

Research Application Summary

## **Hostages of subsistence cultivation: Can they be bailed?**

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### **Abstract**

This study examined why rural small holders have remained hostages to subsistence cultivation in Serere District, Eastern Uganda. Four hundred and ninety (490) subsistence holders were selected and individual interviews conducted to identify the diversity of livelihood sources and other socio-economic dynamics of subsistence livelihood. Focused Group Discussions (FGDs) were also conducted in three villages to discuss the opportunities for livelihood improvement. Individual interview responses were analysed using Statistical Package for Social Scientists while FGD responses were analysed based on emerging themes. Findings indicated that 94% of the subsistence holders depended on subsistence cultivation for both food and income and subsistence cultivation generated over 58% of household income. On average the portion of crops sold generated UGX.255, 878 (USD 127.9) per season. Crop wise, cassava showed a relative importance of 90% as a food crop compared to finger millet (46.9%) whereas cotton was considered lowly (3%) by the respondents. Climate change (variability) was identified as a key emerging challenge in the community. Despite availability of new varieties in the market and at the National Agriculture Semi-Arid Research Institute (NASARI), accessibility and utilisation was limited owing to prices and adherences to traditional varieties and practices. Subsistence holders observed that Government initiatives such as the National Agricultural Advisory Services (NAADS) benefited to political 'heavy weights' and the 'well to do' who have influence in the area. However, opportunities do exist in the community's resilience and desirousness to move out of poverty through fruit (*citrus* and *mangoes*) growing. Therefore, there is need to mobilize the communities without putting political considerations for meaningful production and ensured availability of markets for fruits. Further, Integrated Soil and Fertility Management (ISFM) need be strengthened through community action utilizing the Parish Development Committees (PDCs) and innovative platforms for sustainable livelihoods.

**Key words:** Livelihood, opportunities, Serere, subsistence cultivation, Uganda

## Résumé

L'étude a examiné pourquoi les petits exploitants ruraux sont restés otages de l'agriculture de subsistance dans le District de Serere, Est de l'Ouganda. Quatre cent quatre-vingt-dix agriculteurs de subsistance (490) ont été sélectionnés et des entrevues individuelles menées pour identifier la diversité des sources de subsistance et d'autres dynamiques socio-économiques qui affectent la survie Focus. Les discussions avec des groupes Cibles (DGC) ont également été menées dans trois villages pour discuter des possibilités d'amélioration des moyens de subsistance. Les réponses aux entrevues individuelles ont été analysées à l'aide du logiciel SPSS tandis que les réponses des DGC ont été analysées en fonction des thèmes émergents. Les résultats ont indiqué que 94% des petits exploitants ruraux dépendaient de l'agriculture de subsistance comme source de nourriture et de revenu. La culture de subsistance a généré plus de 58% du revenu des ménages. En moyenne, la part des cultures vendues a généré 255,878 UGX. (127,9 USD) par saison. Concernant les cultures, le manioc a montré une importance relative de 90% en tant que culture vivrière par rapport à éleusine (46,9%), tandis que le coton était considéré comme étant modeste (3%). Le changement climatique (variabilité) est identifié comme l'un des plus grands défis émergents dans la communauté. Malgré la disponibilité de nouvelles variétés sur le marché et à l'Institut national de recherche sur l'agriculture semi-aride (NASARI), leur accessibilité et leur utilisation sont toujours limitées en raison des prix et des adhésions à des variétés et des pratiques traditionnelles. Les agriculteurs de subsistance ont remarqué que les initiatives gouvernementales telles que les NAADS bénéficient les politiciens et d'autres personnes qui ont une influence dans la région. Cependant, des opportunités existent dans la résilience et la volonté de la communauté à sortir de la pauvreté grâce à la plantation des arbres fruitiers (les agrumes et les mangues). Par conséquent, il est nécessaire de mobiliser la communauté sans compromis politiques pour la production significative et d'assurer la disponibilité des marchés pour les fruits. Enfin, la gestion intégrée de la fertilité des sols (GIFS) a besoin d'être renforcée par l'action communautaire en utilisant les comités paroissiaux de développement et les plates-formes innovantes pour les moyens de subsistance durables.

