity in the annual crops ($P < 0.1$) in the home garden.

The survey results were based on illness for 30 consecutive days as a proxy for HIV/AIDS rather than direct observation of HIV/AIDS. Whether this also held for HIV/AIDS-affected households needed to be further established based on actual HIV/AIDS data. For this purpose, we conducted an in-depth analysis of four HIV/AIDS-affected farm households in the area to assess their response in terms of labour organization, crop choice and agrobiodiversity to HIV/AIDS stress. Although limited in sample size, the in-depth study enabled us to gain some insight into the potential changes in agrobiodiversity by comparing the before- and after-HIV/AIDS conditions and throughout the stages of manifestations of the disease.

In-depth case studies

In the following a detailed description is presented of the main intra-household characteristics, resource availability and allocation patterns. The data are summarized in Tables 2–6. Please note that all names have been changed for reasons of confidentiality.

Analysis and results

Changes in status and response strategies at the various stages of HIV/AIDS progression

were analysed in the light of how the households allocate their resources across activities. The analysis focused on the main research questions regarding inter- and intra-stage dynamics of effects on labour allocation, crop choice and agrobiodiversity.

Case 1: Meng

Meng's household can be described as headed by a 31-years-old single male who had recently handed over his two children to an NGO orphanage (see Table 2). Within a year's time Meng's household demonstrated a number of shifts in household type: from being a two-parent household to becoming a single-male parent household, followed by being

Table 2. Household characteristics of the four cases studied.

Household characteristics	Case 1 (Meng)				Case 2 (Kalbi)				
	Pre-illness	Illness female	Death female	Current	Pre-illness	Illness male	Death male	Illness female	Current
Study period	94-96	96-04	2004	04|05	92-94	94-99	1999	2003	04|05
Children (#)	0	3*	2	2	3	3	3	2**	2
Age children (yr)	na [1]	0.1,6	0.8,6	0.8,6	2	2,7,12	2,7,12	2,11	7,12
Adult extended family member	0	1	1	0	0	0	0	0	0
Education: no of children	na	1	1	1	0	0	0	2	2
Child school drop-outs	na	0	0	0	na	na	na	1	0
Migration	0	HH [2]	0	0	0	0	0	0	0
No. of children sent to orphanage	na	0	2	na	0	0	0	0	0
Location residence	Gomma				Gomma				
Distance from town (km)	5				13				
Year birth male	1975				1970				
Year birth female	1977				1974				
Ethnicity	Dawro				Oromo				
Religion	Christian				Muslim				
Education (yr)									
- male	8				8				
- female	4				2				

* A new child was born and died during this stage. ** A step cheld left during this stage.

[1] na = not applicable to the specific family or stage.

[2] HH = household.

[3] Male parent.

a single male-headed household and then to one of a couple with no children through common-law partnership. As a land-scarce household, the family accessed a 0.25-ha field plot (maize) and a 0.13-ha coffee plot through sharecropping arrangements. The household was highly dependent on off-farm activities both during the pre-illness period and currently (Table 3). Meng's household exhibited asset depletion through livestock sales, some land exchange, and selling a watch (see Table 4). The numbers of cattle and sheep declined during the stage of illness of the late wife as the household was forced to sell animals in order to meet increased cash demand. The change in household farm and off-farm income parallels the degree of change in farm and off-farm labour supply by the

Case 3 (Oli)					Case 4 (Sam)					
Pre-illness	Illness female	Death female	Illness male	Current	Pre-illness	Illness male	Death male	Illness female	Death female	Curent
92-04	94-96	1996	94-97	04|05	<95	95-96	1996	95-96	1996	04|05
0	1	1	1	1	4	4	4	4	4	3
na	0.6	0.6	1	7	1,4,8, 9	2,5,9, 10	2,5,9, 10	2,5,9, 10	2,5,9, 10	13,17, 18
0	3	3	3	3	0	0	2	2	2	2
na	na	na	na	0	1	2	2	2	2	3
na	na	na	na	na	0	0	0	0	0	1
0	0	1 [3]	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0

Kersa	Gomma
18	14
1971	1969
1976	1975
Oromo	Dawro
Muslim	Christian
8	9
5	5

Table 3. Labour allocation patterns in relation to illness stage as observed in the four case studies (households).

