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Sustainable Agricultural Enterprises in Two Districts in Uganda

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ABSTRACT

This paper discusses implementation of sustainable agricultural practices in Mpigi and Luwero districts (central region in Uganda). After five-day farmer participatory practical training workshops, follow up extension services were effected to monitor the level of implementation of the technological skills acquired. Thereafter diffusion enhancement among farmers was encouraged through group weekly meetings. Training was on-farm in order to removes biases. Sessions conducted included introduction to sustainable agriculture, soil fertility management, organic pesticides, banana, passion fruit, pineapple establishment, and management. Farmers were taught how to make organic fertilizers from animal urine, wood-ash, cow dung, poultry litter, leguminous plants, making of organic pesticides, and use of A-frame in construction of contour ridges. Success has been registered in restoration of soil fertility, control of soil erosion, planting of multi purpose trees, and sustainable production of food and high value crops. The objective of ensuring food security and improving household incomes from $280 to $380-500 and annual saving from $30-70 of small-scale farmers has been achieved in two districts in Uganda with environmentally friendly practices.

INTRODUCTION

Sustainable agriculture is the successful management of resources in agriculture to satisfy the changing human needs while maintaining or enhancing the quality of environment and conserving the natural resources (CGIAR 1978). The concepts of sustainable agriculture are:

i. Ecologically sound. The quality of natural resources is maintained. Local resources are used in way that reduces loss of nutrients, biomass and energy and minuses pollution
ii. Economically viable. Farmers can produce enough for self-sufficiency and /or income and gain sufficient returns to warrant the labor and costs involved.
iii. Socially Just. The resources and power distributed in such a way that basic needs of society are met.
iv. Humane. All forms of life (plant, animal) are respected.
v. Adaptable. Rural communities are capable of adjusting to constantly changing conditions for farming. This involves development of new, appropriate technologies (Coen et al 1992).

Using Low External Input Sustainable Agriculture (LEISA) most inputs originate from the local farm, village or region and deliberate action is taken to ensure sustainability. The Ecological principles basic to LEISA are:

i. Securing favorable soil conditions for plant growth particularly managing organic matter and enhancing soil life,
ii. Optimizing the nutrient availability and balancing the nutrient flow, particularly by means of nitrogen fixation, nutrient recoiling and complementary use of external fertilizers,
iii. Minimizing the losses due to plant and animal pests by means of prevention and safe treatment,
iv. Minimizing losses due to flows of solar radiation air, water by way of micro-climate management water management and erosion control (Coen et al 1992)

Non Government Organizations (NGOs) build local capacity through community education enable the local people conceptualize and articulate their needs within the wider political and economical structure of the region, promoting self reliant economic activities through provision of credit, inputs, market facilities. NGOs are often concerned with identifying, testing, adapting, and disseminating locally appropriate technology (Coean et al 1992). NGOs are becoming increasingly involved in devising the new participatory methodologies for technology development and extension specifically tailored to the needs of small-scale farmers (Farrington and Amonok 1990). Numerous NGOs have successful worked with small-scale holders to develop appropriate agricultural technology (Bunch 1985, Gubbels 1988). Participatory (or People) technology development (PTD) refers to approaches that aim at strengthening local capacities to experiment and innovate. PTD in agriculture is not a substitute for station-based research or scientist managed on farm trials. PTD is a path to LEISA. It builds upon farmers' knowledge and agricultural practice and encourages the optimal use of locally available resources, external knowledge, and external inputs where applicable and available. PTD activities involved identification and use of indigenous technology knowledge, reconstruction of successful local innovation, critical analysis of community manages changes in the agro-ecological system (Coen et al 1992). Peasant agriculture, poor crop management practices and poor soil and water conservation to recent surveys (Benkunda 1999) characterize farmer practices in Uganda, Many farmers in various parts of the country have reported decline in soil productivity on the farms.

