

**THE ADOPTION OF MUSHROOM FARMING AMONG  
SMALLHOLDER FARMERS: A case of women mushroom  
farmers in Makuyu, Kenya.**

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**Acronyms.**

DEO..... Division Extension Officer.

FGD..... Focus Group Discussion

GDP..... Gross Domestic Product.

JKUAT..... Jomo Kenyatta University of Agriculture and Technology

KIOF..... Kenya Institute of Organic Farming

NALEP..... National Agriculture and Livestock Extension Programme

NGO..... Non-Governmental Organisation.

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## **Abstract.**

This research is about the adoption of mushroom farming by smallholder farmers in Kenya as recommended by Kenya Institute of Organic Farming (KIOF). KIOF is a Non-Governmental Organisation (NGO) established in 1986 to promote organic agriculture as a sustainable farming method. Among the innovations promoted by KIOF is Mushroom farming. In 2008 KIOF trained a total of 210 women in groups of thirty from Makuyu division but results from a survey carried out by KIOF in 2010 showed that only 30% of the trained women had ever started mushroom farming and only 20% were still farming mushroom. KIOF is not quite sure of the reasons for the low adoption rate in Makuyu division.

The objective of this research was to find out the reasons why mushroom farming was poorly adopted by the targeted farmers. To accomplish the objective of the research the following research questions were formulated: What is the farmers' knowledge on mushroom farming? What is the willingness of farmers to do mushroom farming? To answer these questions three focus groups and three interviews were undertaken. The focus groups consisted of two non-adopting groups with 10 members each and one adopting group with 6 members. The interviews were held with two leaders one from each of non-adopting groups and the third one with the Division Extension Officer DEO). The respective group leaders were expected to present views from an informed angle and broader view since they had been interacting with all group members and they could understand the prevailing circumstances facing each of the members. The extension officer was expected to present views from a technical point of view and experiences from working in the division as a whole.

The outcomes of the focus groups and interviews yielded the following results: The most frequently mentioned reasons for non-adoption included inadequate knowledge on the mushroom farming procedures, limited understanding on the benefits of mushroom farming, delay in mushroom seeds, lack of capital, lack of market and high labour requirement. The adopting group seemed to better understand the benefits associated with mushroom farming, were more innovative in sourcing of inputs and the group was more organised to source for inputs, market access and learning from each other.

Based on these results the research concluded that there are knowledge gaps among the trained farmers especially on skills. It was also evident that other important stakeholders in the mushroom chain were not involved in the planning of the mushroom project. These stakeholders included input suppliers, financial institutions and market outlets for the mushroom. Planning of the trainings coincided with other projects; this increased the labour requirement on the farmers. Group dynamics was overlooked during the trainings as some of the groups lacked cooperation in the process of project implementation and hence their activities were negatively affected.

Given above results the research recommends that KIOF broadens the mushroom training to encompass aspects of value addition and marketing which lacked in the initial training and could complement the training. It is also recommended that the trainings are held on site so as to increase practical aspects hence enhance skills among the participants. Involvement of other stakeholders in the initial stages of the training is also important especially the input suppliers, market outlets and financial institutions. Working with functional groups could yield better results as they are more cohesive and organised. Planning of the trainings to ensure it does not coincide with other routine activities by the farmers is important.

## 1. INTRODUCTION

This report is about a research into the adoption of mushroom farming by smallholder farmers in Kenya as recommended by KIOF. KIOF is an NGO established in 1986 to promote organic agriculture as a sustainable farming method, among the innovations promoted is Mushroom farming. In 2008 KIOF trained a total of 210 in groups of thirty women in Makuyu division but as at 2010 only 30% of the trained women had ever started mushroom farming and only 20% were still farming mushroom.

The research described in this report aimed at finding out the reasons for the low adoption of the mushroom farming by targeted farmers after the training. To accomplish the research the following research questions were formulated: what is the farmers' knowledge on mushroom farming? And what is the willingness of farmers to do mushroom farming? To answer these questions three focus groups and three interviews were held. The focus groups consisted of two non-adopting groups with 10 members each and one adopting group with 6 members. The interviews were held with two leaders one from each of non-adopting groups and the third one with the DEO.

The report is structured as follows:

Chapter one introduces the report with a brief overview and the layout of the whole report. Chapter two gives some background information on the study area, the livelihood activities in the area, brief information about KIOF as an NGO, mushroom farming and the mushroom project and the stakeholders involved. Chapter three describes the problem with some of the possible factors that could influence the adoption of a technology, the research problem, the conceptual framework, objective and the research questions.

Chapter four gives the research strategies, methods and tools used with justification for their usage. Chapter five summarizes the collected data from the field. Chapter six discusses the findings leading to results and chapter seven gives conclusions and recommendations based on the results.