Mots clés: Communauté, moyens de subsistance, l'opportunité, Serere, subsistance, Ouganda

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## Introduction

African rural subsistence holders are defined by subsistence farming tendencies and in Uganda, they constitute about 68 percent of the population and even the little they produce may not be enough to ensure household food security (AATF, 2010). That which is produced is devoted to meeting household food requirements but some is sold when there is perceived surplus or in dire situations of need to meet other basic needs including medical care, fuel, school tuition fees for children and debt clearance. Subsistence cultivation is the basis for rural households' livelihood survival in several Sub-Saharan African homesteads. It involves activities such as planting crops, watering and tilling fields, harvesting food, caring for cows, chicken and other animals and this defines the day to day in life of subsistence holders (AATF, 2010; Progress Sheet, 2010). Most often these subsistence holders are faced with

a barrage of problems including, among others; limited and declining land size, pests and insect infestation, high costs of farm inputs, high population growth rates, residence in remote locations of the country, high poverty rates and recently climate change and variability. In fact, in most African countries poverty is a rural phenomenon. In Uganda, the Northern region had the highest poverty incidence at 64.8% with Karamoja sub-region posting the highest sub-regional incidence of 82% in 2008 the former having gone through over two decades of armed conflict that affected the productivity of subsistence farmers while the latter is drenched in cattle rustling. The poverty level in northern Uganda has only reduced to 48% as of 2016.

Agricultural growth is still considered crucial for pulling subsistence farmers out of poverty (WDR, 2008; Zhou, 2010). Its impact is indirect, through ensuring food and nutrition security, increasing the demand for agricultural labor creating jobs in related sectors that service agriculture (forward and backward linkages), providing the resources to invest in education to foster migration out of farming, generating resources that are invested in other sectors to create new jobs, and driving down the price of basic staples (Staatz and Dembele, 2008; WDR, 2008). Agriculture also has the potential to make youths productive within their localities a key consideration in Uganda and sub-Saharan Africa at large. Given that most of Uganda's population is young, agriculture if well developed would offer employment to a wider spectrum of the unemployed youths. Therefore, modernising agriculture has a potential to contribute more effectively to widely shared development. Consequently, the Government of Uganda has injected financial resources into developmental programmes such as Entandikwa scheme, Poverty Eradication Action Plan (PEAP), Plan for the Modernisation of Agriculture (PMA), National Agricultural Advisory Services (NAADS) and more recently 'Operation Create Wealth' to scale up productivity and increase the profitability of agriculture. However, these programmes have had limited impact among the majority subsistence holders. As a result, most subsistence holders have remained impoverished and lack resources to farm their way out of poverty, they are thus the hostages of subsistence cultivation. Therefore, this study sought information on subsistence holder's reliance on subsistence farming and examined avenues for bailing them out.

## **Methodology**

Serere district formerly a county of Soroti district is located in Eastern Uganda. It is largely underlain by rocks of the basement complex pre-cambrian age which include; granites, migmatites, gneiss, schists, and quartzites with four major soil units; Serere and Amuria catena; Metu complex and Usuk series. The vegetation of area is a mixture of woodlands, a wooded savanna, grass savannah, forests and riparian vegetation (DSER, 1997). Serere lies within the Teso agro-ecological zone with finger millet being the traditional staple food while cotton was the cash crop of the area. The primary source of livelihood is subsistence cultivation and animal rearing. Serere district was purposively selected for this study due to researchers familiarity with the place and it has been a host to a number of internally displaced persons who have integrated with long resident community members. Consequently the area benefited from a number of government development programmes. Further, the choice

of Olio sub-county was purposive based on it hosting the agricultural research institute (Serere Agricultural Research Institute).

The study took both a qualitatively and quantitative approach. This was because the issue required in-depth examination of 'what' and 'how' drawing mainly from the subsistence holders perceptions. Quantification was essentially that 490 subsistence holders were interviewed, thus the study was both descriptive and explanatory. Data were collected purposively from subsistence holders to understand why they were 'hostage' to subsistence cultivation and explore possible avenues for bailing them out. Data collection was done iteratively involving three phases. First, there was individual interviews with local council chairpersons. Through these interviews, village lists and key themes/areas were established. The second phase consisted of focused group discussions (FGDs) with subsistence holders in the community. In total three FGDs were conducted involving village elders, women and youths. Village elders were considered because of their long wealth of experience and historical knowledge, women as the major custodians of agriculture, and youth because they constituted the next generation and also provide a considerable amount of labour force for cultivation. The third phase involved individual interviews with 490 subsistence holders to widen the scope of information on the sources of livelihood. Data obtained was quantitatively and qualitatively analysed. At a quantitative level, descriptive statistics was generated in form of percentages and averages while at qualitatively level analysis of FGD data was performed based on emerging themes.