Labour allocation	Case 1 (Meng)				Case 2 (Kalbi)					Case 3 (Oli) [1]					Case 4 (Sam) [1]					
	Pre-illness	Illness female	Death female	2004/5	Pre-illness	Illness male	Death male	Illness female	2004/5	Pre-illness	Illness female	Death female	Illness male	2004/5	Pre-illness	Illness male	Death male	Illness female	Death female	2004/5
Own farm labour (field) (days yr^{-1})																				
Male	30	30	30	40	160	60	0	0	0	120	60	0	0	0	20	0	0	0	0	0
Female	10	0	0	0	60	30	80	60	50	80	0	0	0	0	10	0	0	0	0	0
Child	0	0	0	0	0	0	12	10	12	0	0	0	0	0	0	0	0	0	30	40-60
Off-farm employment (days yr^{-1})																				
Male	240	180	130	180	110	0	0	0	0	100	60	260	260	260	240	100	0	0	0	0
Female	50	0	0	0	0	0	90	0	0	0	0	0	0	0	250	150	0	0	0	0
Child	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Casual labour (days yr^{-1})																				
Hired-out	35	20	35	30	0	0	40	20	28	0	0	0	0	0	0	0	0	0	0	0
Hired-in	0	0	0	0	0	0	5	5	7	0	0	0	0	10	30	25	15	15	15	15
Sharecropping (ha)																				
Shared-out	0	0	0	0	0	0	0.33	0.33	0.33	0	0	4	4	4	0.83	0.83	0.80	0.83	0.80	0.70
Shared-in	0.38	0.38	0.38	0.38	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1] Cases 3 and 4 obtained extended-family labour support during the stages of illness and death but no data are available on the amount of labour support.

Table 4. Household assets and endowments of the four cases studied.

Assets/ endowments	Case 1 (Meng)				Case 2 (Kalbi)					Case 3 (Oli)					Case 4 (Sam)					
	Pre-illness	Illness female	Death female	2004/5	Pre-illness	Illness male	Death male	Illness female	2004/5	Pre-illness	Illness female	Death female	Illness male	2004/5	Pre-illness	Illness male	Death male	Illness female	Death female	2004/5
Land (ha)																				
Title holder [1]	m	m	m	m	m1	m1	m1	m1	m1	m	m	m	m	m	m	m	m	m	m	c
Garden size	0.03	0.03	0.03	0.03	0.18	0.18	0.13	0.13	0.13	0.25	0.25	0.25	0.25	0.25	0.06	0.06	0.06	0.06	0.06	0.06
Field area	0	0	0	0	0.25	0.25	0.20	0.20	0.20	4	4	4	4	4	0.80	0.80	0.80	0.80	0.63	0.63
Coffee area	0	0	0	0	0.31	0.31	0.28	0.28	0.28	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1
Total land	0.03	0.03	0.03	0.03	0.69	0.69	0.60	0.60	0.60	4.38	4.38	4.38	4.38	4.38	1.88	1.88	1.88	1.88	1.69	1.69
Land confiscated	0	0	0	0	0	0	0.08	0.08	0	0	0	0	0	0	0	0	0	0	0.18	0
Livestock (#)																				
Poultry	15	15	11	11	27	15	6	4	4	0	0	10	10	10	7-10	7-10	0	0	0	0
Sheep/goat	5	0	2	0	0	0	0	0.50	1.50	9	0	0	0	0	0	0	0	0	0	
Oxen/bull	1	0	0	0	1	0	0	0	0	5	5	2	2	2	3	3	0	0	1	1
Cows/heifer	2	0	0	0	1	0	0	0.50	0.50	10	9	8	3	3	14	10	4	4	0	0
Donkey/mule	0	0	0	0	0	0	0	0	0	4	4	2	2	2	0	0	0	0	0	0
Asset selling																				
Land (ha)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0
Cattle (#) [2]	0	4	3	0	0	1	0	0	0	0	10	9	2	0	0	4	4	4	1	0
Jewel (#)	0	1	0	1	0	0	0	0	0	0	0	0	2	2	0	0	0	1	5	0
Utensils (#)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0

[1] m = male; m1 = first male (in case of more husbands); c = child.