Study Area

Luwero and Mpigi districts are located in central Uganda in the Lake Victoria Basin. The basin has bimodal rainfall (March – May and August-November) averaging 1125 to 1250mm. The mean annual temperature is 27.5 to 30 degrees centigrade. Crops grown include banana, coffee, maize, beans, passion fruit, pineapple vegetables, etc. Cattle, pigs,

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and poultry are commonly kept livestock. The average farm has 2.0-2.5 acres. The average annual household income was US$ 280 and annual savings estimates at US $ 30. The level of performance of government extension was far from satisfactory due to lack of funds and lack of motivated staff. This has led to initiation of many NGOs in Uganda and particularly Luwero district given the effects of civil war. Volunteer Efforts for Development Concerns (VEDCO) continued commitment to the project area was due to the inadequate smallholder farmer's access to Government services.

BACKGROUND TO THE PROJECT

The core problem was low production, which led to low household incomes and subsequent poor health, high level of school dropout and lack of adequate saving for productive investment. The major problem identified that limited production was identified to be inadequate agricultural skills, poor returns from marketed agricultural produce and lack of access to capital. As a response to farmer's plight, VEDCO implemented the Integrated People Centered Development Program from 1996 to 1999 with support from German Agro-Action and Nerthlands Organization for International Development cooperation (NOVIB). In order to address these problems VEDCO defined the overall program goal as promotion of sustainable increases in household incomes of small holders farmers and expansion of the farmers organization capacity. This would foster economic growth and development in Katikamu county and neighboring areas (for sustained household food security and profitable income generation). Participatory Rural Appraisal were conducted to update the requirement of the target group (farmers with less than 5 acres of land) in production and marketing. The problems related to agricultural production were poor agricultural practices, environmental degradation, poor planning for the market, high expenditure in agriculture, cultural suppression of women, poor land distribution and high population.

STRATEGY

VEDCO created component to address the farmers' problems such as training unit (TU) to strengthen the internal organization of self-help producer groups for self-reliant development. Activities included social mobilization, leadership development, and saving education as well as gender development. Agricultural Extension and Sustainable land use (AESL) was created to develop agricultural skills and practices of smallholder farmers on locally sustainable basis for food security, marketable production, and land management. Rural Credit finance Scheme (RUCREF) was created to provide investment credit for viable income generation. Activities included group saving mobilization, technical support to saving and credit entities as well as revolving credit fund. Marketing Organization Strengthening (MOS) was created to enable smallholder farmers' monitor their food security and engage in profitable sale of surplus produce. Policy advocacy and Networking was created to empower small holders' skills to influence policies of local government and financial institutions. VEDCO addresses poor agricultural practices and environmental degradation by providing knowledge and skills in LEISA through agricultural extension. The LEISA concept focuses on farming system in an integrated approach including crop production, animal husbandry, agro-forestry, and water management in sound with the environment. The Agricultural extension approach followed PTD concepts. The Agricultural a Extension and Sustainable Land-use (AESL) component carried out agricultural trainings, on farm visits and training local agricultural advisors called Rural Development Extensionst (RDEs) in collaboration with the Government extension workers.