## Results

**What is unique about subsistence holders in Serere district?** About 71% and correspondingly 29% of the respondents were male and female headed subsistence holders, respectively. The average age of the household head was 43 years while the average size of the household was 6.8 persons. Overall, 76% of the household heads had attained primary level of education, while the other 2.4%, had not been to any formal schooling. Of those who had attended formal education, 23.9% had completed primary school education, 22% secondary education, while 17.3% had completed tertiary education. About 99% of the residents used fuelwood for cooking and preserving food with a per capita consumption of 542.5 kg. However, 96% of the subsistence holders have never planted a tree specifically for firewood. Fruits trees constituted the most planted trees (19.8%) by subsistence holders; these manly included mangoes and citrus.

**What are the major sources of household engagement?** Over 94% of the subsistence holders relied on crop cultivation for both food and income generation (Fig. 1). They planted cassava, maize, finger millet, sorghum, sweetpotatoes, groundnuts, and cotton. Over 90% of the subsistence holders owned a garden of cassava which was considered a key food security crop. Household heads argued that cassava was a security crop due to its ability to withstand drought, and had increasingly become a dependable crop to generate household income. Cassava generated household income among 58% of the households. Maize has also become an important crop, 66.3% of the subsistence holders had grown it. This was followed by sweet potatoes (57.8%), while finger millet that used to be a traditional food

crop was grown by only 46.9% of the households. The household heads argued that growing finger millet was tedious especially during weeding time yet the traditional communal labour system of 'aleyá' or groups digging together has died out. Cotton, a traditional cash crop was grown by only 3% of the subsistence holders (Fig. 2). Farmers attributed their reluctance to grow cotton to decreased yields, low market prices, tediousness of cultivation, increasing number of cotton pests and diseases, collapse of cooperative societies that used to provide inputs and better market prices, and decreasing land size. However, 66% of the subsistence holders had equally grown other crops including simsim, coffee, green grams, peas, soya beans and rice to raise income.

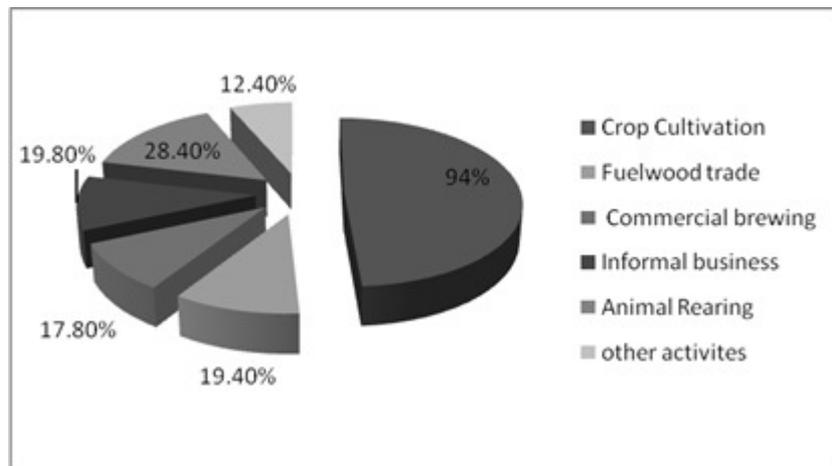


Figure 1. Household Livelihood sources (N=490)

