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MITIGATING HIV AND AIDS IMPACTS THROUGH AGRO-FORESTRY PRACTICES

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A B S T R A C T

Throughout the world the impacts of HIV and AIDS are being felt at all levels-individual, household, community, national, regional and international. The impacts are felt more in the sub-Saharan Africa (SSA) where poverty levels are very high. Malawi just like all other countries in SSA is experiencing serious problems of HIV and AIDS as well as high levels of poverty. In responding to the impacts of HIV and AIDS and poverty, there are a number of agricultural based responses that are being promoted ranging from technological adaptation to agroforestry systems. Kasungu Chipala and Chulu Extension Planning Areas have benefited from International Centre for Research in Agroforestry's (ICRAF) agroforestry scaling up programs in the past fifteen years. The specific objective of the study was to assess whether agroforestry contributed to increases in maize yields of HIV and AIDS affected households. Data was collected using household survey questionnaires, focus group discussions and key informant interviews. The results showed that households practicing agroforestry were obtaining higher maize yields as compared to households that were not practicing agroforestry. The study concludes that households affected by HIV and AIDS need to practice agroforestry for achievement of food security. The recommendation is that there is need for more scaling up of agroforestry technologies in the face of exorbitant prices for inorganic fertilizers.

Keywords: Agro forestry, HIV & aids, impact mitigation.

INTRODUCTION

HIV and AIDS impacts have reached devastating proportions, especially in sub-Saharan Africa countries like Malawi. Since the start of the epidemic, an estimated 60 million children and adults have been infected with HIV and AIDS worldwide, of which about 20 million have died. About 5 million new infections occurred in 2001 alone. Currently, 40 million people worldwide are living with HIV and AIDS, of which about 95% live in developing countries. Out of every ten HIV infected people, seven live in Sub-Saharan Africa. It is estimated that about one third of those currently living with HIV and AIDS are between the ages of 15-24 years (UNAIDS/WHO, 2001).

Various studies have been conducted to look at the impacts of HIV and AIDS on household labour, assets and other livelihoods. A study commissioned by FAO (2003a) revealed that HIV and AIDS related illness and deaths bring additional costs associated with decreased household labour and increasing health care expenditure. These reduce the already meagre return to investment and lead to depletion of assets and fundamentally affect long-term food security. An IFAD study conducted in 2001 revealed that although HIV and AIDS have had devastating effects on many rural communities in Eastern and Southern Africa for over a decade, there are few mechanisms that deal with the negative effects of the epidemic. The countries of the Eastern and Southern Africa region seem to have evolved strategies for effective prevention and palliative care, but little for maintaining the production potential of HIV and AIDS affected households. The picture brought by these studies shows that smallholder farmers lack sustainable coping mechanisms to deal with the problems of HIV and AIDS. Being that the main occupation of these smallholder farmers is agriculture; the most effective copying mechanisms are likely to be in terms of exploiting opportunities within the agriculture sector.

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For a long time, HIV and AIDS were seen as purely a health issue, and most financial resources had passed through Ministries of Health towards reducing infection rates, buying Ant-Retro Viral (ARV) drugs, educating and raising awareness and, more recently for increasing home-based care (UNAIDS/WHO 2001; FAO/WHO 2002). However HIV and AIDS have implications that reach far beyond health- including great impacts on agricultural and food production systems (Gillespie 1989, FAO 1995; FAO 2001; FAO 2002a,b; FAO 2003a,b,c; FAO/UNAIDS 2003; FAO/WHO 2002; FASAZ 2003; Gari 2002a,b; Gari 2003; Gari and Villarreal 2002; Stokes 2003; Waala and Tumushabe 2003) in UNAIDS 2001.

What is agroforestry: Agroforestry is a set of land use practices involving the deliberate combination of trees, agricultural crops and/or animals on the same land management unit in some form of spatial arrangement or temporal sequence (Lurdgren and Raintree, 1982 *in FAO, State of the World Forests 2005*). Cultivating crops and livestock in combination with trees is an ancient practice. However since the 1970s the following factors had contributed to the rising interest in agroforestry; the deteriorating economic situation in many parts of the developing world whereby many farmers are not able to buy inorganic fertilizers and thereby resorting to agroforestry, increased tropical deforestation and degradation and scarcity of land because of population pressure and growing interest in farming systems, intercropping and the environment (Nair, 1993). Amongst the benefits of agroforestry in Southern Africa are improvement in soil fertility, crop yield and food security improvement, income generation, diversification of livelihoods and impact on the environment (Kamanga, 1999, Ajayi et al., 2007; Sileshi et al., 2007). The literature available on the contribution of agroforestry practices to HIV and AIDS could be categorised into two. On one hand there is a school of thought that HIV and AIDS impacts negatively on agroforestry practicing by making it difficult for households to participate in agroforestry activities (Swallow et al. 2004). This is because HIV and AIDS affects labour availability in the household and yet agroforestry practicing requires the same labour. The other school of thought is that agroforestry indeed contributes to maize yields (Swallow et al 2004) but it was not clear whether this also applied in the context of HIV and AIDS affectedness.