[2] Cattle sales include all livestock except poultry. Where numbers of cattle sold and stock balance at each stage do not square, multiplication of herds is involved. Case 4 suffered several livestock deaths and thefts.

Table 5. Income, medical expenses and consumption smoothing (× 100 Br [1] per year unless indicated otherwise) in relation to illness stage as observed in the four case studies (households).

Item	Case 1 (Meng)				Case 2 (Kalbi)					Case 3 (Oli)					Case 4 (Sam)					
	Pre-illness	Illness female	Death female	2004/5	Pre-illness	Illness male	Death male	Illness female	2004/5	Pre-illness	Illness female	Death female	Illness male	2004/5	Pre-illness	Illness male	Death male	Illness female	Death female	2004/5
Income																				
Farm total	10	10	10	12	33	29	12	12	14	51	45	40	35	25	70	60	30	30	25	35
Off-farm male	40	22	22	25	14	8	0	0	0	40	45	27	27	27	40	40	0	0	0	0
Off-farm female	10	0	0	0	0	0	6	2	2	0	0	0	0	0	20	10	0	0	0	
Off-farm child	na[2]	na	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total off-farm	50	22	22	25	14	8	6	2	2	40	45	27	27	27	60	50	0	0	0	0
HIV support	0	12	12	12	0	0	0	12	12	0	0	14	14	14	0	0	0	0	0	0
Total	60	44	44	49	47	37	18	26	31	91	90	81	76	66	140	110	30	30	25	25
Medical expenses																				
Household	0	0.4-6	0	0.5-1	0	5	3	2	1-1.5	0	4	3.6	1	3.6	0	20	20	20	12	0
Public	0	12	0	0	0	0	0	0	0	0	0	3	22	22	0	0	5	0	0	0
Consumption smoothing																				
Savings	1.2	0	1	1	4	0	0	0	0	6	1	0	0	0	30	0	0	0	0	0
Loan	0	8.9	0	0	4	0	1.5	1.5	3	8	8	8	8	8	0	0	0	1	4	2
Interest rate (% yr^{-1})	na	150	na	na	10	na	200	200	200	10	10	10	10	10	na	na	na	150	150	150
Purpose loan [3]	0	fd+md	0	0	1	0	fd	fd	fd	I	I	I	I	I	0	0	0	md	md	fd
Food shortage (months)	0	0	0	0	0	0	2.5	4	4	0	0	0	0	0	0	0	0	3	2.5	2

[1] 1 US$ = Br 8.6

[2] na = not applicable to the specific family or stage.

[3] fd = food consumption; md = medical expenses; I = farm inputs.

household members such that a total income decrease was observed during the period of illness as compared with the pre-illness stage (Table 5). Looking at the inter-stage differentials, however, recently life had become better for Meng as the time and cash previously invested in his ill wife and children (late wife and children currently residing in an orphanage) was now available for other productive uses. In effect, this household can be said to be better-off now than during the illness period.

Labour allocations. As shown in Table 3, male farm labour supply remained the same for Meng's household as the household moved from disease stage 1 to stage 2 while female farm labour supply declined. Such a response is not surprising given that his household was land-constrained and normally accessed land through sharecropping land from outside. Male farm labour supply increased in disease stage 4 following the death of a female spouse after a long period of severe illness, demanding intensive care both for the patient as well as the young children. Female farm labour supply remained at zero after stage 2.