## **2. BACKGROUND INFORMATION.**

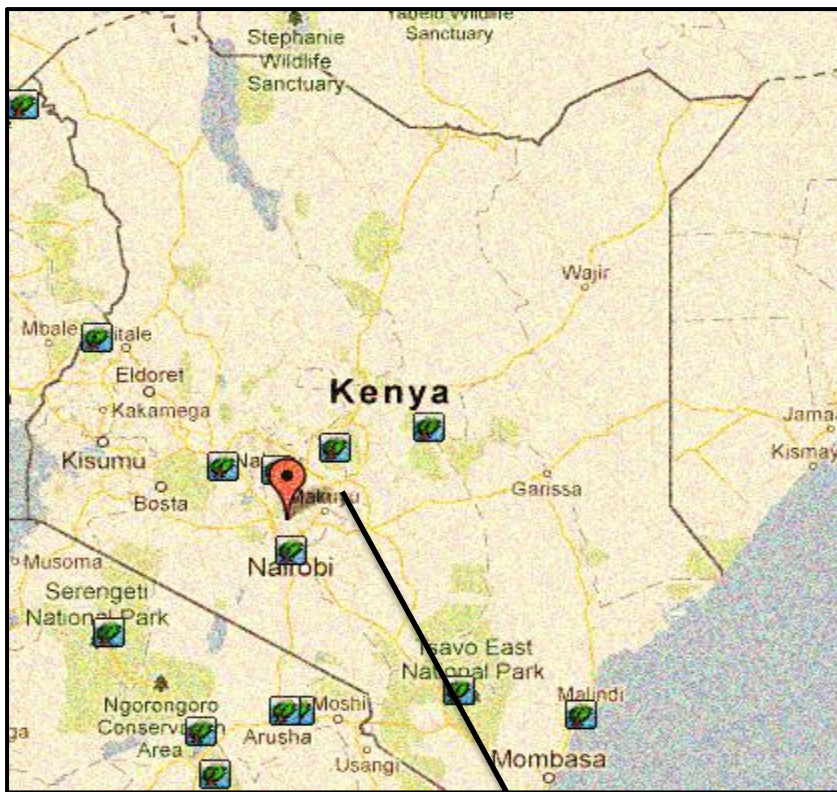
### **2.1 Makuyu, Maragua district.**

Agriculture is the mainstay of the Kenyan economy with the highest contribution coming from the small scale holders. According to Fermont et al (2008) the Kenyan population is on a continuous increase against a declining acreage of arable land. The effects of climate change are projected to be severe in Africa. The long term economic development blueprint for Kenya, the “Vision 2030”, which is in tandem with the millennium Development Goals has identified Agriculture as one of the key sectors to deliver a 10% annual economic growth rate. To achieve the 10% annual economic growth rate requires improvement of agricultural productivity through diversification to high value crops and transformation of smallholder agricultural sector from subsistence to innovative, commercially oriented modern sector (GOK, 2007)

Maragua District is located in Central Province of Kenya. The province borders Nairobi city in the south, Mt. Kenya in the north and the Aberdare ranges in the eastern side. It is divided into 7 districts; Kiambu, Thika, Maragua, Murang’a, Kirinyaga, Nyeri and Nyandarua.



Figure 1 Map of Kenya showing the research area.

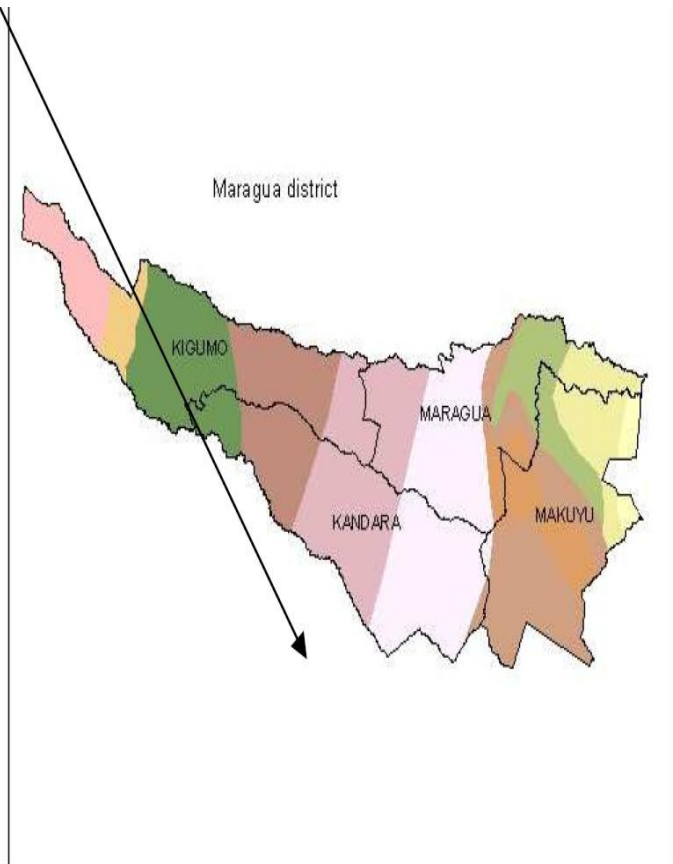


**Legend**

□ Division boundary

**Agroecological Zone**

- LH1
- LM3
- LM4
- LM5
- UH1
- UH0
- UM1
- UM2
- UM3
- UM3-4
- UM4



Maragua district which initially formed the larger Murang'a district lies between the altitude of 1100 and 2950 metres above sea level. The area receives a bi-modal type of rainfall with an average of 1200 mm during the long rains (March to May) and 1000mm during the short rains(October to December)“Maragua district is composed of four administrative divisions namely Makuyu, Maragua, Kigumo and Kandara. The district covers an area of 1,065 sq. Km<sup>2</sup> (including the Gatara Forest). It is bordered by Muranga District to the north, Thika District to the south, Nyandarua District to the west, Machakos to the east and by Kirinyaga and Mbeere Districts to the northeast. The district lies between latitudes 0°45' South and 1° 07' South and longitudes 36° East and 37° 27' East. In the district 80% of the population depend on agriculture where crops like coffee, tea, maize and beans are cultivated. Dairy production, fish farming and bee keeping are also common. There are cases of high absolute levels of poverty in the district. They include the landless mostly found in the arid and semi-arid areas of Makuyu and lower parts of Kandara Division where there are several squatters. Poverty situation in Maragua District is manifested in various forms such as inaccessibility to health services, food security, inadequate safe drinking water, inadequate shelter, poor sanitation, inaccessibility to education and health services and landlessness” (NCAPD, 2005).

The research was done in Makuyu division, Makuyu location. According to KNBS (2010) the location has a population of 6800 inhabitants spread in 1800 households, this makes the location one of the most densely populated in the division.

## **2.2 Livelihoods.**

Farming plays a major role in the livelihoods of households living in rural sub- Sahara Africa. In Sub-Saharan Africa excluding South Africa, most farming is small scale farming, and most rural populations are engaged to varying degrees in small scale farming as one component of diversified livelihoods therefore no one would argue that improving the performance of small farms should be off the agenda for poverty reduction in Sub-Saharan Africa (IFPRI, 2005).

Farmers typically view their farms, whether small subsistence units or large corporations, as systems in their own right. Farming systems in sub-Saharan Africa are diverse and complex and can only be understood in their respective context they are existing. According to FAO & World Bank (2001) each individual farm has its own specific characteristics arising from variations in resource endowments and family circumstances.