In all studies mentioned above the main focus was on what agroforestry is capable of doing. The main methodological difference with this study was its special focus on households affected by HIV and AIDS.

The main objective of this study was to compare the maize yield of households affected by HIV and AIDS who practiced agroforestry and households affected by HIV and AIDS who did not practice agroforestry.

METHODOLOGY

Research design and research site: The survey was conducted in two Extension Planning Areas (EPAs) of Kasungu Chipala and Chulu in Kasungu District. Both EPAs had benefited from agroforestry technologies promoted by ICRAF since 1997/98 crop growing season. The main agroforestry practices that were being promoted in these two areas were improved fallows and under sowing of *Tephrosia vogelli* and improved fallows of *Sesbania sesban*. In this study maize yield has been used as a proxy for food security. Maize is a staple food in Malawi and it is grown in all districts across the country.

Sample size calculations, sampling techniques and data collection: The study involved 186 respondents from which 103 were engaged in agroforestry and 83 were not engaged in agroforestry. Selection of the households that were affected by HIV and AIDS was done with guidance of Village health committees, AEDOs and NAPHAM officials.

Ethical issues and human subjects considerations: As Hilhorst et al (2004) in *'Impact of AIDS on Rural Livelihoods' in Benue State, Nigeria* pointed out, issues concerning illness and death are in general sensitive topics to discuss. So in this study special care was taken when collecting data for this study. This was especially so in the case of HIV and AIDS, which was still highly stigmatised in Malawi. It was noted that most people did not know what exactly killed their loved ones in cases where reference was made to a relative who had died and therefore proxy indicators were used to assess whether the case was HIV and AIDS related or not.

Model specification: Logistic regression model was used in analysing data in this study. Maize Yield was a binary dependent variable in the sense that households that were found to be food insecure were assigned the code of 1 and households which were food secure were assigned the code of 2. Food security here was explained in terms of producing enough maize for all household members (on average 270Kg/Person/Year).

The amount of maize that a household got was considered as a function of the following independent variables; age of household head, marital status of household head, household size, HIV and AIDS affectedness, whether household used chemical fertilizers or not, whether household practices agroforestry or not, land holding sizes, number of crops a household grows, whether household had livestock or not, respondents main occupation, educational level of respondent, sex of household head. The logistic regression model which was developed was given as follows:

$$MY = \alpha_o + \alpha_1 age + \alpha_2 amaritalstat + \alpha_3 hhsize + \alpha_4 HIVandAIDS\ affectedness + \alpha_5 Fertuse + \alpha_6 agroforestry\ practicing + \alpha_7 land\ size + \alpha_8 cropno + \alpha_9 livestock\ possession + \alpha_{10} respondents\ main\ occupation + \alpha_{11} edulevel + \alpha_{12} hhsex + \varepsilon$$

MY	Maize yield was a binary dependent variable measured in kilogrammes. Households harvesting maize equal or more than 270Kg/person/year were deemed as food secure with code 2 and those with less yield were said to be food insecure and assigned 1. Estimation of the maize yields was done using the following estimates which are used by Ministry of Agriculture and Food Security**:** For shelled maize 1 oxcart gives 270Kg, 1 pail gives 18Kg And for unshelled maize 1 bag of 50Kg gives 30Kg, 1 nkhokwe (granary) gives 750Kg, and 1 basket gives 37.5Kg
α_o	was the constant or intercept
α_i	were coefficients of the independent variables with i ranging from 1 to 12 [based on actual number of independent variables].
age	age of household head Age
maritalstat	marital status of household head was measured using representative codes as follows: 1.Single, 2. Divorced/separated, 3. widowed, 4. married, 5. Polygamous.
hhsize	was measured as the number of people that eat from the same pot and live within the same compound.
affectedness	affectedness measured how the hh had experienced the effects of HIV and AIDS. The options for affectedness were based on proxy indicators for HIV and AIDS affectedness as follows: 1. Infected with HIV and AIDS, 2. Loss a husband/wife. 3. Loss of a dependable relative (brother/sister, uncle/aunt, child), 4. Keeping orphans, 5. Long illness of any household member
fertuse	measured whether a household used chemical fertilizers or not in the past 2005/2006 crop growing season. Yes was denoted as 1 and 2 was assigned for non-use of chemical fertilizers. This was measured as a categorical variable.
afpract	whether household practiced agroforestry was a binary dependent variable with 1. for agroforestry practicing households and 2 for non-agroforestry practicing households
landsize	total amount of land that was cultivated by a household measured in hectares.
cropno	number of crop enterprises a household was engaged in.
edu level	Level of education of the household head.
sexhh	sex of household head 1 for male and 2 for female.
ε	error term assumed to be normally distributed, with mean zero and constant variance.