On the other hand, following his wife's illness both male and female off-farm labour supply declined with the latter being reduced to zero when the female fell severely ill. Male off-farm participation decreased during the period of his late wife's severe illness (for about 1 year), as he was responsible for caring for his two children (including a 10-months-old baby) in addition to taking care of his ill wife. Male off-farm labour supply declined at the onset of stage 2 whereas it increased as the household moved to stage 4. Given the good health status of Meng, there was a potential to further increase off-farm participation, unless the leisure-labour trade-off occurs as a result of the increase in net income. Recently, the household was getting NGO support after declaring his positive HIV status. Meng, who recently had entered into a common-law partnership, continued sharecropping land of other landowners, as his land is small compared to his work capacity.

Crop choice and diversity. Given that Meng's household was a land-scarce household, no change was expected in terms of the type of crops grown outside the home garden. Little change was observed in the home garden except for the planting of some fruit trees during his late wife's period of illness (Table 6). Enset planting increased in Meng's home garden in existing spaces, without significantly affecting other home garden crops. Since the household had faced death very recently, it would be premature to talk about the responses in terms of crop choice following death.

The number of crop species had slightly increased as the household moved from stage 1 to stage 2, after which it remained the same. On the other hand, the number of field crop species grown had not changed across the disease stages. Hence, the dynamics in the total number of crop species were the same as the dynamics in the number of home garden species. As this household accessed field plots through sharecropping, the fact that the same number of crops could be maintained across the disease stages indicates that farm labour had not changed much.

Case 2: Kalbi

A 32-years-old single female with two children, 7 and 12 years old, headed Kalbi's household (see Table 2). She had been married two times, was a widow, and had lost a 2-years-old child. Income was mainly generated from her sharecropper-operated field, her family

Table 6. Area (ha) allocated to crops, number of plants (#) or quantity produced (kg) per crop in relation to illness stage as observed in the four case studies (households).

Crop	Case 1 (Meng)				Case 2 (Kalbi)				
	Pre-illness	Illness female	Death female	2004/5	Pre-illness	Illness male	Death male	Illness female	2004/5
Home garden crops									
Sugarcane (ha)	0	0	0	0	0.08	0.13	0	0	0
Qat (ha)	0	0	0	0	0	0	0	0	0
Maize local [1] (ha)	0.03	0.03	0.03	0.03	0.03	0.03	0.1	0.1	0.1
Sorghum anchiro (ha)	0	0	0	0	0.03	0.03	Am [2]	Am	0.03
Haricot beans (ha)	0	0	0	0	Im[2]	Im	Im	Im	0
Cowpeas (#)	0	0	0	0	1	1	0	0	1
Taro (kg)	100	100	50	50	150	150	50	50	50
Yam (kg)	50	50	10	10	15	15	0	0	0
Other veg. (kg)	0	0	0	0	10	10	0	0	20
Enset geno (#)	2	5	9	9	60	30	10	10	13
Enset anchiro (#)	0	0	2	2	5	5	2	2	2
Enset nobo (#)	0	0	0	0	0	0	0	0	0
Coffee local (#)	0	0	0	0	40	40	40	40	40
Coffee Hyv (#)	0	0	0	0	20	20	20	20	20
Papaya (#)	6	6	10	10	10	10	10	10	0
Orange (#)	2	2	3	3	5	6	6	6	6
Mango (#)	0	1	1	1	3	3	3	3	3
Guava (#)	1	1	1	1	1	1	1	1	1
Avocado (#)	0	0	0	0	0	0	0	0	0
Pineapple (#)	2	2	2	2	0	0	0	0	0
Banana habesha (#)	30	30	8	8	20	20	0	0	30
Banana Kenya (#)	0	0	0	0	20	20	0	0	0
No. of species	9	10	10	10	15	15	10	10	11
Field crops (ha) [3]									
Maize local	0.25	0.25	0.25	0.25	0	0	0.08	0.08	0.08
Maize BH660	0	0	0	0	0.08	0.08	0	0	0
Maize BH140	0	0	0	0	0.07	0.07	0	0	0
Sorghum anchiro	0	0	0	0	0.13	0.13	0.13	0.13	0.10
Haricot beans	0	0	0	0	0	0	0	0	0
Teff	0	0	0	0	Dm[2]	0	0	0	0
Pepper	0	0	0	0	0	0	0	0	0
Banana	0	0	0	0	0	0	0	0	0
Qat	0	0	0	0	0	0	0	0	0
Taro	0	0	0	0	0	0	0	0	0
No. of species	1	1	1	1	3	2	2	2	2
Coffee (ha)[3]	0.13	0.13	0.13	0.13	0.33	0.33	0.33	0.33	0.28
Fallow (ha)	0	0	0	0	0	0	0	0	0