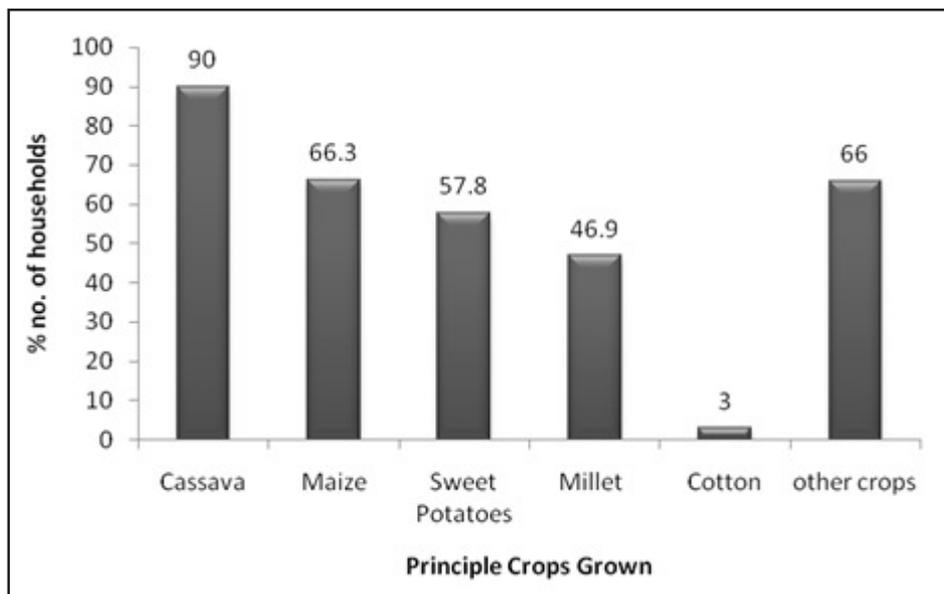


Figure 2. Principle crops grown among the subsistence holders in Serere (N=490)

Nineteen percent (19.4 %) of the household heads were engaged in fuelwood trade (firewood and charcoal) with a marked difference among parishes: 41.1% in Oburin; Okulonyo 18 %, Akoboi 15.3 %, and Osuguro 0.7 %. While Osuguro reflects limited participation in fuelwood trade, Oburin had comparatively larger wood biomass stock. Subsistence commercial brewing of local brew (millet beer-*ajon* and Potent Gin-*eguli*) was another source of household livelihood among 17.8 % subsistence holders (Fig. 1). About 20% of the subsistence holders operated informal businesses, 28.4 % reared animals (cattle, goats, sheep and poultry), and 12.4 % were involved in other activities such as building construction and provision of casual labour for pay. Besides reliance on cultivation for livelihood support, 14.1% of household heads were engaged in formal employment as teachers, agricultural officers, and Local Government officers, 49.4% in informal sector and pensioners constituted 1.6 percent. This leaves 35.1% of the household solely reliant on crop cultivation without any livelihood diversification.

**Are there any variations in land ownership?** There were substantial number of subsistence holders with more than 3 acres of land (58.8%); this was followed by those with 2 acres (15.7%), with 1 acre and less than 1 acre registering nearly the same percentage of 8.8% and 8.2%, respectively (1 ha = 2.2 acres). Parish wise, there were significant differences. For example Akoboi had 75% of the subsistence holders with 3 acres and above compared to Osuguro with 11.7%. This could be a consequence of urban growth occurring around Osuguro but also linked to settlement of immigrants from other parts of Teso especially from Ngora and Kumi. About 17% of the land was owned by female headed subsistence holders, though 29.2% of the subsistence holders were female headed. They explained that land belonged to the clan; they could only use it but had no absolute legal ownership rights. Over 58% of the subsistence holders sold cassava, followed by sorghum (13.5%). About 65% of the subsistence holders sold other crops including maize and groundnuts. The trade in crops generated average household earnings of UGX 138,517 per season (about USD50). Over 64% of the household heads also engaged in other activities besides crop cultivation with 49.4% being in the informal sector, 14.1% in the formal sector and 1.4% being pensioners. From these other activities, the average household earnings was UGX 117, 361 per month.

**What do households spend on?** Consumption expenditure of the subsistence holders revealed varied patterns; the minimum expenditure on food per week was UGX 2,000 (USD 1) while the maximum recorded was UGX 182,000 (USD 91) with the average expenditure being UGX 34,334 (USD 17.2). The average monthly expenditure on medical care was UGX 22,736 (USD 11.4) with minimum and maximum being UGX 500 (USD 0.25) and 240,000 (USD 120) respectively. On education, some subsistence holders barely had any expenditure either because they did not send their children to school, had no school going age children and/or children went to school without scholastic materials. This phenomenon was more common among the households in Akoboi Parish. Others paid highly, with UGX 1,800,000 (USD 900) recorded as the highest amount paid by a household head. These categories take their children to town schools away from Serere District. The average household expenditure on education per term was UGX 113,420 (USD 56.7) for household heads that had their children in schools within Soroti district.