METHODOLOGY

Participatory Rural Appraisal (PRA) sessions were held with self-help groups to analyze social, economic, and ecological environment and were based on farmers' indigenous knowledge. (Coen et al., 1992). These were situational analysis while needs analysis sessions were conducted before every training at the village level. Five-day on farm practical training were conducted for farmer leaders and 1 day training for technical back up to experimenting farmers. The 5-day training began with an introduction to sustainable agriculture and exposure visit to a farmer practicing sustainable agriculture. Soil fertility, soil and water conservation, banana, passion fruit and pineapple establishment and management followed. On the last day, the farmers drew work plans for on farm visits, carried out by VEDCO Agricultural staff and government extension workers on a weekly basis. Soil fertility session included making vegetation compost, liquid animal urine, Liquid cow dung manure, and plant tea. Soil and water conservation included making contour ridges using A-frame and planting elephant grass on ridges. Banana establishment included spacing, pruning, desuckering, mulching and application of organic pesticides and manure. Passion fruit management included spacing, pruning, and application of organic pesticides and manure. Pineapple management included spacing, mulching using coffee husks. Other sessions included planting calliandra as agroforestry. Calculating profitability using gross margin analysis (variable costs only thus excluding depreciation on inputs) of banana, passion fruit, and pineapples. Vegetation compost was made from locally available material such as animal, wood ash. Topsoil and rough vegetation plant material (dry and green). These were applied in sequence: Rough vegetation dry, green vegetation, cow dung, top soil, green vegetation ash to height of 1 meter above, depending on the farmer. Plant tea from green leaves of leguminous plants as beans, Soya, calliandra were placed in a drum of water for 2 weeks thereafter diluted with water with a ratio 1:2. Liquid animal urine was kept in a drum or jerrycan for 2 weeks with addition of ash. These were diluted with a ration of 1 jerrycan of urine to 2 jerrycans of water for soil fertility. Ash was added to all manure. Nutrient flow on farm system was emphasized between crops, animal, and agro-forestry during the training and in extension messages in agreement with scones and Toumin (1999). During the training and after on-farm demonstrations were set for adoption of other farmers. Local agricultural Advisors called Rural Development Extensionist (RDE) were trained for farmer-to-farmer

extension network. The RDEs carried out farmer-to-farmer extension in sustainable agriculture to their group members and non-VEDCO members. VEDCO extension workers and government extension workers provided technical support to RDEs on bi-weekly basis in agreement with Haverrkot et al. (1988). There was intensive monitoring of the on-farm demonstrations. Organic pesticides from local material such as marigold, chilies, tobacco, and lantana camara were crushed and stored for 3-8 days or boiled for less than 30 minutes before soapy water was added.

RESULTS

There has been control of soil erosion on small holders' farms under the Integrated People Centered Program implemented by VEDCO. The soil fertility has improved greatly enhancing production of banana, passion fruit, and pineapples. The yields for banana were 0-1 bunch per week, passion fruit less than a tin per week, 0- 5 pineapples per week before the intervention. The yields after the intervention were as below. The average yields for bananas was 3 bunches per week for quarter acre and 5-6 punches for half-acre. The bunches weighed 20-30 kg. The yield was 3 tons yr^{-1} for quarter-acre, giving 30 tons ha^{-1} yr^{-1}. Most homes consume 1-2 bunches per week depending on the family size and the rest is sold. The average yield for pineapple was 15 pineapples per week for quarter-acre. A pineapple weighed 2-3kg. This gave 1.5 tons yr^{-1} for quarter-acre, giving total of 15 tons ha^{-1} yr^{-1}. The average yield for passion fruit was three tins per week for quarter-acre, thus 12 tins per month for quarter-acre. A tin averages 15 kg. Farmers sell the passion fruits in tins in rural parts of Uganda. They average 2 tons yr^{-1} for quarter-acre, hence 20 tons $ha^{-1}yr^{-1}$. Some are sorted for export market and the remainder sold to local markets. These were grated passion fruits, which farmers accessed from VEDCO Nursery. One kilogram of sorted passion fruit is worth $ 0.70. Most on-farm demonstrations were a quarter-acre for passion fruits and pineapples, but for bananas, some farmers attained a half an acre. Some of the yield was eaten at household level. The soil loss was 90 tons ha^{-1} yr^{-1} for bare land, 44 tons ha^{-1} yr^{-1} for intercrop, and 55 tons ha^{-1} yr^{-1} for maize monocrop (Majaliwa-Mwanjalolo, 1998). The soil loss was 7-10 tons ha^{-1} yr^{-1} with control of soil erosion using contour ridges (personal communication with Majaliwa). On farm support and on farm demonstrations (Table1) have enabled the adoption of the technologies. The food security situation has improved to the extent that some farmers sell surplus banana. The production of pineapples and passion fruits has increased. There are both local and export market for passion fruits thus household incomes improved. The farmer-to-farmer extension network (Table1) has benefited non VEDCO farmers as well as having multiplier effect in agreement with Feder and slade (1985), Mavedzenge et al (1999). Having farmers in self-help groups has enabled adoption of technologies and diffusion enhancement in agreement with Mavedzenge et al (1999). The household annual incomes have increased from $280 to $380-500 and annual savings have risen from $30-70. The innovators have acquired motorcycles, better housing, paid school fees, and acquired livestock such as cattle, pigs. The pesticides were preventive not curative.