[1] Local variety refers to the long established, traditional, not high-yielding variety.

[2] Am = alternating with maize; Im = intercropped with maize; Dm = double-cropped with maize.

[3] The data for the field crops and coffee in Case 1 (Meng) refer to the crops on land sharecropped from outside.

Case 3 (Oli)					Case 4 (Sam)					
Pre-illness	Illness female	Death female	Illness male	2004/5	Pre-illness	Illness male	Death male	Illness female	Death female	2004/5
0.13	0.08	0	0	0	0	0	0	0	0	0
0.08	0.08	0.08	0.08	0.08	0.06	0.06	0.06	0.06	0.06	0.06
0.2	0.2	0.08	0.08	0.08	0	0	0	0	0	0
0.05	0.05	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	Im	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	10	0	0	0	0	0	0	0	0	0
0	40	50	53	53	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	50	50	50	0	0	0	0	0	0
50	50	50	50	50	12	12	12	12	12	12
0	0	0	0	0	0	0	0	0	0	0
2	2	14	14	14	12	12	12	12	10	2
11	11	11	3	3	2	2	2	2	2	7
2	2	7	7	7	1	1	1	1	1	4
1	1	1	1	1	2	2	2	2	2	5
0	0	4	4	4	5	5	5	5	5	1
0	0	0	0	0	3	3	10	10	10	10
50	50	50	50	50	5	5	5	5	5	7
100	100	100	100	100	0	0	0	0	0	0
9	11	10	10	10	9	9	9	9	9	10
0	0	0	0	0	0	0	0.31	0.31	0.31	0.31
0.8	0.8	0.8	0.25	0.25	0.63	0.63	0.31	0.31	0.31	0.31
0	0	0	0	0	0	0	0	0	0	0
0.50	0.50	0.50	0.50	0.50	Am	Am	Am	Am	Am	Am
Im	Im	Im	Im	Im	0	0	0	0	0	0
0.50	0.50	0.50	0.50	0.50	0	0	0	0	0	0
0	0	0.25	0.25	0.25	0	0	0	0	0	0
0	0	0	0	0	0.07	0.07	0	0	0	0
0	0	0	0	0	0.08	0.08	0	0	0	0
0.2	0.2	0.2	0.12	0.12	0	0	0	0	0	0
5	5	6	6	6	4	4	2	2	2	2
0.13	0.13	0.13	0.13	0.125	1	1	1	1	1	1
0	0	0	0.38	0.38	0	0	0	0	0	0

and some hired-labour operated coffee plot, family-operated home garden, and some off-farm farming activities (Table 3). Currently, the family was receiving some financial support from an NGO.

Kalbi's household experienced a 0.08-ha reduction in land holding because of a land claim by her stepdaughter. She had further experienced a 100% reduction in number of cattle due to sales to meet medical and consumption expenditures following the death of her spouse (Table 4). In addition, she also had sold household utensils for the purpose of meeting medical expenses for her late child. Recently, however, the family had started to increase the number of livestock through a 50% share in cow and goat owning and the purchase of a goat. The increased number of animals also resulted from changes in the expenditure pattern fuelled by an effort to leave real capital for the children at her death. The current gross family income was estimated to be about 35% lower than during the pre-illness stage, not accounting for the increased health-related expenses and cost of borrowing (Table 5).