Farmers in Makuyu depend highly on Agriculture for their livelihood. The common crops under production are maize, beans, peas and fruit trees especially mangoes, avocado and oranges. Beekeeping and petty trading at the shopping centres are other economic activities the people are involved in. Kitchen gardening is also common among households where vegetables are produced for consumption and surplus is sold. Droughts and crop failures are common in the division. Land is also scarce as the population is high with 524 people per square kilometre, households land acreage range between 0- 3 acres per household.

## **2.3 Mushroom in Kenya.**

In the words of Wesonga et al (2002), although mushroom production has not been developed well in the country, a number of communities have harvested wild mushroom for food in the past; overall little amounts of mushrooms are being cultivated in Africa. In the

past Government extension was not promoting mushroom production but with the inception of the National Agriculture and Livestock Extension Programme (NALEP) in the year 2000 the situation changed. NALEP has been promoting appropriate technologies among them mushroom production as an income generating enterprise. SIDA (2006) posits that farmers are willing to adjust their farming into businesses, focusing on high value enterprises such as vegetables, poultry, zero grazing, and crops such as mushrooms, which represent a new opportunity. Previously research on mushroom farming and information was limited but the NALEP and government effort Jomo Kenyatta University of Agriculture and Technology (JKUAT) has been in the fore front in promoting the same mushroom farming. JKUAT is involved in research and training on mushroom farming.

According to Wesonga et al (2002) Mushroom production provides a number of opportunities for improving the sustainability of small farming system and rural development. Edible mushroom production is a particularly effective form of bioconversion technology and can be based on a wide range of agricultural by-products. Additionally the substrate remains after the mushroom have been harvested form a good organic fertilizer for the soil. This makes mushroom farming an environmentally friendly venture.

Since the year 2000 several universities and NGOs are involved in promotion and training on mushroom farming. KIOF and JKUAT are among the organisations involved in trainings. JKUAT is also involved in generation and sale of mushroom seeds (spawn) as it involves sophisticated process.

According to KNBS (2011) Kenya produces about 500 tonnes of mushroom annually with a farm-gate value of Ksh. 255 million and a retail value of Ksh. 340 million. Additionally Kenya imports about 81.5 million tonnes of dried mushroom worth Ksh. 9.8 million and exports 16 tonnes of mushroom worth Ksh. 3.9 million. From a food security standpoint Kenya is a net importer of mushroom, which means that the availability aspect cannot be sustainable due to the dependence on other sources.

In terms of utilization, few households consume mushrooms, they prefer to produce and sell and use the money to buy other food stuffs. For those producing the mushroom and selling they are getting economic empowerment which enables them to buy other items for the household. Mushroom production is not dependent on seasons as they are grown in structures where all the growing conditions can be manipulated hence there is a possibility for a year round supply which means there is stability in production. Currently a kilogram of mushroom retails at 700Ksh while mushroom farmers sell between 400-500Ksh. Per Kg. The high retail prices are good for the farmers as they get high prices for their product but on the negative side it exposes mushroom to completion from other protein source products which are cheaper.

## **2.4 Kenya Institute of Organic Farming.**

The Kenya Institute of Organic Farming (KIOF) is an NGO based in Kenya. The organization envisions achieving communities of men and women who are empowered with skills and knowledge of organic farming for sustainable rural livelihood. To achieve this KIOF carries out several activities among them training of farmers on organic farming techniques. As an organisation in development KIOF uses organic farming as a strategy towards sustainable rural livelihoods of smallholder farmers. To achieve this strategy KIOF has been using the Technical Change approach since the organisations inception in 1986. Among the trainings are mushroom production and Kitchen gardening among others.

The Technical Change approach is an extension approach which aims at the maximum adoption of a number of innovations. Technical information is diffused indiscriminately within the rural society. Farmers are free whether or not to receive the information and try, adopt or reject the innovation implement what they learned and diffuse the knowledge and skills to their neighbours.

World Vision Kenya is an international NGO. The organisation works with communities on different projects. In 2008 the organisation initiated the food security project in Makuyu division.

In 2008 Kenya Institute of Organic (KIOF) was contracted by World Vision to train a total of 7 women groups in Makuyu on organic agriculture practices. Each group was composed of 30 women on average who were expected to learn and set up a common demonstration centre. The centre would act as a learning point as the farmer to farmer extension approach has been viewed as a more participatory method compared to previous approaches that were top down. Each of the members was expected to implement on their own farms and others (not trained) would learn from them since it was not possible to train everyone from the division. It was expected that each trained farmer would train 3 others.

The mushroom project was one among other projects like dairy goats and improved avocado (hass variety) to empower the women in the division.

## **2.5 The mushroom project.**

Mushroom farming was among the technologies that the groups were trained on. According to KIOF (2010) only 30% of the trained women had ever started mushroom farming after the training and by the time of the survey (August 2010) only 20% of the trained women were still practicing mushroom farming with the highest number coming from a group close to the Makuyu town. For benefits of a project to diffuse to a large population training is not enough, the people have to first adopt in large numbers so that others can copy from them which is one of the assumptions for the technical change approach to be successful. Invention refers to new concepts, products, processes or forms of organization that are derived from individuals, scientific research, other forms of research or a novel combination of existing knowledge. Innovation, on the other hand, refers to the actual use of the invention. Thus, inventions only become innovations when private companies, individual farmers or other parties use them to improve what they are doing in the words of Woodhill et al. (2011). This assertion implies that in as long as the Mushroom invention has not changed into innovation no benefits can be realised.

Mushroom is a high value niche product with great potential to contribute to enterprise diversification and poverty alleviation by utilizing agricultural wastes, thus providing an environmentally friendly disposal system (Isikhuemhen et al, 2000). Mushroom cultivation can help reduce vulnerability to poverty and strengthens livelihoods through the generation of a fast yielding and nutritious source of food and a reliable source of income (Marshall and Nair, 2009). Edible mushroom production is a particularly effective form of bioconversion technology. Edible mushrooms are a source of high quality protein - about 19% to 35% (Longvah and Deosthale, 1998) with all essential amino acids, and are of medicinal value to man (Chiang and Mshigeni, 1997). Mushrooms have a production cycle of 6-12 weeks and are not dependent on the climatic conditions of the area since the conditions are controlled indoors. Additionally mushroom farming provides a diversification option, Marshall & Nair (2009) cites that Mushroom cultivation is highly combinable with other traditional agricultural and a variety of domestic activities, and can make a particularly important contribution to the

livelihoods of the disabled, of women and the landless poor who, with appropriate training and access to inputs, can increase their independence and self-esteem through income generation. This means that mushroom can provide income or food for households all year round. The new Agriculturist (2007) documents how over 300 mushroom farmers in Tanzania were able to generate income to pay school fees, buy goats and other assets among other benefits.

