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Assessing the potential of mushroom cultivation in improving household incomes of smallholder farmers

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Abstract

Mushroom cultivation technology was introduced in Kyanamira sub-county, Kabale District as a strategy to relieve pressure on land, increase farmers' incomes and food security. This is because mushroom growing utilizes agricultural residues as substrate and requires little land as it is done intensively indoors. This study, therefore, aimed at introducing, promoting and assessing the impact of mushroom growing technology on household incomes of small scale farmers in Kabale. The study was carried out in Nyabushabe and Kyanamira parishes in Kyanamira sub-county, Kabale district. Sixty farmers from the two parishes were interviewed twice: at the beginning and at the end of the project. Thirty of these were selected, trained and provided all inputs for mushroom production. The study concluded that mushroom growing, which ranked favourably among major income sources, has a potential to be a leading alternative income source besides the traditional crops. There is widespread knowledgeable and appreciation for edible wild mushrooms. There was ready market for mushrooms which could increase with awareness creation. The technology had some impact on gender relations. Mushroom growing requires less and has therefore not added to their labour requirements. Women were the main mushroom growers so could easily influence the decision to grow mushrooms. Income from farm was controlled by women. The study recommends the continued promotion of mushroom growing as an alternative income source to reduce the devastating effects of land shortage and soil exhaustion.

Key words: Agricultural technology, Market for mushrooms, Uganda.

Introduction

Kabale is one of the most densely populated areas of Uganda with a population of 417,218 people (Mugisha, 2002). This has exerted a lot of pressure on farm land resulting into reduced agricultural productivity, low incomes and increased food insecurity in the district. This directly threatens the livelihoods of the people who are primarily dependent on agriculture for survival. To improve quality of life in this area, this action oriented research was initiated to address problems associated with land shortage and poor soils due to the ever increasing populations.

Mushroom growing, which is an intensive enterprise that requires little land space, earns high income, and provides source of food was introduced to alleviate this problem. It was expected that mushroom growing in Kabale District would reduce pressure on land, increase farmers' incomes and improve food security. Mushrooms are macro-fungi highly valued for their nutritional and medicinal properties. Since time immemorial, mushrooms have been considered a special food delicacy for kings, warriors or gods. Scientific research has shown that edible mushrooms are highly nutritious in terms proteins they contain (15-45% on dry matter basis), vitamins and minerals. They also contain high quality fats, and low carbohydrates and cholesterol. This makes them ideal to people who want to trim weight (Qumio *et al*,. 1990).

Despite the global interest in consumption of consumption of natural health foods and the nutritional and medicinal values, mushroom development in Africa and particularly in Uganda has stalled. In Uganda, mushroom cultivation was introduced in 1990. Since then, there has been an increasing demand for cultivated mushrooms, especially among the elite. Hence its introduction was expected to provide a great opportunity for the locals to raise their incomes. To meet the increasing demand, mushrooms are still being imported albeit costly from South Africa and Britain.

Mushroom growing utilizes agricultural residues as substrate and requires little land as it is done intensively indoors. The climatic conditions in Kabale are suitable for the growth of a wide range of mushroom species. Given these conditions, farmers in the area could easily adopt this technology relative to the low land areas. Promotion of mushroom cultivation technology could relieve pressure on land, increase farmers' incomes and food security, and uplift the status of women in the household as far as decision-making is concerned.

Besides scanty information on indigenous edible wild mushrooms, there have been no attempts made to domesticate or preserve them. These wild mushrooms are fast disappearing from their habitats due to environmental

degradation. The population is missing out on the biodiversity they provide, including their nutritional and medicinal values. Indigenous knowledge of the medicinal mushrooms is at risk of extinction it is passed on from generation to generation by medicine men. There is therefore, an urgent need to document this indigenous knowledge on mushrooms. The cultivation of Mushrooms in Uganda has raised awareness and concern among the population about how fast the wild edible mushrooms are disappearing from the environment.

The overall objective of this study was to introduce and promote mushroom production and assess its impact on household incomes and household dynamics in Kyanamira Sub-county, Kabale district. Specifically, the study sought to establish local knowledge about edible mushrooms; assess the change in household dynamics of the participating households due to mushroom growing; and determine changes in income of participating households as a result of mushroom growing.

In line with the Plan for Modernization of Agriculture (PMA) that aims to transform agriculture from subsistence to market oriented commercial agriculture (MAAIF, 2000), mushroom growing is one of the enterprises that would fit well in this plan as it uses agricultural wastes and needs less land space, thereby avoiding further environmental degradation. Mushrooms cost a higher price per kilogram and per unit area than any other agricultural enterprise in Uganda. Furthermore, mushrooms can easily be produced by women without leaving their homes and other household chores.