Labour allocations. As shown in Table 3, Kalbi's family had been involved in sharecropping other peoples' land for a 50% produce share during the pre-illness stage in addition to cultivating their farm. In an attempt to mitigate farm labour scarcity following the illness and death of her spouse, Kalbi sharecropped her field plots for a 50% produce and input share contract. Male farm labour supply had been declining during illness until it was completely withdrawn at the death of the male head. Increase in the demand for care during his illness had also implied a decline in the amount of female farm labour supply although she had managed to increase it during the early stages of her single parenthood. However, it decreased recently as her health status deteriorated.

Her sharecropping arrangement was such that the sharecropping labourer provided his labour (including draught power) for the major operations and half of the seeds. In addition to sharing 50% of the input costs, the arrangements required Kalbi to assist in weeding and harvesting on the sharecropped plot. Although Kalbi faced labour shortage on the coffee plot, she considered the future risk of losing land in her decision as to whether or not her coffee plot should be sharecropped. Due to the associated risk of a claim on the coffee plot in the long run, arising from its perennial nature, Kalbi decided to use hired labour for weeding and slashing of the coffee plot instead of sharecropping. An adequate amount of labour hiring could not be maintained, however, due to scarcity of cash.

The advantage of a sharecropping arrangement was that in most cases the sharecropping labourer bought the farm inputs (mainly seeds) and Kalbi reimbursed half of the input cost at harvest. In the event that this was not possible, there was a possibility of obtaining only 33% of the produce if Kalbi opted not to share any inputs. At this stage, however, Kalbi was unable to supply off-farm farm labour to generate income. During her own illness in the production season, which is recurring, her labour contribution for weeding and harvesting of fields was reduced and as a result her product share reduced to 33%. Increasing levels of child labour supply were reported in weeding and harvesting recently. The children also assisted Kalbi in herding livestock, fetching water and firewood, harvesting coffee mainly for home consumption, and crop protection from animal attack on the maize and sorghum plots near the house. Kalbi reduced some weeding operations on her coffee plots during parts of her illness period and lacked the necessary cash to hire

casual labour. Recently, her children had assisted her in harvesting and selling coffee in the local market. The labour required for the home garden was partly met by herself and sometimes by labour assistance from neighbours.

Male off-farm participation dropped to zero during her husband's illness. Kalbi started off-farm farming after her spouse died. There was a slight increase in male off-farm labour supply due to remarriage for some time after the stage of single parenthood. For Kalbi's family, female off-farm participation increased during the period of single female parenthood prior to the onset of her own illness.

Finally, it was evident that Kalbi's household had transformed from a labour-surplus to a labour-scarce one as the household became increasingly dependent on sharecropping labour throughout the stages of progression of HIV/AIDS. Recently, with the children growing older, some child labour supply had become evident mainly for activities such as crop protection, harvesting, and livestock herding.

Crop choice and diversity. As shown in Table 6, Kalbi had abandoned sugarcane production in the home garden since the death of her husband and replaced it by increasing the area under maize. The improved maize varieties that were used before her first husband's death had now been replaced by local varieties. Similarly, following his death, enset and papaya declined in importance due to a decrease in the number of plants. The total number of species in Kalbi's home garden and on her farm as a whole was less now than during the husband's pre-illness stage.

Case 3: Oli

A 30-years-old absentee single male parent headed Oli's household. Following the severe illness of his late wife, Oli had migrated and was currently residing in town (Table 2). He left his 5-years-old child under the guardianship of extended family members who moved to Oli's village home to assume responsibility for supervising the sharecropping on Oli's farm.