Land being scarce in the division mushroom production offers a viable option for those with small plots of land and also the landless. On the negative side, mushroom production is claimed to require a lot of labour in the initial stages for construction of the mushroom unit in which to grow them. Substrate preparation also needs a lot of labour, after that minimal labour is needed in maintaining the climatic conditions inside the mushroom unit by spraying water inside the unit.

The whole mushroom production training took five days. The farmers gathered at the social hall in the town (one group of 30 for five days). Within the five days the farmers were taken through both theoretical and practical sessions. Mushroom production involves seven generic steps as indicated by Marshall & Nair (2009) as follows:

*The basic concept in cultivation is to start with some mushroom spores, which grow into mycelium and expand into a mass sufficient in volume and stored up energy to support the final phase of the mushroom reproductive cycle, which is the formation of fruiting bodies or mushrooms. The key generic steps in mushroom production – a cycle that takes between one to three months from start to finish depending on species – are:*

- 1. Identifying and cleaning a dedicated room or building in which temperature, moisture and sanitary conditions can be controlled to grow mushrooms in.*
- 2. Choosing a growing medium and storing the raw ingredients in a clean place under cover and protected from rain.*
- 3. Pasteurising or sterilizing the medium and bags in which, or tables on which, mushrooms will be grown (to exclude other fungi that would compete for the same space – once the selected fungi has colonized the substrate it can fight off the competition).*
- 4. Seeding the beds with spawn (spores from mature mushrooms grown on sterile media).*
- 5. Maintaining optimal temperature, moisture, hygiene and other conditions for mycelium growth and fruiting, which is the most challenging step; adding water to the substrate to raise the moisture content since it helps ensure efficient sterilization;*
- 6. Harvesting and eating, or processing, packaging and selling the mushroom.*
- 7. Cleaning the facility and beginning again.*

### **Spawn and inoculation**

*Mushroom spawn is purchased from specialist mushroom spawn producers, and there are several types or strains of spawn for each type of mushroom. It is not generally advisable for mushroom growers to make their own spawn because of the care needed to maintain the quality of spawn in the production process.*

The above steps formed the basis of the whole training as the procedures for each step were explained to the participants with occasional demonstrations.

According to Beetz & Kustudia (2004) several factors influence Mushroom species selection namely: Availability of waste material for use as growth medium, environmental conditions, available expertise, available resources and market demand. Oyster mushroom species was chosen for Makuyu considering the environmental conditions, expertise and available waste materials for growth. The species grows very fast using crop remains like maize and beans, does not need strict expertise and can grow in hot climate. On the negative side it decays very fast after harvesting and needs refrigeration or immediate marketing.



### 3. PROBLEM DESCRIPTION AND THE RESEARCH PROBLEM.

#### 3.1 Problem description.

Agriculture accounts for 29% of the gross domestic product (GDP) in developing countries and provides jobs for 65% of their populations, additionally in many countries; economic health is closely linked to the fortunes, or misfortunes, of farming communities (Smith, 2011). The population depending on Agriculture as the major livelihood in rural areas is even higher. This status quo calls for most development programs to put more effort in this sector.

KIOF envisions achieving communities of men and women who are empowered with skills and knowledge of organic farming for sustainable rural livelihood. By extension sustainable rural livelihood would mean that households are food secure from the utilization of promoted innovations. According FAO (2011) Kenya has 33% of the total population food insecure. With agriculture possessing a high potential to solve the food insecurity there is a need to put more emphasis and efforts in the sector.

The low adoption of mushroom farming may have been caused by several factors. The first factor may be knowledge gap. The farmers may not have understood some of the procedures which were taught during the training. Without clear understanding of the different steps may make farmers unable to commence on the mushroom farming. Additionally skills are important for one to perfect any activity; skills are only gained through actual practice and may take time before one masters the technique. In the words of Marshall & Nair (2009):

*Mushrooms have not often been actively promoted in the past by agricultural ministries of developing countries. Various reasons have been cited for this neglect, including: a lack of technical capacity in production techniques with poorly equipped government supported advisory services resulting in interested farmers having to seek technology on their own; comparatively few studies on tropical mushrooms; and a lack of technical skills to produce spawn with suitable strains often hard to find.*

Additionally Wesonga et al (2002) posits that the existing mushroom farmers pursued an active exclusion principle. They were not willing to allow other farmers to visit their production sites. And since it is an in-the-house technology it was easy to exclude others. The number of existing producers was also too small to allow much unaided diffusion of the technology

The second reason may have been the willingness of the farmers to start farming mushroom. Willingness is normally pegged on two dimension namely claims and benefits. "The willingness to adopt a new technology depends, in part, on the farmer's expectations for increased output or the alleviation of constraints resulting from its use. One such constraint is the lack of access to labour" (Doss, 1999). This means that farmers will only adopt an innovation based on their perception that the net benefits will outweigh the claims (disadvantages associated with the innovation). There are several benefits associated with mushroom farming at household level. Some of the benefits include income generating activity from sale of the mushroom, high nutritional value, Medicinal value, livelihood diversification opportunity and independence from weather patterns. The continuous production ensures even distribution of labour throughout the year. In the words of Devereux & Maxwell (2001) food for farmers is scarcest, and food insecurity highest in the mid to late rainy season, maximum food availability and lowest food insecurity occurs after harvest. Additionally the periods of maximum food insecurity coincides with the period of highest

labour demand, see fig. below. However unless the farmers fully understand all the benefits properly they will not be willing to adopt the technology.