Weekly expenditure on fuelwood averaged UGX 3,385 (USD 1.7) with a minimum of UGX 500 (USD 0.25) and maximum of UGX 14,000 (USD 7). This pattern is a result of some subsistence holders having fuelwood sources being close to their homesteads. As result, the opportunity cost of collecting fuelwood was lower for subsistence holders close to fuelwood sources compared to those who moved a longer distance. Household monthly expenditure on charcoal was UGX 3,780 (USD 1.9). This seemingly low expenditure is due to the fact that subsistence holders that used charcoal occasionally also used fuelwood for cooking (fuel stacking). The average monthly expenditure on electricity was UGX 771 (USD 0.38). This can be attributable to the fact that few subsistence holders were connected to the national grid. This shows that electricity is not an important source of energy in the area. Further, the extension of the national grid is limited to parts of Osuguro and Okulonyo parishes while Akoboi had no access to the national grid.

### **What constraints exist to agriculture improvement and what opportunities exist?**

It emerged that subsistence holders earnestly waited to benefit from Government programmes such as National Agricultural Advisory Services (NAADS), Peace, Recovery and Development Programme (PRDP) and 'Prosperity for all'. Owing to the manner in which these opportunities are discussed on local radio stations such as Radio VERITAS, Voice of Teso and Etop radio, politicians drum local support and raise public hope. Unfortunately, subsistence holders are hardly organised in community groups or associations through which these programmes would benefit them yet this is one of the mandatory prerequisites. Politicians argued that subsistence holders are disorganised and the multi-party politics has further increased the divide along political parties and personality lines. However, in a counter accusation, subsistence holders argued that it is the politicians that fuel these divisions so that they remain the major beneficiaries, only using them for their personal benefit. In another twist, subsistence holders pointed out that extension workers existed in theory because it was rare to interact with them. They (farmers) also pointed out that the new varieties promoted by the extension agents were highly susceptible to crop diseases. *If you do not spray your crops with insecticides and pesticides be ready to sweat for nothing* remarked one of the FGD participants.

In the discussions, climate variability and change surfaced as one of the emerging challenges in agriculture in the area; farmers had experienced climate changes which had affected planting seasons, crop yields and crop markets. Other challenges identified included: high costs of inputs such as pesticides, seeds and seedlings, limited direct market and high costs of transport due to the poor road network. In one of the FGDs conducted in 2008, one participant angrily remarked *trees have always been there, we found them here and they will be there, we did not plant and we do not need to plant, they grow alone!* These constituted challenges to agricultural improvement in the area.

According to the respondents, granting district status to Serere constituted an opportunity to community members. They believed that services were being brought closer to them and as such, resources were bound to be within their reach and they would easily interface with the District officials. They also believed that this new status would enable their roads to be easily worked upon since the district will have its own road works unit. This would enable



Citrus, Egyptian Tang variety

Mangoes, Apple variety

**Plate 1. Fruits grown**

**Table 1. Subsistence holder characteristics**

Subsistence holders characteristics	Parish level	
	Education	No formal education
	Primary level	36.5%
	Secondary	22.2%
	Tertiary level	17.3%
Age	1-20 years	53.5%
	20-40 years	40.4%
	41+	6.6%
Gender (average)	Males	3.3
	Females	3.5

them to easily market their produce. Further, their children would obtain jobs in the district. They also mentioned that fruit growing (citrus and mangoes) was providing a ray of hope. One fruit farmer, Mr. Odeke in Adoku testified to earning more from his fruits than from crop cultivation. He planted high yielding and fast growing mangoes: *Kent*, *Tommy*, *Apple* and *Boribo* varieties, *Citrus*; *Egyptian tang*, *Sweet med*, *Washington*, *American tangerine* and *Hamlin* varieties and also integrated apiary (see plate 1). It was also observable that some farmers had started planting trees such as pines, cashew nuts, the jatropha (*ejumula*), eucalyptus, and *grevillea robusta*. These constitute opportunities for subsistence communities.

## Discussion

In Uganda and Soroti District, the national and district household size average during the 2002 Population and Housing Census (PHC) was estimated at 5.6 and 5.1 persons, respectively (UBOS, 2007a). Now that Serere County has been made an independent district, the results from the present study show that on average a household had seven persons.

