

Full Length Research Paper

Assessment of factors influencing smallholder farmers' adoption of mushroom for livelihood diversification in Western Kenya

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Poverty is a critical issue in developing countries. It has become almost impossible to carry out any profitable agricultural production as a means of livelihood diversification in areas with small land acreage. Therefore, there is need to identify enterprises that can be incorporated into small holder farmers' production processes. This study assessed the factors that influence small holder farmers' adoption of mushroom for livelihood diversification from a sample of 240 smallholder farmers in Vihiga County in Western Kenya. Both descriptive methods and a binomial logit model were applied in the analysis. Results indicate that about three quarters of the farmers in the area were aware of mushroom production in the area and four fifth of them were willing to engage in mushroom production as a livelihood diversification option. Empirical results indicated that marital status, formal education, group membership, consumption of mushroom, availability of market for mushroom in the area, previous involvement/experience in mushroom production and total land acreage had a positive effect on farmers' awareness of mushroom production. Age, gender, awareness level, consumption of mushroom and total land available had a positive effect on the farmers' willingness to engage in mushroom production.

Key words: Poverty, land constraint, livelihood diversification, mushroom production.

INTRODUCTION

Agriculture can be used to deliver an annual economic growth rate of 10% in Kenya, if the right policies and framework are put in place (UN, 2000). This can be achieved through diversification to high value crops and transformation of the smallholder agricultural sector from subsistence to an innovative and commercially oriented sector. The World Bank (2007) identifies three key areas

where improvements are critical if strong economic performance is to be sustained; infrastructure, agricultural productivity, and the investment climate. Diversification of rural livelihoods is the subject of scientific research because income from farming has come under pressure due to population explosion (Barrett et al., 2001). Rapid population growth and subdivision of land has also

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resulted in small land acreage leading to a concern that contribution to household incomes from agricultural activities may no longer be meaningful (Marenya et al., 2003). Governments throughout the developing world have for many years had a keen and sustained interest in diversifying their rural economies and the economic activities of rural residents (Delgado and Siamwalla, 1997). Households combine and explore diverse strategies to act, cope and adapt to fast-changing local and regional drivers (Valbuena et al., 2015).

Ellis (1998) defines livelihood diversification as the process by which rural families engage in different activities and social support capabilities in order to improve their standards of living. This is the phenomenon where rural households engage in multiple activities in order to survive and to improve their standard of living. These activities are either on-farm or off-farm and it includes both agricultural and non-agricultural activities. On-farm diversification includes the introduction of new crops into farming systems or farmers investing in livestock, hunting, and fisheries. This is distinguished from 'off-farm' activities which generally refer to activities undertaken away from the household's own farm such as wage employment on other farms (Ellis and Freeman, 2005). Livelihood diversification is a serious long term issue for policies concerned with reducing poverty in low income developing countries. However, farmers in rural areas in the developing countries are most vulnerable because of their lack of access to education, longer distance from markets to their homes, their low wealth status and small household size and may have the fewest opportunities to diversify in spite of the acknowledged importance of diversification as a strategy to accumulate income for consumption and/or investment and to spread risk (Ellis, 2000).

Generally, from the perspective of managing risk and associated vulnerability of rural households, and in some cases from a desire to increase incomes, farm diversification makes sense as a policy goal (Kimenju and Tschirley, 2009). Better off rural households may diversify their farming practices and their non-agricultural employment to balance risks of possible market failure where the economy lacks adequate insurance mechanisms (Von and Pandya-Lorch, 1991; Ellis, 1998). Diversification is one strategy that smallholder farmers may employ to reduce their vulnerability in the face of global environmental change (Paul et al., 2015).

Opportunities may arise, to significantly improve up an existing but considerably small activity, in response to a sudden change in circumstances. Developing more generic livelihood skills together with the provision of generic business services will improve individual abilities to identify and seize new livelihood opportunities in a range of sectors (Gordon et al., 2010). Household level diversification has implications for rural poverty reduction policies because the conventional approaches aimed at increasing employment, incomes and productivity in



Figure 1. A picture showing the rocky terrain and steep landscape in Vihiga County, Kenya.

single occupations, like farming, may be missing their targets. Household members especially from peasant families often refrain from adopting beneficial technologies and engage in production of low value crops that require extensive labor. This often results to them having to sacrifice quick monetary gains in favor of achieving long term sustainability of their livelihood systems (Stakhanov, 2010).