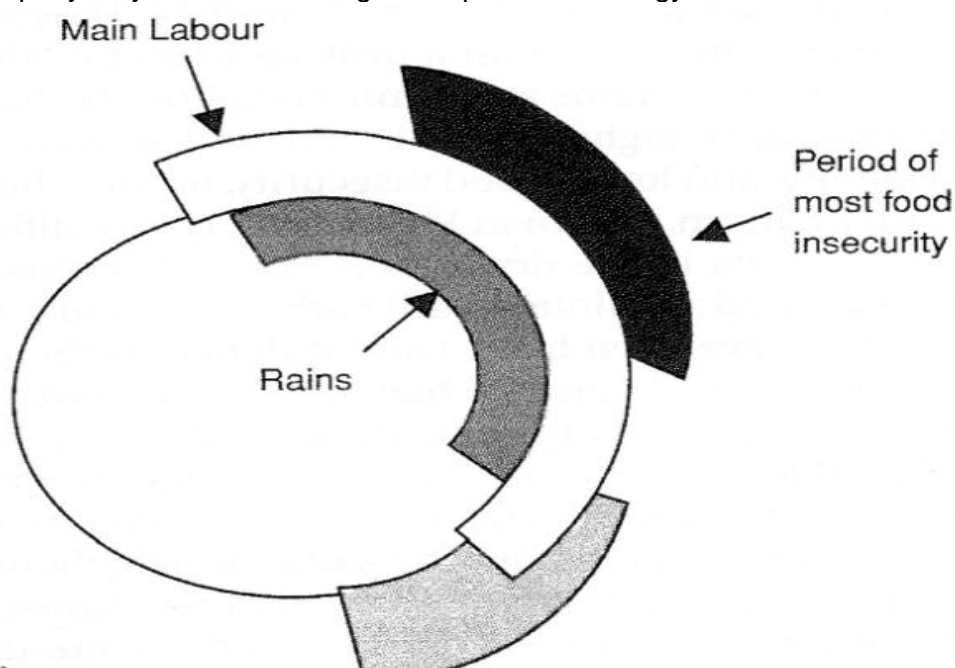


Figure 2 showing the relation between food insecurity and labour requirement during rainy season.

On the claims side, there are several disadvantages associated with mushroom farming. Mushroom production requires high labour in the initial stages; the labour is required for room construction and sterilization of the substrate for the mushroom. Even though Marshall & Nair (2009) posits that Mushrooms are not labour intensive and can be undertaken as an additional livelihood activity which fits around other household or productive tasks, Odendo et al (2004) stated that labour is one of the challenges for small scale mushroom producers. Given the double roles played by women at household level that is productive and reproductive duties; this may have added burden on their activities as they were the ones trained so they were the ones who understood the whole process better. Depending on the scale of production the initial capital outlay maybe high for resource poor farmers to afford.

Mushroom market is not very well developed as not many Kenyans consume mushroom and a portion of the mushroom consumed are wild collections from the forests. The available market is limited to big supermarkets and hotels who demand high standards of hygiene and strict on delivery of ordered volumes on time. This demands constant production by the farmers to meet required volumes throughout the year. The local market at the small towns faces the challenge of competition from other protein sources as mushroom prices are higher.

Wesonga et al (2002) cites several reasons for neglect of mushroom in developing countries: comparatively little scientific study has been done on tropical mushrooms, literature on mushroom growing is expensive and not aimed at developing countries, unavailable technical skills to produce spawn and suitable strains are hard to find. Now a few institutions have come up who are providing the inputs required for mushroom farming. The scarcest inputs are seeds and poly bags for packing the substrate.

From above factors that could have influenced the adoption of mushroom in Makuyu a causal diagram was conceptualised.



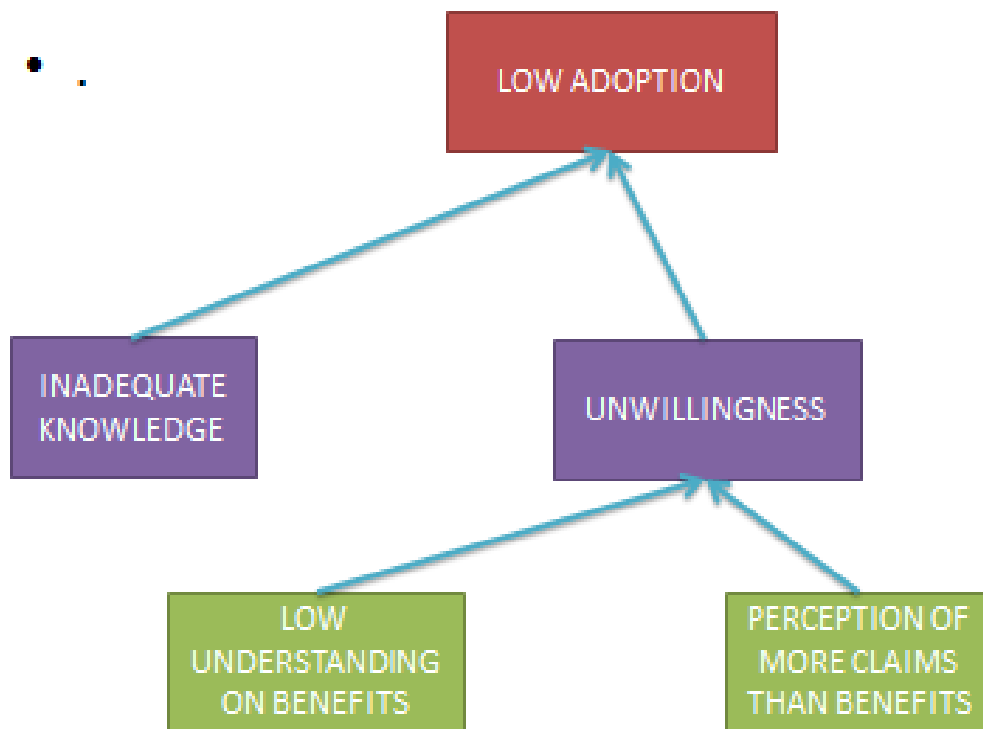


Figure 3 A causal diagram from the problem description.

### 3.2 Research problem

The low adoption of the technology has impacted negatively on KIOFs goal to reduce food insecurity in the region. KIOF was targeting that the total 210 trained women would train three farmers each (this would make a total of 630 farmers). Technology diffusion is cheaper when it occurs from farmer to farmer, this means that with minimal number of adopting farmers there are less farmers who can be reached. Since there are limited funds to carry out the trainings it would be beneficial if more farmers adopt the technology and assist in diffusion.