This is higher than the national average. The dependence of over 94% of the subsistence holders on crop cultivation for both food and income generation is a testament to a community's reliance on natural capital. This figure is far higher than the 2005/2006 findings by Uganda National Household Survey (UNHS) that estimated district dependence on subsistence farming at 79% for Soroti District (UBOS, 2007b). This portrays that land based activities are still fundamental to household livelihoods in the area (Giannecchini, 2007). According to Grunzweig *et al.* (2003) over reliance on crop cultivation implies that more tracts of land have to be cleared for cultivation. This will lead to land use/cover changes (Egeru and Majaliwa, 2009). These changes escalate conflicts in provision of food, fuel and grazing area on which the livelihoods of the poor depend (Bolwing *et al.*, 2006). This has indeed led to increasing deforestation and increased distance traveled to collect firewood (Buyinza *et al.*, 2008). Therefore, with the huge number of subsistence holders (94%) still depend on subsistence cultivation for survival, livelihood of the people is threatened: more land is needed to feed this population, more fuelwood is needed to cook the food, incomes are low and will consistently be low and investment may not be feasible due to dependence on subsistence cultivation with limited or no savings at all.

The subsistence holders are in a delicate situation of food insecurity owing to reliance in food crops to generate income. Cassava and other crops provided 58% of household income, but are not produced on a large scale, which exposes subsistence holders to food insecurity that in case of a prolonged drought the chances of hunger and famine are quite high. Elsewhere, Mafimisebi (2008) indicated that subsistence farmers in Ondo State in Nigeria also relied on cassava for food and income generation. The World Bank in a study *quiet revolutionaries* described cassava as a 'hunger crop' (World Bank, 1993). It is believed that cassava has become very popular in Sub-Saharan Africa because of its ease of cultivation and adaptability to a wide variety of soils, even in marginal areas (Hahn, 1994). Contrastingly, cultivation of finger millet (46%) and cotton (3%) formerly a major food crop and cash crop, respectively, have declined significantly compared to the 66% and 85% importance in the 1960s (Ebanyat, 2009). Farmers attributed their reluctance to grow cotton to: decreased yields, low market prices, tediousness of cultivation, increasing number of cotton pests and diseases, collapse of cooperatives that used to provide inputs and better market prices, and decreasing land size. In a previous study, Ebanyat (2009) indicated that in Pallisa District finger millet production had declined because of the farmers practices of communal weeding and harvesting organised to help one another ('*ebole*') had collapsed and labour cost was very high. In the communal practices, labour service was rewarded with a meal and local brew ('*ajon*') at the end of the season. In this current study, this kind of social construction has phased out in the community because wage labour is now predominant.

As pointed earlier, the diversity of threats such as climate change (variability), break down of social ties, pests and diseases, high costs of inputs such as pesticides, seeds and seedlings, limited direct markets for produce, high transport costs, and political bickering threaten the backbone of community existence in the study areas. The combination of these and other threats have negatively affected crop productivity and yields. However, the productivity of subsistence production can greatly be increased by the use of improved inputs and technologies such as seeds, fertilizers, among others (Baiphethi and Jacobs, 2009). Further,

improved access to water and appropriate farmer support (through extension) would also have positive and significant impacts on improved yields for subsistence farmers. Better still, access to low external input technology could improve productivity of the subsistence farmers and form the basis for human and capital formation (Tripp, 2006). Baiphethi and Jacobs (2009) also observed that for resource-poor subsistence holders to take advantage of the technologies, complementary investments, especially in extension, need to be made available. Another important consideration to improve access to low external input technology would be the development of broad-based farmer organisations in order to stimulate a demand-driven approach to technology generation and information provision. These farmer organisations are critical in view of the shortcomings of the current agricultural extension delivery services. Declining land size in the area is a further constraint to production and has contributed to erosion in vegetation cover (Egeru and Majaliwa, 2009).