In low income countries in Asia, Latin America and Africa, people diversify their productive activities, sources of income, and households' resources to secure their wellbeing and/or to respond to a crisis. For instance, better off rural households may diversify their farming practices and their non-agricultural employment to balance risks of possible market failure where the economy lacks adequate insurance mechanisms. They also may diversify sources of off-farm employment to increase household income when the economy is improving. Poor farmers who cannot rely solely on agriculture commonly use off-farm income diversification as a form of self-insurance (Barrett et al., 2001). Chambers (1997) argued that poor people have to diversify sources of livelihood in order to survive in a risk-prone and uncertain world.

Decreasing land availability has necessitated research in new technologies that require less land for profitable agricultural production especially in areas where the existing farming practices have led to increasingly low production (Figure 1).

Mushroom in Kenya is one of the high value crops that can be grown alongside other crops as a diversification option for both small holder and large scale farmers. It is an important cash crop, though still mostly produced at a small-scale level within the country. Button (*Agaricus*



Figure 2. A picture of the local mushroom variety.

bisporus) and Oyster (*Pleurotus* species) are the two main commercially produced mushroom varieties in Kenya. A three square meter plot of land can produce up to 1,000 mushroom sets in small polythene bags. Harvesting can be done fortnightly with a kilo of mushroom going for as much as 800 Kenyan shillings. Use of idle structures, production all year round the first harvest being 28 to 35 days after planting the crop, use of agricultural waste as substrate and its ability to biodegrade offers opportunity for its production and this provides a more economical and environmentally friendly disposal system (Figure 2) (Isikhuemhen et al., 2000).

Kenya is yet to achieve rapid growth in incomes in rural economy and in the economy as a whole, and this can be done by first embracing agricultural transformation, where individual farms are to shift from highly diversified subsistence-oriented production towards more specialized production oriented towards the market or other systems of exchange (Kimenju and Tschirley, 2009). The current local mushroom supply of 484.5 tones is way below its demand of 1,200 tones necessitating importation. However, mushroom being an emerging crop limited research has been done on its use as a livelihood diversification option for farmers in areas where land is a constraint to production. Mushrooms have the potential to steer a country to achieve the MDGs of poverty and hunger eradication, improved health, improved environment and potential to boost the overall national economy (Gateri, 2012). However, limited research has been undertaken on mushroom to provide clear information about mushroom production and marketing (Odeno et al., 2012). This calls for the joint participation of players and all stakeholders in production, extension, research, policy and marketing in order to optimize the mushroom value chain (Figure 3).

METHODOLOGY

This paper is based on small holder farmers' survey data from a random sample of 240 farmers in Western, Kenya. The study used both qualitative and quantitative data collected in the survey. Part of the qualitative data was obtained from the focus group discussion which constituted farmers and an extension officer from the Ministry of Agriculture, through oral discussions. Data was also collected using semi-structured questionnaires which were administered to the households by trained enumerators who interviewed the farmers in their respective homes. The data collected included household characteristics, farm characteristics, farm enterprise investments and non-farm enterprise investments. However, there are some potential limitations in the data based on the fact that farmers in the study area kept very little records on their farm and non-farm enterprise activities and this meant that most of the data was based on farmers' memory recall. These limitations were overcome by engaging the farmers in lengthy discussions on their production over time. Different socio-economic characteristics were described using percentages and means that were obtained and graphs were used to describe their distributions. Binomial logit was applied in regression analysis for farmers' awareness of mushroom production and willingness to engage in mushroom production as a livelihood diversification option.