A better understanding of how mushroom production impacts gender roles among households in the Makuyu case would be important for adaptation of the innovation. The low adoption of the invention means that the potential income that could be realised from the sale of the mushroom is lost at household level.

KIOF has inadequate information on what specific factors that may have contributed to the low adoption rate in Makuyu. Other regions where KIOF has been working have had a minimum of 45% adoption rate. So far no thorough investigation has been carried out into the causes. For KIOF to make the right decisions on how to improve on the number of the people adopting the innovation it has to first understand the underlying reasons for the low adoption.

### 3.3 Conceptual framework

#### 3.3.1 Theories on technology adoption by farming communities.

Doss (1999) posits that we must recognize that technology adoption and technology impacts depend on intricate webs of interaction that defy simple generalizations. Farmers have

subjective preferences for technology characteristics (Ashby & Sperling, 1992) and these could play major roles in technology adoption. Adoption (rejection) of technologies by farmers may reflect rational decision making based upon farmers' perceptions of the appropriateness (inappropriateness) of the characteristics of the technologies. This means that several factors will determine whether a technology will be adopted or rejected by farmers.

Leeuwis (2004) posits that improving food production and fostering economic development is not just a matter of individuals receiving messages and adopting the right technologies, but has more to do with altering interdependences and co-ordination between various actors. To design location specific technologies for farmers it's important to factor in farmers circumstances. For many farming households, agriculture is only one of various income generating activities, implying that agricultural practices can only be understood in context of practices in (Hebinck & Ruben, 1998). Furthermore, it has become clear that agricultural decisions are not made solely by the individual "head of the household", but extended to other household/ or community members ( Maarse et al, 1998). Farmers not only consider possible technical consequences (e.g. yield expectations, required inputs, impact on quality etc.), but also socio-economic effects (required labour organisation, income effect, impact on social relations, etc.) (Leeuwis, 2004).

### **3.3.2 The four dimensions on technology adoption.**

According to Leeuwis model (2004), adoption of technology is pegged on four dimensions: knowledge, willingness, ability to do it and being allowed to do it. These four variables can be helpful in understanding what farmers do and not do at a given time. By doing so it gives us some entry points for contributing to change and innovation (Leeuwis, 2004).

#### **3.3.2.1 Willingness.**

The dimension on willingness has to do with claims and benefits. Farmers would have to weigh the advantages and disadvantages before they adopt the innovation. For farmers to adopt they have to compare between the advantages against the disadvantages of the innovation. According to Odendo et al (2004) women are involved in most of the mushroom management practices even though the decision to venture to mushroom production is highly vested on men. This means that there are power relations in mushroom production above the fact that it also increases the workload for the women. For farmers to want to adopt an innovation they must also fully understand the benefits related to it.

#### **3.3.2.2 Ability.**

The ability relates to farmers' access to factors of production for the mushrooms production. The role played by women in rural mushroom production can be very significant because certain parts of the mushroom cultivation process, such as filling substrates in containers and harvesting, are ideally suited for women's participation (Marshall & Nair, 2009). Initial costs determine adoption decisions especially in the case of the resource-poor smallholders they can become a limiting factor for adoption since farmers cannot adopt a profitable technology if capital is scarce (Batz et al, 1999). This means that if farmers are resource poor and access to capital is limited, profitable technologies might not be adopted if it requires a high capital outlay. Another aspect has to do with their conditions in terms of soil fertility, ease of transport to market, availability of inputs etc. The ability to market the product is important since if one of the benefits of the produce is high income then the must be able to market it to realise that benefit.

### *3.3.2.3 Knowledge.*

Believe/know- this dimension has to do with the knowledge of the farmers. Whether they understand all the concepts of the whole process and whether they believe they can do it. Wesonga, et al (2002) cites several reasons for neglect of mushroom in developing countries: comparatively little scientific study has been done on tropical mushrooms; literature on mushroom growing is expensive and not aimed at developing countries, unavailable technical skills to produce spawn and suitable strains are hard to find.

### *3.3.2.4 Social pressure.*

Being allowed to do it has to do with social pressure. Leeuwis (2004) cites that farmers have direct and indirect relationships with other people who often have certain explicit or implicit ideas about what they would like a farmer to do in a specific context. Such actors can include spouses, children, relatives, village leaders, neighbours, communication workers, politicians among others. Thus, it is conceivable that while a farmer holds an attitude towards an innovation that is largely positive, social pressure from his/her neighbours may influence his/her decision to adopt it (Burton, 2004).

Using the theories explained above a conceptual framework was adapted to help in the implementation of the research. For purposes of this research all the efforts were concentrated on the knowledge and willingness. Given that the organisation is involved in training it would be interesting for the organisation to identify any knowledge gaps among the participants, this information would be useful for the trainers to know what areas to put more emphasis during training sessions. The second important aspect was on the willingness. The information on willingness will also be important for the organisation to know the claims and benefits from the participants' point of view; this will assist in adapting the technology especially using the claims so that it can suit the participants' local conditions perfectly.

Under the knowledge dimension the research will focus on the knowledge of the farmers pertaining the seven steps in mushroom production and a section on practical skills. Having the knowledge is one thing but how to apply the knowledge can be a challenge for farmers. The practical skill bit will try to test whether the participants got enough practice to apply what they learned theoretically. The eight steps will form part of the checklist for the research.