Methodology

The study was carried out in Nyabushabe and Kyanamira parishes both of which are parishes in Kyanamira sub-county, Kabale district. Kyanamira sub-county in Kabale district was selected because is one of the most land-constrained areas in the district, whose soil has been eroded and exhausted due to over cultivation without the use of manures and fertilizers. Over cultivation in the area has led to the digging up of terraces and "*hinga raza*" which were formerly enforced to prevent soil erosion. The soil exhaustion problem has further been exacerbated by soil erosion that has left the hills bare. Extensive deposition in the wetlands and valleys has made these areas very attractive for reclamation and farming, leading to further environmental decline.

Sampling

The target population consisted of all farmers in Kyanamira Sub-county. Baseline information was obtained by interviewing 60 randomly selected farmers in two parishes of the sub-county. The information included current economic activities, incomes, and the gender relations in the families.

After preliminary analysis, 30 of those interviewed during the baseline survey were selected for an in depth study on household incomes and household dynamics. To these, mushroom cultivation was introduced by training them; inputs for its production provided and demonstrations established. Of these farmers, 15 were from Kyanamira and an equal number from Nyabushabe parish. Selection was based on two conditions: willingness to grow mushrooms and possession of basic facilities (such as a room and substrates) to carry out the project. The research team inspected these facilities during the individual interviews which were held either in farmers' fields or homes. The trained farmers were supplied with free spawn for the first six months to produce mushrooms as a group.

Data collection

At baseline, the two researchers interviewed 60 individual farmers. Respondents were interviewed wherever they were found, mostly in their homes and fields. The interviews were to document the local knowledge and appreciation of edible mushrooms, local varieties available and market opportunities (for both local and cultivated mushrooms). More information was collected on sources and amount of income, gender relations and issues (household incomes and dynamics).

During the implementation and monitoring stage, the 30 selected farmers were trained in mushroom growing technology in a two day training in each parish that included practical demonstration and hands-on learning by participants. The trainees were then provided with seed materials to start pilot projects. The research team made monthly visits to these demonstration sites to collect data on the number of people taking up the technology, scale of production, yield, use, and household incomes. Data was mainly collected through observations and group discussions.

During the monitoring stage, farmers were mobilized for the follow up training. Ten weeks after training, the research team conducted a training seminar in trouble shooting and post harvest handling, processing, preservation and marketing. At the end of the study, an evaluation was carried out using participatory structured interviews, observations, informal interviews and group discussions to collect data on changes in income, and household dynamics among mushroom growing homes.

Data analysis

Quantitative data from individual interviews were coded and analysed using Statistical Package for Social Sciences (SPSS) and excel. The data was analyzed and presented using mainly percentages and frequencies. T-test was used to compare incomes and household dynamics before and after the project. Pie charts were used to present some of the findings from gender analysis. Qualitative data mainly from group discussions and observations were organized and grouped according to the key areas of interest. This way, issues that emerged consistently were more readily identified and interpreted.

Results and discussions

Local knowledge on edible mushrooms in Kyanamira sub-county

When asked about types of wild edible mushrooms, farmers mentioned three mushrooms: *ebituzi* (56.7%), *obunege*ri (48.3%) and *ensabire* (58.3%). They described *ebituzi* as big in size and brown in color. Whereas *obunegeri* was described as white and small, *ensabire* was identified as brown and small. Therefore, there was widespread knowledge about existence of these wild mushrooms. About the habitat for the mushrooms, farmers mentioned that obunegyeri and ebituzi grow any where during the rainy season. Unlike the other two types, ensabire grows any where in any season during the year.

Although the focus of the study was on edible wild mushrooms, farmers readily referred to *ebijege*, a wild type of mushroom that can not be eaten. They described this mushroom in contradicting ways. Some farmers said it is brown whereas others maintained that it is white. However, they seemed to agree one characteristic, that the mushroom is big. They also mentioned that the mushroom grows only during the rainy season. The mushroom grows in wet areas, bush, and rotting tree trunks or under trees.

Availability of wild mushrooms now and in the past

Majority (70%) of the respondents interviewed said that wild mushrooms are rare now than before. About 5.0% of the farmers think there has not been any change wild mushroom availability (Table 1).

Knowledge on cultivated mushrooms

Up to 70% of the respondents agreed that they had heard about cultivated mushrooms during the time of the survey. When asked about the benefits of cultivating mushrooms, many of the respondents (41.7%) had no idea how they would benefit from cultivated mushrooms, 25%, 18% and 15% of them thought mushrooms could be eaten, sold and both eaten and sold respectively (table 2).