RESULTS AND DISCUSSION

Socio-economic characteristics

The average sampled household in the study area is generally led by a male with the average age of 30 years. Development programs being introduced in the area should mostly target the youth because most of the people currently living in the area are aged between 19 and 35 years. Sampled households in the area had an average of 5 members, this was attributed mostly to the fact the study defined a household as people living and eating in the same house. The largest sampled household

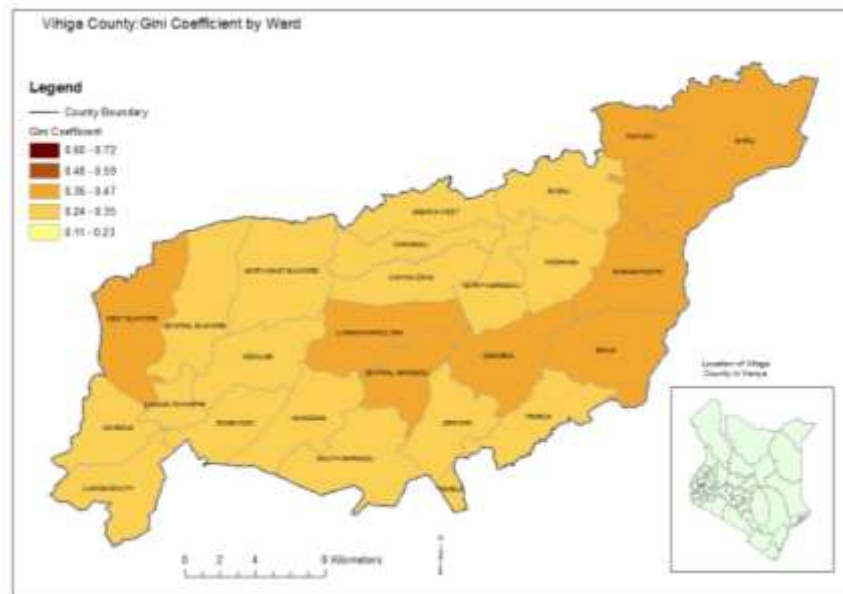


Figure 3. A map of Vihiga County Kenya.

in the survey had 11 members. The households with only one household member were either unmarried men or senior citizens who were living alone with the rest of their families living either in urban centers or further away from their current location in search of jobs or education. In all the households, the proportion of women in the household composition was lower than that of men. For the interviews conducted, most of the respondents were the heads of the households; this can be used to explain the high poverty levels because the household head that is mostly looked upon to provide for the family stays at home for lack of engagement in any productive economic activity. Only 58% of the household heads in the survey were married, with rest widowed, separated or divorced. Less than a quarter of the people interviewed belonged to farmer groups, attending an average of 4 meetings per year. A large proportion of the members in the households interviewed were farmers with an average of 1 acre per household.

A large percentage of the respondents were aware of mushroom production in the area (69%) though only 3% of them were mushroom farmers. Mushroom was being consumed by nearly all of the interviewed households. Less than 10% of the people currently not producing mushrooms have been previously involved in production but stopped mainly because of poor access to input and lack of credit. People who have not been involved in production were willing to start production mainly because of home consumption and income diversification because they were of the opinion that there is an existing market in the area, therefore it would be an alternative source of income for them and this would in turn improve their livelihoods. The major setback of information

dissemination in the area was that only the people in development groups obtained information directly from the source, all the rest received it through third parties.

The land allocated for maize production dropped in 2013, but went up greatly in 2014 most likely so as to increase production to cater for the needs of the increasing population but the production still continued dropping in the 3 years making it impossible to cater for the high population. Given that 40% of the households depend on farming as their main source of income, a lot of households were adversely affected by the decrease in maize production because it is the enterprise that is depended on mostly by people in this region. The results show there are challenges that call for policies that support alternative and more remunerative livelihoods that assist farmers exit the poverty web.

Results of the binomial logit regression model

The negative elasticity on age, gender, crop total, total livestock unit, and average acreage under maize production imply that a unit addition on any of these variables has a negative effect on the awareness of mushroom production (Table 1).

Age had a negative effect on awareness of mushroom production. This implies that the older the person was, the less likely they were aware of mushroom production in the area. This can be attributed to the fact that as people age they tend to be more risk averse hence are comfortable with their current portfolio and would not want to engage in any new ventures for the risks involved.

Table 1. Factors affecting farmers' awareness of mushroom as a diversification option.