RESULTS AND DISCUSSIONS

A number of household characteristics were studied to understand their relationship with maize yields of the two categories of households.

Summary of comparisons of socio-economic characteristics of the respondents: The table 1 below provides a comparison of the socio-economic characteristics of the respondents. Mean and p values have been used to compare the two groups of households. The results show significant differences that exist between the agroforestry practicing households and the non-agroforestry practicing households. The major differences were in the areas of maize yields and cash realised from crop sales.

Table 1: Comparison of agroforestry practicing households and those not practicing

Statistic	Agroforestry practicing	Non-agroforestry practicing	Level of significance (P value)
Age (Years)	45.7	41.86	0.072
Education (*Years*)	5.2	5.55	0.572
Household size	6.3	6.42	0.951
No of crops grown	3.8	3.02	<0.0001
Land size (ha)	1.6	1.44	0.279
Maize yield (Kg)	1, 720.6	881.19	<0.0001
Cash earned from crops (MK)	19, 834.6	8, 993.06	<0.0001

Maize yield of respondents: The yields of maize for the two categories of households were found to be very different. Households that were affected by HIV and AIDS but did not practice agroforestry had a mean maize yield of 881.19Kg while as households that practiced agroforestry had a mean maize yield of 1, 720.6Kg. The differences in maize yield was found to be significant (t= 4.2728, P<0.0001). The difference in the maize yields can be explained by the fact that households that practiced agroforestry had an advantage of improving the soils of their land for more maize productivity. Agroforestry technologies irrespective of fertilizer usage are still very important since their usefulness goes beyond just improving the soil fertility. There are other benefits of using agroforestry that lead into increased productivity such as soil texture improvement.

Assessment of adequacy of maize yield across the two groups of households: The amount of maize that was harvested by each household was assessed on its adequacy whether it would suffice for all household members over a period of one year. The measurement of maize yield adequacy was explained in terms of producing enough maize for all household members (on average 270Kg/Person/Year). After the analysis it became clear that only 26.3% had harvested enough yield to last them throughout the year while as the rest didn't. Of the 26% of households that were found to be food secure, a significant percentage (71%) of households came from the group that was engaged in agroforestry while as the remaining (29%) came from the group of households not engaged in agroforestry. The results showed a positive correlation between practicing agroforestry and maize yield (paired sample t test: p<0.05.). This shows how significant contributions agroforestry technologies are making in terms of the maize yield that the households obtained as compared to the case if they did not. A study by Ajayi et al (2005) agreed with the findings as above. Ajayi found out that fertilizer tree systems increase the yield of maize (the staple food crop in the region) by two or more times compared to the usual smallholder farmers' practice of continuous maize without nutrient inputs (Kwesiga et al., 2003; Akinnifesi et al., 2006 in Ajayi 2005).

Results of logistic regression analysis on factors influencing maize yield: The explanatory variables were run on a logistic regression model to assess how each variable explained the changes in the dependent variable. Findings are presented in Table 2. The coefficient of determination, R^2 is 0.64 and this was an indication that 64% of the variation in the maize yield of households was explained by the explanatory variables in the equation. This also suggested the goodness of fit of the model used. The coefficient of determination (R^2) measures the variation in the dependent variable accounted for by the explanatory variables.

Table 2: Results of the logistic regression analysis for maize yield of the households

Variable	Coefficient	S.E	Wald	Sign
HHMARS	.960	.402	5.70	.017*
HHEDUC	-.063	.057	1.201	.273
HHSIZE	-.571	.125	20.689	.000*
AFPRAC	1.069	.502	4.522	.033*
CROPNO	.255	.138	3.399	.065
LANDSIZE	.761	.225	10.101	.001*
SOILFERT	1.192	.423	7.961	.005
Constant	-.314	2.129	0.022	.883

Key * means significant variable at p<0.05 R^2= .64

The significant relationship between the dependent variable and the independent variable suggests that indeed agroforestry options contribute to maize yield of households affected by HIV and AIDS.