These are indications that mushroom growing is a potential source of income, particularly for the farmers with small plots of land in this highly populated area.

Problems associated with mushroom cultivation

Majority (66.7%) of the respondents believed there were no problems that could affect mushroom production. Despite the apparent benefits farmers cited in mushroom production, some potential mushroom farmers have remained highly sceptical citing various problems (Table 3). About 8.3% of the respondents mentioned expenses incurred particularly in spawn purchase as a hindering factor. Others have mentioned lack of knowledge (6.7%) and information (5.0%).

Some of the respondents went ahead and advanced solutions to their perceived problems associated with mushroom production (Table 4). They suggested training for extension workers (5.0%) and farmers (8.3%) who have money to invest mushrooms.

Household dynamics in families before and after the project

A brief gender analysis was undertaken during the individual interviews to reveal connections between gender relations in households and mushroom production. This was intended to establish if gender relations is likely to have an impact on mushroom growing and give an indication of the likely impact. The research team asked a series of questions mainly concerning who owns what resources, who controls what and finally who benefits from what activity.

Who controls household income?

The respondents (41.7%) mainly believed that it is the women (wives) who control household income (table 5). However some (23.3%) of them said both couples control income. About 16.7% of the respondents think its men (husbands) who control incomes at home.

Who allocates work in the household and farm?

Women (68.3%) have been identified to be behind work assignments within the household in the area (Table 6a). This follows a similar work allocation pattern in the farm. Respondents (58.3%) interviewed also identified women to be the ones allocating work in the farm (Table 6b). Men have been seen to be more active in the field than in the household in making decisions on what to do. About 18.3% think men allocate work on the farm compared to 13.3% in the household. This means women are responsible for both household and field work.

Who does household and field work?

Most of the respondents (45%) said everybody at home is involved in field work (Figure 1). The greater part of the field work is done by women (25%) and children (25%). Very few (5%) of them think men are the ones doing farm work.

As for household work, every body is involved in one way or another (46.7%). However, women still do more of the work (23.3%) than men (1.7%). The rest of the details can be viewed in Figure 2 above.

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Who collects mushrooms?

There is a general belief here that men are not supposed to collect mushrooms. It is one of those activities demeaning to men. This was confirmed by the majority of the respondents (78.3%) who said it was women and children collecting mushrooms (figure 3). Some respondents (11.7%) think children are responsible for mushroom collection. Men (6.7%) have a negligible contribution towards mushroom collection.

Table 1. Availability of wild mushrooms now and in the past

Comment	Number of farmers	Percentage
No idea	8	13.30
More than in the past	9	11.70
Rare now than before	42	69.90
Same as before	3	5.00

Table 2. Perceived benefits of cultivating mushrooms by farmers

Benefit	Number of farmers	Percentage
No idea	25	41.7
Eaten	11	18.3
Eaten and sold	15	25.0

Table 3. Problems associated with cultivated mushrooms as cited by farmers

Problem	Number of farmers	Percentage
No problem	40	66.70
Expensive	5	8.30
Lack of seed/inputs	2	3.30
No extension for mushrooms	3	5.00
Drought	1	1.70
Marketing	1	1.70
Lack of knowledge	4	6.70
Lack of information	3	5.00
Processing/drying	1	1.70

Table 4. Suggested solutions to problems associated with cultivated mushrooms

Problem	Number of farmers	Percentage
Providing loans	3	5.0
Training extension workers	2	3.3
Train people with money to invest	5	8.3
Hire labour	1	1.7

Table 5. Control of household income

Who controls income	Number of farmers	Percentage
Men (husbands)	10.00	16.70
Women (wives)	25.00	41.70
Both men and women	14.00	23.30
Children	3.30	5.00
Relative	2.00	3.30
Women (Wives) and girl child	2.00	3.30

Table 6a. Work allocation in the household

Who allocates work	Number of farmers	Percentage
Men	8	13.30
Women	41	68.30
Both men and women	6	10.00
Children	2	3.30
Relative	3	5.00

Table 6b. Work allocation in the farm

Who allocates work on farm	Number of farmers	Percentage
Men	11.00	18.30
Wife	35.00	58.30
Both men and women	7.00	11.70
Children	3.00	5.00
Relative	3.00	5.00

Who cultivates mushrooms?

This had never been done in this area before, the majority (75%) of the respondents had no idea about who could cultivate mushrooms. However, 15% of them thought it would likely be the women to do that. This is yet another indication that mushroom growing is largely seen as a women activity.