Table 1.

Activity	1996/1997	1997/1998
Number of Registered farmers with VEDCO' Agricultural Extension and Sustainable land-use(AESL)	-	300
Number of Participatory Rural Appraisal (PRA)	21	28
Number of on farm demonstrations	12	43
Number of practical training	66	38
Number of on farm visits	165	277
Number of farmers operating farmer to farmer network	8	8

Criteria for farmers registered with VEDCO was not yet established although the training were taking place for 1996/1997. Most of the training in1996/1997 were one-day training and some in 1997/1998. The Program continued through September 1999.

DISCUSSION

The application of organic manure was sufficient for acreage below one acre as well as the amount of liquid manure, vegetation compost and coffee husk was affordable for small holder farmers. As the farmers increased the acreage, the quantities needed were high and could not be obtained. One-time application of chemical fertilizers could boost the productivity (Bekunda, 1999). The investment costs for passion fruit have hindered the adoption rate. The poles and wire were costly for one to establish one acre of passion fruits. The cost of coffee husk and cost of planting material have affected increased production of pineapples. One time application of chemical fertilizers could boost production. The Export market for organic products is on increase due to a liberalized economy (Background to the Budget, 2000). VEDCO is yet to adopt a comprehensive monitoring and evaluation process to obtain up to date data on households. No developing country has in place a national monitoring system for soil quality (Scherr, 1999). Most households are peasant farmers that do not invest in soil analysis as opposed to commercial farming common in developed countries and not on large extent in Uganda. Commercial farmers prefer to know the nutrient content of their soil. In Uganda, soil laboratories are found at Makerere University and Kawanda Agricultural Research Station. Both are located in Kampala and in its neighborhoods. The last updated literature about soil of Uganda was done in 1970 (M.M. Tenywa, personal communication). Scherr (1999) reviewed that researchers trying to assess soil quality have used approximate measures such as consultation with experts who were long familiar with particular regions and provided a ranking or qualitative assessment of the scale and process of degradation within the region (Oldeman et al., 1991), extrapolation of results of case studies, field experiments and other micro- and watershed level data to national level (Bojo. 1996), Review and comparative evaluation of published studies on degradation from many different sites within the region (Lal, 1995), estimates constructed from examination of secondary data on land use change (Rozanov et al., 1990) .Construction of contour

ridges is labor intensive. The women have had to hire labor or use the boy child. This has had an effect on the adoption of the technology. The land tenure has not encouraged some small holders to increase the acreage under cultivation in agreement with Scoones and Toulmin (1999). Ash provided the essential nutrients such as potassium, sodium, calcium, and magnesium according to sample analysis carried out by VEDCO. The Provision of nitrogen from animal dung (cattle, poultry, rabbits, goats) in combination with ash gave plants the macronutrients such as NPK as in agreement with Bekunda (1999). Each nutrient enhanced uptake of the others (Brandy, 1990). The Economic aspect of the approach has induced more farmers to adopt the innovations. There has been increase in household incomes because of the economic benefits this is in agreement with Scher (1999). The proportion of Ugandans in consumption poverty fell from 56% in 1992 to 35% in 2000 and average real consumption per capita grew by 22%. Average incomes grew faster in regions such as central Uganda (Background to the Budget, 2000-2001). The organic pesticides could not cure fungal and intensive entomological attacks. There is need for supplementary use of chemical insecticides and fungicides.

CONCLUSION

There has been successful control of soil erosion, improved soil fertility management. The adoption of technologies has been enhanced by farmer-to-farmer extension networks, on farm demonstrations, and on-farm visits in agreement which agrees with Chamber et al. (1989). Emphasis on profitability of enterprises has facilitated implementation of technologies.

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