Parameter	Coeff.	Std. Err.	Z	P> z
Age	-0.01	0.01	-0.78	0.44
Gender	-0.38	0.39	-0.97	0.33
Marital status	1.08	0.45	2.42	0.02**
Highest grade	0.64	0.41	1.56	0.12
Group membership	0.09	0.39	0.23	0.82
Consumption	2.88	1.69	1.70	0.09*
Mushroom market	1.69	0.41	4.11	0.00***
Previously produced mushroom	1.90	1.09	1.75	0.08*
Cropping land	-1.70	0.83	-2.05	0.04**
Total land	1.29	0.73	1.78	0.08*
Total Livestock unit	-0.03	0.13	-0.27	0.79
Log cash on food per week	0.70	0.33	1.99	0.05**
Log farming amount	0.28	0.14	2.03	0.04**
Average maize acreage	-2.40	1.36	-1.77	0.08*
Average bean average	0.60	0.92	0.65	0.51

*Significant at 10%, **Significant at 5% and ***Significant at 1%.

Gender had a negative effect. More women were more aware of mushroom production compared to men. This can be attributed to the fact more women are in development groups than men therefore women access production information more than men during their group meetings.

Married people are also more likely to be aware of mushroom production than single parents. This is because as they each goes about their day to day activities they meet different people therefore each of them has access to different information which they share when they get back to their homes.

The more educated the respondent the more likely they were aware of mushroom production. It can be viewed as the more educated a person is the more they are ready to learn therefore they get information on new production in the region and also in other regions. Also, the people who are in development groups were more aware than those not in groups because most group members get more information as they go for meetings and also most donors target groups for awareness campaigns and projects.

People who consume mushroom were more aware of its production in the area because they were either producing it or they purchase it for consumption, they were even aware of the people producing it in the area. Also people who had previously produced mushroom were more aware of its production in the area because they stopped production mostly because of lack of spawns.

People with larger pieces of land under crop production are more risk averse and are mostly producing what has previously been grown; maize and beans. People with smaller pieces of land are willing to try out new crops that

will enable them to get the most from their small pieces of land. They were more willing to grow crops that they eventually sell and use the proceeds from those sales to purchase maize because it is uneconomical for them to produce it under the small land acreage.

The number of animals a household keeps has a negative effect on its awareness of mushroom production because farmers who kept more animals preferred them to crop production because they found crop production to be uneconomical therefore they never sought information on crop production making it impossible for them to be aware of some of the crops that are grown in the area (Table 2).

The negative coefficient on marital status, work status, total land under cropping, total livestock unit and total amount spent on food per week imply that a unit addition on any of these variables had a negative effect on the willingness of the farmers to diversify into mushroom production.

Age has a positive effect on willingness to start production. The older people were more willing to start mushroom production majorly because it was not considered as an enterprise that requires a lot of energy and can even be practiced out with people with disabilities. This supports the findings by Olale et al. (2010) and Wanyama et al. (2010) that households experience on livelihood options and the desire to diversify increase with age. A group of people living with disabilities that was interviewed in Hamisi was engaging in mushroom production as a group venture. Gender was also a positive factor in that more men were willing to start production majorly because they are considered as the bread winners in most families therefore they are

Table 2. Determinants of farmers' willingness to diversify into mushroom production

Parameter	Coeff.	Std. Err.	Z	P> z
Age	0.09	0.04	2.01	0.05**
Gender	2.10	1.05	2.01	0.05**
Marital status	-2.47	1.40	-1.77	0.08*
Work	-2.09	1.17	-1.79	0.07*
Log meetings	0.15	0.38	0.39	0.69
Highest grade	1.19	0.91	1.31	0.19
Awareness of production	0.06	0.92	0.07	0.94
Mushroom consumption	0.37	1.80	0.20	0.84
Mushroom market	2.20	0.87	2.55	0.01***
Cropping land	-2.92	1.60	-1.82	0.07*
Total land	1.53	1.33	1.15	0.25
Total livestock unit	-0.19	0.28	-0.70	0.49
Total on food per week	-0.00	0.00	-1.02	0.31
Farming amount	0.00	0.00	1.70	0.09*
Average bean acreage	3.77	2.80	1.35	0.18

*Significant at 10%, **Significant at 5% and ***Significant at 1%.

more willing to engage in enterprises that would be considered as income diversification so as to supplement their income. Marital status had an effect; the household heads that were not married were more willing to engage in mushroom production because they are considered as the sole bread winners in their families hence they are more willing to engage in enterprises that they consider to receive a higher pay off which can be used as a source of income from their families.