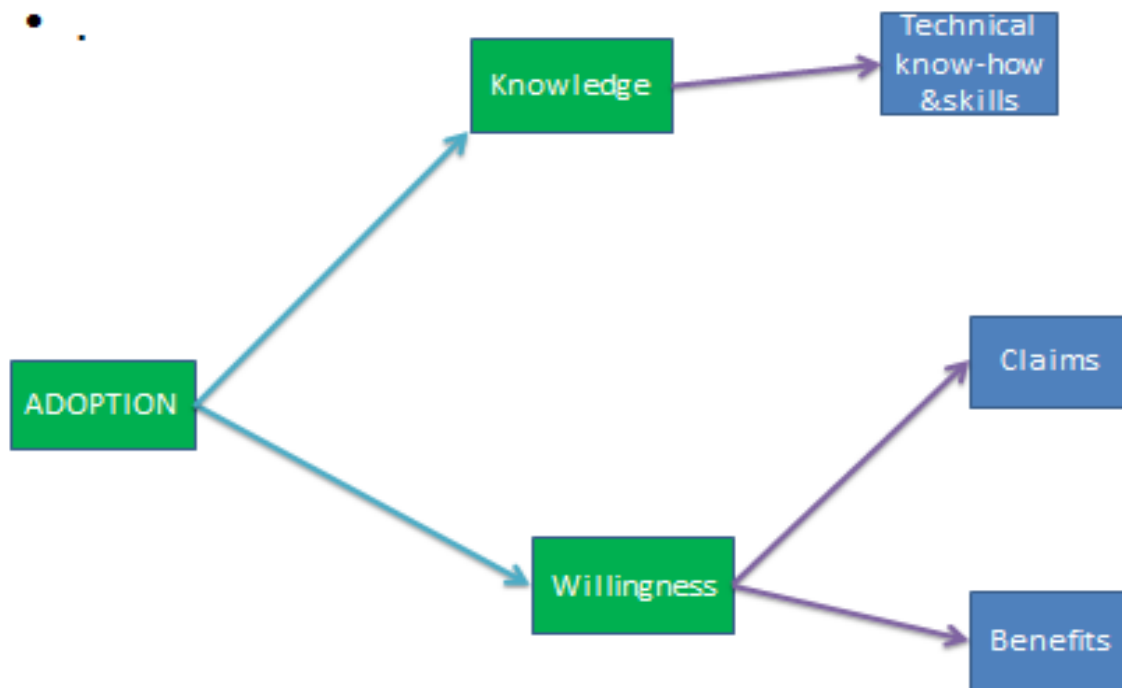


Figure 4 The conceptual framework

The willingness by farmers to adopt a technology can be based on their perception on its claims and benefits. Singh et al (2008) posits that the high profitability of mushroom can make the unemployed youths, housewives and farmers to be attracted towards this enterprise because the space required for mushroom cultivation is available even at home and the surplus manpower of a family owing mushroom unit can be judiciously utilized. The claims are the perceived disadvantages of the technology. Mushroom production is associated with high labour requirement especially during substrate preparation and sterilization (Odendo et al., 2004).

In as much as literature shows there are different factors influencing technology adoption, there is a need to evaluate some of the major factors and see to what extends each of them has played a role in the case of Makuyu. However given the time to carry out the investigations in Makuyu it was not be possible to research into each dimension exhaustively. The research therefore concentrated on only two dimensions which are knowledge and willingness. Focusing on the two dimensions gave detailed insights which gave an in depth account of the situation in that Makuyu location.

### 3.2.3 Definition of terms and concepts.

To avoid confusion throughout the report as some technical terms may be defined differently by different authors, the following definitions will be used for the chosen terms:

**Food security-** the definition by FAO (2001) was adopted which states that food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

**Household-** a group of individuals living in proximity and sharing food, assets, income and labour.

**Functional group-** a collection of individuals who mobilise their own resources to achieve a shared goal.

### **3.4 Objective.**

To contribute to the knowledge of the factors influencing mushroom farming adoption.

### **3.5 Research questions.**

What aspects of knowledge and willingness influenced the adoption of mushroom farming by farmers in Makuyu, Kenya?

To help in answering the above main question the following sub questions were used.

1. What is the farmers' knowledge on mushroom farming?
2. What is the willingness of the farmers to do mushroom farming?

To operationalize above questions there was a need to split each of the questions into indicators. On knowledge the different steps of mushroom farming were used as indicators and put in the checklist (see annex 1) and also the questionnaires (see annex 2 &3). The dimension on willingness was split into claims and benefits and they were also put in the checklist and questionnaires.

## 4. RESEARCH STRATEGIES AND METHODS.

### 4.1 Secondary information

A desk study was carried out in the initial stages of the research to get some background information about the research area and also get some insights from theories on technology adoption. Relevant documents on the topic were studied like books, reports, journals, lecture notes and theses among others. This information was used to come up with a conceptual framework on technology adoption. The conceptual framework helped in coming up with research sub questions and ultimately the key words to be used in the check lists for the group discussions.

### 4.2 Primary data

#### Case study.

To get primary data from the study area a case study was used as a strategy. Focus group discussions were done with a total of three groups. Three women groups were chosen from the total 7 group in the division. One group was located near Makuyu town and the rest further away from the town.

According to Verschuren & Doorewaard (2010) a case study is a research strategy in which the researcher tries to gain a profound and full insight into one or several objects that are confined in time and space; additionally a quantitative analysis of the collected data will not be possible therefore a different qualitative research method must be used. This means that the emphasis of the research will not be on counting and calculating on the basis of the observation units, but on comparing and interpreting the results, additionally the case study will focus on the depth rather than the breadth. A focus group discussion was chosen as tool for the strategy based on the words of Krueger & Casey (2000) who posits that focus groups are less threatening to many research participants and this environment is helpful to participants to discuss perceptions, ideas, opinions and thoughts.

#### Focus groups.

The groups were chosen strategically in that the group near the town was expected to have slightly different income generating activities than the ones further away from the town. Their access to market for the market was also assumed to differ and also land access.

Purposeful sampling was done to have 6 members from adopters and 10 members from non-adopters for the first group and the same for the second group.

The non- adopting groups were expected to present reasons that made them not embrace the technology from their own point of view. The adopting group was chosen to cross check whether some of the reasons presented by non-adopters were valid from the perception of those already practicing.

Group A(near town)	Group B(far from the town)
F3- adopters-6	F1-non adopters-10
	F2-Non adopters-10

Table 1 Showing the selected groups and number of participants.

The group from near town was a women's group which was in existence before the training was done. The two groups far from the town were made up of women formed for purposes



of the trainings. Additionally adjacent to the locality is Kakuzi estate (a company involved in large scale production of coffee, vegetables and poles among other crops) which provides labour opportunities for the local populace.