Change in household dynamics

In the main, there was negligible impact of mushroom growing on household dynamics. However, a comparison of the brief gender analysis findings revealed some significant differences ($P<0.5$) allocation of work in households and mushroom cultivation (Table 7). Meaning that many more women have been able to take part in decisions regarding land use and allocation of who does what work in households. A positive change in attitudes about mushroom cultivation has been observed because during the baseline survey, some respondents (15%) thought it would be women likely to grow mushrooms. However, in the final survey up to 40% actually said women are the ones cultivating mushrooms.

Mushroom growing is largely viewed in Kabale District as a women activity. This attitude has been reinforced by cultural set up in which men who attempt to collect wild mushrooms are stigmatised. "I can not collect mushrooms. Even if I have discovered some, I just sent children because men are not supposed to do that" was the response from a man in Nyabushabe parish when asked if he can collect mushrooms. Some men have however said when it comes to cultivated mushrooms, it is a different matter altogether.

Changes in household income as a result of mushroom growing

During the individual interviews, farmers were asked to rank their sources of income (Table 8). Mushroom growing was ranked favorably as an income source among eleven enterprises. This was a positive indication given that it was just the beginning of the second year after its introduction. By the end of June 2003, all members had conducted individual trials, and nine of them had earned money, ranging from five thousand to nine thousand shillings a month. This amount was in addition to the group dividends (money from joint mushroom project) of one thousand five hundred shilling for each member during the first quarter of the year.

It should be noted that establishment of farmers' income from each of these enterprises was difficult. Records of crop sales and yield were scarcely available. However, an attempt was made to determine the amount of income from some of the income sources (Table 9). Sorghum tops the list with 76.7% of the farmers at least earning from it at the end of the mushroom growing project. A crop that is widely grown and sold is sweet potatoes. All the respondents claimed to have earned some money from it at the beginning of the project and 66.7% earned at the end of the project. More people seemed to have joined the poultry business because initially it was not among the major income sources but at the end, 15% of those interviewed got earnings from the enterprise. Maize, beans and bananas which were mentioned among the top enterprises initially were dropped at the end. Continued decline in the production of these crops will negate mushroom production which heavily depends on residues from them.

Market for mushrooms

There was ready market for both fresh and dried mushrooms in and around Kampala. The researchers linked project participants to Horizon bus services so that they could easily transport their mushrooms to Kampala. It was noted that the mushroom growers should step up their production if they are to satisfy a steady market. The problem here was not lack of market but sustaining supply of mushrooms.

Conclusions

Mushroom growing has a potential of increasing income for the communities in Kyanamira sub-county. Within a period of seven months, mushroom production ranked favorably among the major income sources for farmers. There is already widespread knowledge on wild edible mushrooms in Kyanamira. There were three well-known wild edible species and one cultivated one, *Pleurotus ostreatus*, with several strains. All those who were interviewed eat and appreciate mushrooms.

About household dynamics, all the farmers interviewed use family labour and communal labour in their fields. Very few use hired labour. Mushroom growing requires less labour and has not added to their labour requirements. Nobody hires labour for mushroom growing, they all use family labour. Household work is mostly done by women and children. Decisions on land use are made by women. Income from the farm produce is mostly controlled by the women. Farm and household work is allocated by women. Women are the main

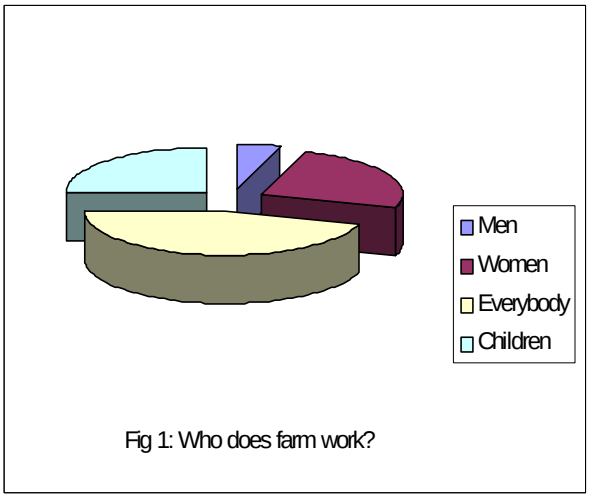

Fig 1: Who does farm work?