Oli thought that the productivity of his farm was about 40% lower now than when his farm was cultivated by family labour. Due to his involvement in permanent off-farm activity in town the proportion of off-farm income as a share of the total income had increased in comparison to the pre-illness stage of his wife although the amount of income per unit of off-farm labour was lower (Table 3). Oli's family had faced > 50% reduction in the number of cattle and pack animals following the severe illness and subsequent death of his wife (Table 4). In addition to the health expenditure covered by the household, Oli had recently been incurring travel expenses for antiretroviral treatment offered free of charge at the public hospital in Jimma (Table 5).

Labour allocations. As shown in Table 3, on Oli's farm the own male labour supply had declined due to parental migration. He had sharecropped his field regardless of his work capacity because of his choice to migrate to the nearby town after knowing his HIV status and facing casual illness. Casual labour demand for his coffee plot had also increased since then. Oli had turned into a fulltime off-farm worker from a part-time one during the late wife's pre-illness stage. As a result, his off-farm participation had drastically increased after his illness.

Crop choice and diversity. Table 6 shows that sugarcane had disappeared in the currently

absentee male-headed household of Oli whereas enset, coffee and fruit tree planting had increased in his home garden, which currently was being cultivated by his extended family. Moreover, pepper had been introduced in the field 3 years ago. As a result, the present number of crop species in home garden and field and the total number of crop species on Oli's farm had slightly increased compared with the pre-illness stage of his wife. In the field, the same crop varieties were now being used. Recently, Oli's 0.375-ha plot, on which the family used to cultivate maize during the pre-illness stage, had been left fallow. In Oli's household, increasing enset planting was the extended family's decision.

Case 4: Sam

Sam's household consisted of five persons and was run by fostering grandparents who joined the household (Table 2) since the severe illness of his late parents who both had died within 4 months of each other. The main income was generated from the sharecropper-operated field plot, the hired and family labour operated coffee plot (after a long period of almost abandonment) and the partly sharecropper-operated home garden (Table 3). Recently, Sam, the older son who was now 17, had taken on a considerable responsibility in household resource allocation decisions whereas the role of the extended family members had diminished to domestic caregiving.

The farm's land area had decreased by a total of 0.3 ha of which 0.175 ha was due to a claim from the local Peasant Association following the death of Sam's parents and 0.125 ha to selling land in an effort to ease the prevailing financial constraints (Table 4). The number of cattle had been reduced by > 90% between the pre-illness stage and now through a gradual decline following the illness and death of the parents. Currently, the household owned only one ox, which they paired-up with another one in the neighbourhood for mutual benefit during soil preparation. Sam's household also had sold watches and gold jewellery worth about Br 2000 which they had inherited from their late parents, in order to meet medical expenses for a now deceased child and consumption needs. Moreover, off-farm income of the household had been reduced by 100% following the death of both parents (Table 5). Total household income was about 70% lower now than when both parents were still alive. Sam's family health expenditures during the parents' illness period were roughly estimated at about Br 4000 per year. The health expenditure for Sam's recently deceased brother was estimated at Br 1000 per year. No current medical expenses were reported by the household. There is a potential for more child involvement in generating farm and off-farm income as the children grow up.

Labour allocations. As shown in Table 3 for Sam's family, following parental illness the farm labour supply showed only little change, as both parents had been involved in full-time off-farm activities although the main source of income was from sharecropping their fields and the hired labour-operated coffee plot. The amount of male and female farm labour during the pre-illness period had been small and was reduced to zero with the onset of illness. Child farm labour had increased recently with the increase in the children's age and their capacity to run their farm.

Casual labour for operating home garden and coffee plot had declined due to a shortage of cash and, as a result, the coffee plot had almost been unproductive until recently. A shortage of cash also had caused the household to sharecrop the part of their home

garden under qat. Both the female and male off-farm labour supply drastically declined following illness of the father.

Crop choice and diversity. For Sam's household, the change in crop choice involved the recent introduction of enset and increased fruit tree planting and hence an increase in crop species in the home garden (Table 6). On the other hand, the number of species in the field had declined due to the loss of part of the field through land confiscation. Thus, the total number of crop species on the farm was lower now than during the pre-illness stage of his parents although it recently showed a slight increase compared with the disease stages 2 and 3. Moreover, the improved maize variety in the field had been partly replaced by a local one.