Baiphethi and Jacobs (2009) point out that the World Bank proposed that commercial and subsistence smallholder farming can be made more productive and sustainable by among other measures, improving price incentives and increasing the quality and quantity of public investment; making product markets work better; improving access to financial services and reducing risks; enhancing the performance of producer organisations; and promoting innovation through science and technology. These suggestions ultimately have to work within a framework of accountable and politically organised systems that have interest in seeing its people out of the doldrums of pure subsistence cultivation that breeds rural poverty. Therefore, for rural locations like in Olio sub-county in Serere District, it is imperative to mobilize the community without putting political considerations for meaningful production to be attained. Political leaders need to 'walk the talk' and be accountable to the people other than 'living on them'. Functional input and output markets need to be established as they will help farmers acquire and use improved inputs as well as market their produce. It is also vital to galvanise efforts within the umbrella of Integrated Soil and Fertility Management (ISFM) by strengthening community action while utilizing the already existing structures such as the Parish Development Committees (PDCs). Innovative platforms for sustainable livelihoods would also constitute another dimension for bailing out these rural subsistence holders particularly because Integrated Agricultural Research for Development (IAR4D) deals with a multiplicity of objectives like increasing productivity, risk aversion and climate variability. The approach would ensure the use of multi-prong dualistic interventions in bailing out the subsistence holders.

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### **References**

African Agricultural Technology Foundation (AATF). 2010. A study on the relevance of Chinese agricultural technologies to smallholder farmers in Africa. AATF, Nairobi.

- Baiphethi, M.N and Jacobs, P.T. 2009. The contribution of subsistence farming to food security in South Africa. *Agrekon* 48 (4):459-482.
- Buyinza, M. and Teera, J. 2008. A system approach to fuelwood status in Uganda: A demand-supply nexus. *Research Journal of Applied Sciences* 3 (4): 264-275.
- Bowlig, S. and Odeke, M. 2007. Household food security effects of certified organics export production in tropical Africa: A gendered analysis. A research report submitted to EPOPA (Sida).
- Bryceson, D.F. 2000 Rural Africa at the crossroads: Livelihood practices and policies. Natural Resource Perspectives No. 52. London: Overseas Development Institute.
- Chapman, R. and Tripp, R. 2004. Background Paper on rural livelihoods diversity and agriculture. Overseas Development Institute Agricultural Research and Extension Network] Electronic Conference on the Implications of Rural Livelihood Diversity for Pro-poor Agricultural Initiatives.
- Ebanyat, P. 2009. A road to food? Efficacy of nutrient management options targeted to heterogeneous soils in the Teso farming system, Uganda. PhD Thesis, Wageningen University, pp. 19-32.
- Egeru, A. and Majaliwa, M.G.J. 2009. Land use/cover change trend in Soroti district, eastern Uganda. *Journal of Applied Sciences and Environment Management* 13 (4):77-79.
- Ellis, F. and Mdoe, N. 2003. Livelihoods and rural poverty reduction in Tanzania. *World Development* 31 (8): 1367-1384.
- Giannecchini, M., Wayne, T. and Coleen, V. 2007. Land-cover change and human-environment interactions in a rural cultural landscape in South Africa. *The Geographical Journal* 173 (1):26-42.
- Grunzweig, J.M., Lin, T., Rotenberg, E.M., Schwartz, A. and Yakir, D. 2003. Carbon sequestration in arid-land forest. *Global Change Biology* 9 (5):791-799.
- Hahn, S.K. 1994. Root crops for food security in sub-Saharan Africa. Proceedings of the Fifth Triennial Symposium of the International Society for Tropical Root Crops. Akoroda. M.O. (Ed.). Kampala, Uganda. pp. 16-21.
- Mafimisebi, T.E. 2008. Determinants and uses of farm income from the cassava enterprise in Ondo State, Nigeria. *J. Hum. Ecol.* 24 (2):125-130
- Progress Sheet. 2010. Progress in agriculture. <http://s3.amazonaws.com/one.org>
- Uganda Bureau of Statistics (UBOS). 2007a. The 2002 Uganda Population and Housing Census: Mapping Socio-Economic Indicators for National Development. Uganda Bureau of Statistics, Kampala Uganda. pp. 16-39.
- Uganda Bureau of Statistics (UBOS). 2007b. Uganda National Household Survey (UNHS) 2005/2006: Report on the Agricultural Module. Uganda Bureau of Statistics, Kampala, Uganda. pp. 14-56.
- World Development Report (WDR). 2008. Agriculture for development: Rural households and their pathways out of poverty. World Bank. pp. 72-74.
- Zhou, Y. 2010. Smallholder agriculture, sustainability and the Syngenta Foundation. Syngenta Foundation for Sustainable Agriculture. <http://www.syngentafoundation.org>