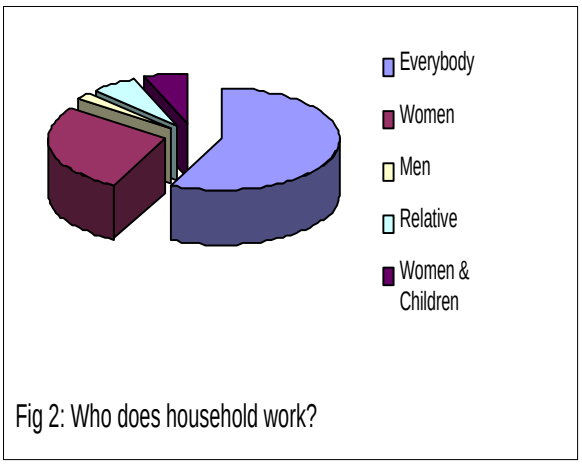

Fig 2: Who does household work?

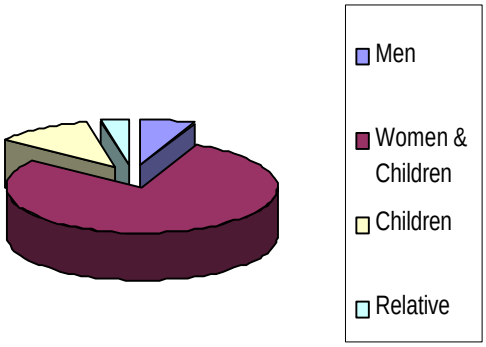

Fig 3 Who collects mushrooms?

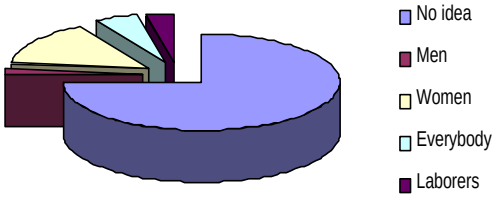

Fig 4: Who cultivates mushrooms?

Table 7. Household dynamics before and after the project compared

Role	Baseline survey	Final survey	t-value
Land ownership	4.850 (0.917)	5.150 (0.799)	-1.910
Control of produce	5.100 (1.39)	5.170 (1.404)	0.262
House hold work allocation	5.450 (1.126)	5.883 (0.450)	-2.764
Field work allocation	5.267 (1.191)	5.183 (1.308)	0.365
Cultivation of mushroom	1.317 (2.347)	2.567 (2.970)	-2.560
Control of income	4.650 (1.730)	4.380 (1.470)	0.910
Collecting/harvesting	4.470 (1.610)	4.130 (0.596)	1.500

Table 8. Farmers' major income sources

Enterprise	Percentage of farmers ranking in order of importance				
	1st	*2nd*	*3rd*	*4th*	*5th*
Sorghum	46.70	23.30	8.30	1.70	0.00
Sweet potatoes	5.00	26.70	3.00	1.70	1.70
Potatoes	8.30	26.70	11.70	1.70	1.70
Poultry	6.70	5.00	5.00	1.70	1.70
Brick laying	18.30	0.00	0.00	0.00	0.00
Off-farm employment	8.30	1.70	0.00	1.70	0.00
Mushroom	0.00	0.00	5.00	6.70	6.70
Cattle (milk)	0.00	3.30	0.00	1.70	0.00
Trade	1.70	0.00	0.00	1.70	0.00
Craft	0.00	1.70	0.00	1.70	0.00
Vegetables	0.00	0.00	0.00	1.70	0.00

mushroom growers so can easily determine the decision to have mushroom growing as an alternative to other farm activities. Wild mushrooms are collected by women and children and so they are more knowledgeable about them. They, therefore, have been the first to adopt the mushroom growing technology.

The major income source for households was crop production, mainly sorghum, sweet potatoes and potatoes. Off-farm employment, petty trade, sweet potatoes and brick making were some of the supplementary sources of income mentioned. Now mushrooms have become an additional source of income, superceding some of the traditional income sources above. Market for mushrooms is available; it is the production that is still limited. Drying of mushrooms at small scale level of production can be done without use of expensive equipment like solar dryers.

Recommendations

Efforts to promote mushroom growing in Kyanamira should continue in order to diversify and lessen the devastating effects of land shortage and soil exhaustion. Owing to the relatively high start up costs, poor farmers growing mushrooms should not only continually be assisted in marketing their produce but also in ways to subsidize production costs. Not all farmers can qualify for this assistance given the nature of the enterprise, which need commitment and willingness. More people should be trained about the nutritional and medicinal values of mushrooms to boost consumption levels. This awareness creation can increase market for the producers as well as improve health of the poor.

Furthermore, men should be encouraged and involved in mushroom growing so as to reduce the work load of women and children. A study on domesticating the three indigenous edible mushrooms that are fast disappearing from this area is recommended in order to preserve biodiversity and explore alternative ways to produce mushrooms cheaply. Further training of mushroom growers in spawn making, storage of substrates safely till the next season and business management skills would greatly increase production.

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