Discussion

We are aware of the difficulty of making generalizations based on the four cases of the in-depth analysis. We are, however, convinced that the in-depth analysis results complement the general observations from the survey, as they provide a detailed exposition of the labour allocation, crop choice and agrobiodiversity responses of HIV/AIDS-affected households for a better understanding of possible variations in effects.

The in-depth studies confirm the general survey observation regarding the tendency of sharecropping their own fields among households affected by adult illness and death. In addition, the tendency of having a higher number of crop species in the home garden of the households that sharecropped their land – as seen in the survey results – is consistent with the HIV/AIDS-affected cases. The observed increase in agrobiodiversity in the home garden indicates a potential that can be strengthened for improving nutrition in the context of HIV/AIDS, for example, through integrating nutrition education. This requires conducting cost-benefit analysis of education on nutrition versus alternative strategies of HIV/AIDS prevention and impact mitigation such as distributing multivitamin supplements, antiretroviral therapy, raising HIV/AIDS awareness, or a combination of them. The in-depth study results also indicate that the effect of HIV/AIDS is diverse, depending on many variables of the affected farm households including the stages of manifestation of HIV/AIDS and the household role of the affected member. Differences in the likelihood of staying on the farm after knowing one's positive HIV status, and differential claims over land of the surviving members after loss of the spouse between male and female-affected households influences the adjustment in labour allocation and crop choice. The variation of responses depending on which household member is affected suggests that efforts to respond to HIV/AIDS-affected farm households need to consider providing households with sufficient options to enhance response in accordance with their specific circumstances. Such efforts may include providing clear land titles and off-farm employment opportunities particularly during single parenthood.

Availability of sharecropping options implies that for households with land titles, a severe impact of loss of farm labour is more reflected by a reduction in income than in gross production. With lack of land titles and/or increased degree of confiscation following loss of adult(s), however, the impact may go beyond reduction in production and income, as it may involve land grabbing. The distressing consequences of land holding

insecurity has implications for the value of facilitating land titles to the surviving household members and to fostering parents, as necessary, as well as legal enforcement to avoid unfairness in case of land confiscation and the insecurity associated with sharecropping plots with perennial crops.

Increased off-farm participation is observed to ease the cash constraint as is also reflected by Loevinsohn & Gillespie (2003) who indicated that HIV/AIDS causes households to reallocate labour towards quick return non-agricultural activities, which in our case included migration. Therefore, creating off-farm employment opportunities are among the relevant strategies to consider. Note that domestic household roles of single female and fostering female parent households imply that their range of available off-farm employment opportunities tends to be limited to off-farm farming and self-employed off-farm activities around the house, contrary to those of their male counterparts. The observed increase in small-animal production activities also indicates a potential area of intervention that could be run through part-time child labour assistance. The identified engagement in various off-farm and small-animal production activities points to the role of diversification to assist HIV/AIDS-affected households. Enhancing free mobility of labour helps to benefit from sharecropping and long-term off-farm participation in the context of HIV/AIDS. The evidenced migration, however, is partly driven by the perceived social exclusion due to HIV/AIDS infection. Thus, strengthening safety nets such as the reported NGO support may be useful not only for influencing the degree of social exclusion through awareness campaigns but also for preventing further decline in household assets through direct financial assistance. Financial supports may be particularly useful during the stages of illness.

Replacement of labour-intensive crops such as sugarcane by food crops has been observed, as reflected in Haddad & Gillespie (2001) and Yamano & Jayne (2002), following loss of the adult male. A similar tendency of favouring less labour-demanding crops in the fields of single women has been noted by Salick (1992) and Song (1998) although their studies were not on HIV/AIDS households. We also observed a reduction in importance of some food crops. Hence, the crop cycle in the context of possible change in the decision horizon of HIV/AIDS-affected households, the labour required to process the product and access to sharecropping are important in crop choice decisions.

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