Households with farming as the main source of income were more willing to engage in mushroom production than households that had other alternative sources of income for example households engaging in business and the employed. The more educated people were more willing to engage in mushroom production because it is often assumed that the more educated a person, the more risk loving they are. And most educated people, for example the teachers and the people working in the county office, were willing to engage in risky ventures whose pay off is high. They were the ones who had several diversification options in their portfolio. This supports the findings of Olale et al. (2010) of positive influence of education on livelihood strategy diversification.

People that are aware of mushroom production are willing to engage in its production. This is also the case for people consuming mushroom because they are aware of the mushroom market in the area and the current supply does not meet the demand.

The larger the cropping area and the higher the amount of money spent on food per week, the less likely the farmer was willing to engage in mushroom production. This is mostly because most farmers with large pieces of land already have their mind set to production of a given

type of crop mainly maize, beans, sweet potatoes and bananas and they assume they have specialized in only these type of crops therefore they are not willing to engage in other enterprises. Families that spend less on food per week were more willing to engage in the production of mushroom because, such families mostly depend on consuming what they produce on their own farms and purchase only what they cannot produce or what is in insufficient supply because they are mostly very poor. Since mushroom is grown for subsistence and commercial purposes, such families would engage in it so as to get food for consumption and also money to purchase what they lack.

CONCLUSIONS AND POLICY IMPLICATIONS

From the study it was concluded that diversification is vital for the well being of the smallholder farmers in Western Kenya. Mushroom as a livelihood diversification option should be adopted by farmers in Western Kenya because of the land and topographic challenges. Factors such as consumption of mushroom, market for mushroom and land acreage should be used to create awareness of mushroom production in the area while age, sex, work status and mushroom market in the area should be used in designing policies for adoption of mushroom as a livelihood diversification option for in Western Kenya County.

Currently, most farmers in Western Kenya County are aware of mushroom production and market in the area but are not actively engaged in its production. The County Government's office for agriculture should continue with the mushroom awareness campaign that is

currently ongoing in the area, as this will continue to encourage more farmers to engage in its production because there exists a market both in the area and in other areas and this can serve as a way of the people in the county improving their livelihoods and reduce the poverty levels in the county.

Some farmers in the area were not actively engaged in group membership and some were not members of any development group. Farmers should also be advised on the importance of being members of farmers groups and development groups in the area as it is a channel for information access on new agricultural production practices. Being members of such groups also puts the farmers in better positions to access credit that can be used in agricultural production thereby improving their welfare. The county government should also continue with encouraging more farmers to join development and farmer groups as this puts them in a better position to obtain knowledge and at times inputs to use in agricultural production.

Many farmers were willing to engage in mushroom production but lacked skills to engage in this enterprise, therefore, the County Agricultural office should come up with strategies that include farmer field days and extensive extension programs with all the stakeholders in the region that will ensure the farmers are well trained on different agricultural production techniques. Currently in Western Kenya, farmer field days are planned by the ministry of Agriculture office but some farmers still fail to attend. Awareness campaigns on the importance of attending such forums should be put in place by the county government of Western Kenya. Increased turn out in such events will encourage the donors to allocate more funds for awareness campaigns and trainings to ensure the farmers have knowledge on production of mushroom and also subsidize the cost of spawn that is supplied to farmers.

LIMITATIONS OF THE STUDY AND SUGGESTION FOR FURTHER RESEARCH

Studies have been done on mushroom markets and its value chain but little has been done on its use as a diversification option for farmers in different areas facing different production challenges. Given the decreasing land sizes necessitating diversification in the country, more research should be done on livelihood diversification for farmers in different areas, in order to come up with the best production mix for farmers in different areas. This will ensure that farmers come up with the best production mix that will ensure maximum profitability given the resources at their disposal.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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