Significance of the explanatory variables: Analysis the variables were found to be significant ($p<0.05$) at different levels; whether household practiced agroforestry or not, household size, land holding size and the marital status of household head.

Agroforestry practicing: The results showed that households that were affected by HIV and AIDS and practiced agroforestry options had more yields as compared to households that were affected by HIV and AIDS but did not practice agroforestry. The results were significant at $P<0.05$. While it is a known fact that one of the impacts of HIV and AIDS is reduction in maize production (Phiri 2003), agroforestry options helped to mitigate the negative impacts of HIV and AIDS. While all households affected by HIV and AIDS are constrained in terms of cash needs to buy chemical fertilizers, households are better off practicing agroforestry options. Swallow et al (2004) argued that female-headed households with reduced labour input tend to concentrate on home gardens. In such circumstances agroforestry can contribute to soil fertility. It should be emphasized here that households' maize yield was not a sole contribution of agroforestry technologies but other factors were also significantly contributing to the levels of maize yield obtained. Other factors that were also found to be significant were: The marital status of household head, Household size, number of crop enterprises a household is engaged in, Land holding size and Use of chemical.

Household size: The coefficient for household size was negative meaning that as the number of members in a household increased the maize yield obtained decreased ($p<0.05$). This was so because in most cases the large number of members in households affected by HIV and AIDS were orphans who were generally youngsters who did not contribute so much to the farming business. This finding disagreed with what Phiri (2003) found out that household size positively relates to maize production and adoption of pigeon pea farming respectively. In Phiri's study the average household size was 5.5 and the national average household size is 4.4 (according to The Malawi Demographic and Health Survey 2004). In this particular study the average household size was 6.4. The bigger household size could be explained by the fact that this study focussed on households affected and afflicted by HIV and AIDS and therefore the sizes of the households were big because of the young members who happened to be orphans.

Land holding size: Land holding size was another significant variable ($p<0.05$) in as far as maize yield was concerned. The relationship with the dependent variable was positive indicating that with more land more yields were obtained. This confirmed what Phiri (2003) found out that an increase in land holding size leads to an increase in maize yield also. As argued elsewhere in this report households that were practicing agroforestry had more labour committed to farming. This also meant that more land was being cultivated. All other factors being equal more land put to farming also means more yield obtained.

Marital status of household head: Respondents' marital status was found to be positively related to the dependent variable MY ($p<0.05$). Households in which there was a husband and wife were found to have better maize yields. More than seventy five percent (75.5%) of those households that had adequate maize yield for all members were from the married category of households. This was explained by the fact that households with man and woman produced more labour than single parented households.

CONCLUSION AND RECOMMENDATIONS

The results of this study demonstrated that households that were affected by HIV and AIDS and practicing agroforestry had better maize yield than households that were affected by HIV and AIDS and not practicing agroforestry. Logistic regression revealed that the main factors that contributed to the maize yields were the practicing of agroforestry, the size of the Household, the marital status of household head and land holding size. The main lesson learnt in the study was that agroforestry is a good technology for households affected by HIV and AIDS. This is true when one considers the significant differences in maize yields between the two groups of households that participated in this study. However it was also clear during the study that amount of land put to farming was a significant independent variable to adoption of agroforestry practices.

This study has generated lessons for programming in development work.

- Development programming should consider looking

- at broader issues of rural livelihoods. This study revealed that the practicing of agroforestry is giving households affected by HIV and AIDS an economic advantage over the households that do not practice agroforestry. It therefore makes sense to promote agroforestry options in various places in Malawi. It would be important to select options that are perceived to be better than others in different places in the country.
- Relevance of agroforestry options should not be understood as a stand-alone factor in improving maize yields and incomes of HIV and AIDS affected households. The derivation of higher maize yields depends on a lot more factors. Land sizes have to be relatively bigger. Labour has to be available and in some cases combining with chemical fertilizers have been found to be other factors that enhanced the maize yield.

RESEARCH AREAS: The impact of chemical fertilizers in influencing maize yield of respondents' households could not assumed to be constant. The usage of chemical fertilizers must have played a role in showing that households practicing agroforestry had better livelihoods as compared to households not practicing agroforestry but all of them affected by HIV and AIDS. It can therefore be recommended that better econometric measurements are required to understand these issues more clearly excluding the impact of chemical fertilizer usage. The study did not look at the effects of agroforestry practices among those not-affected by HIV and AIDS. It is therefore recommended that another study be designed that can look at whether agroforestry practices would have different effects on those affected and not-affected by HIV and AIDS.

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