A check list (see annex1) was used during the focus group discussions. The reason for choice of a focus group discussion was because it would allow probing for answers and the participants would give answers from their own point of view. It would also lead to venturing into other areas previously not considered but important for understanding of the topic, this would lead to collection of a detailed data set. The focus group discussion would also allow for more interactions amongst the participants hence more information would be generated. During the focus discussions, after introduction the facilitator got some background information about each of the participants. The information collected for background revolved around the areas of size of land owned, household size, household activities and when the group was formed.

For selection of the participants for the focus group discussions KIOF records were used. The lists show group members and their status on whether they are producing mushroom or not. For the adopters the first 6 members on the list were chosen depending on their availability because only a small number is still farming mushroom. For the non-adopters the top ten odd numbers that were available were chosen for the discussions. During the focus group discussion every participant was free to air their views; however for an issue to be considered as point to be recorded it had to be supported by at least more than half of the participants. Support for a point included several examples (experiences) by the participants.



Figure 5 Picture showing one of the focus group sessions.

### **Semi structured interviews.**

To cross check the information gathered from the focus group discussions semi structured interviews with two representatives from the two non-adopting groups (one from each) and another interview with the Division Extension Officer (DEO). The representatives were the respective leaders of the groups who were purposefully left out of the focus group discussions.

The respective group leaders were expected to present views from an informed angle since they had been interacting with all group members and they could understand most of the circumstances facing each of the members. A semi structured questionnaire (see annex 2) was used for the interviews. The DEO was expected to present views from a technical point of view and experiences from working in the division as a whole. To accomplish the semi structured interview a questionnaire (see annex 3) was used.

### **4.3 Limitations**

Apparently the DEO was on vacation (leave) and did not get to meet her face to face and the interview had to be done via her phone. Even though she was expected to give some technical information on the topic she was not well conversant with mushroom farming, additionally she had not fully been involved during the mushroom farming training of the farmers hence the information she gave was scanty.

Given that I am working with KIOF which was made clear to the respondents during introductions the respondents may have been hesitant to reveal sensitive information. This was evident as it was observed that during the initial stages of the focus groups few comments were given though with time more and more respondents became more talkative.



## 5. FINDINGS.

### 5.1 Respondents background information

	<b>FGD1+leader</b>	<b>FGD2+ leader</b>	<b>FGD3</b>
<b>AVERAGE LAND SIZES</b>	0.25-1.5 ACRES	0-2 acres.	0-1 acre.
<b>AVERAGE HOUSEHOLD SIZES</b>	3-6 MEMBERS	2-5 members	3-7 members.
<b>HOUSEHOLD ACTIVITIES</b>	Farming-maize, beans, avocado, mangoes, oranges and dairy goats. Others-petty trading of fruits.	Farming-maize, beans, fruits-mangoes, oranges, avocados, cows, goats. Others-labourers at Kakuzi estate, petty trading.	Farming- vegetables(kitchen gardening), maize, beans, peas, fish ponds Petty trading.
<b>GROUP FORMATION</b>	Formed in 2008, for purposes of the trainings. Current been there for 2 years, first leader chosen by world vision during trainings. New members are those with avocado or passion fruits.	Formed in 2005 with 12 members, increased to 28 members in 2008 for purposes of organic farming trainings. Leader been there for 5 years, elected by majority. Initially group kept rabbits, changed to dairy goats. Group shared mushroom production demo centre.	Formed in 2002 as a self-help group through merry go round. Set up a demo before other members set their own mushroom houses. Innovation- one member, a retired teacher sells ready-made mushroom bags ready with substrate, so all they need is the house. Members also buy rice straw from mwea for substrate as it's easier to chop than maize Stover.

### 5.2 Respondents Knowledge on the innovation.

	FGD1	FGD2	FGD3(adopter s)	Leader1	Leader2	DEO
1				Room construction		
2		Maize Stover not available(fed to animals)				
3	More theory without practical	Sterilization .	Sterilization, lack fuel wood.		Sterilization	Sterilization needs

	on sterilization of materials.					more technical know-how as it's the most sensitive part that may make or break the mushroom production venture.
4	Don't know where to get the seeds			Where to get the seeds.		
5	Pest control on mushroom (beetles)	Don't know how to identify diseases		Ventilation control.	Disease control	Complaints of diseases.
6	Processing (drying) of the mushroom not known.	How to cook for eating. How to package and lack of packaging materials.		Value addition of the mushroom (processing).	Cooking and processing.	
7						
8	More theory without practical on sterilization of materials.	Participants did not understand well the substrate preparation process.				

**NB:**

The statements in respective rows shows the knowledge gaps expressed by participants during either the focus group discussions or the semi structured interviews. Gaps in some rows shows that participants expressed full knowledge of the respective item as taught during the training.

**Key:**

1. Room identification and construction
2. Choice of growing medium and sources.
3. Sterilization of medium and materials
4. Seeding with spawn.
5. Mushroom house practices and disease control.
6. Harvesting, eating, processing.

7. Cleaning room to start again.
8. Practical skills

### 5.3 Claims and benefits according to the respondents.

	<b>FGD1(Bombo)</b>	<b>FGD2(Kakuzi)</b>	<b>FGD3(Baraka)</b>	<b>LEADER1</b>	<b>LEADER 2</b>	<b>EXTENSION IST</b>
<b>BENEFITS</b>	Income, food source, maximum utilisation of small land, medicinal value	Utilises small land, remains used for soil fertility, food source and income.	Income Diversification opportunity. Constant production hence spreads labour maximum utilisation of small land(high returns per unit area) Not climate dependent. Increased member contribution	Medicinal value. Household income. Climate independent.	Income. Medicinal value. Food. Constant supply.	High value(income) Continuous production. Diversification option.
<b>CLAIMS</b>	Lack of market. Variety decays fast. High initial investment. Group members lacked cooperation on the group demo. High labour requirement - mushroom dairy goats and avocados above other household activities. To get seeds was a problem(delay)	High labour. High capital demand. Lack of accountability from the demo plot proceeds. Lack of market-sold at local market which was not stable. Seeds took long before getting them.	Initial labour is high. Low yields in periods of water shortage. Diseases common. High water usage. Fluctuation of prices.	No market Delay in seed procurement. Members neglect at the group demo (lack of cooperation). Lack of capital. Wrong timing-project started when they had other farming activities. Lack of extension (follow up). Training	High capital investment. High initial labour requirement. Lower prices than expected-500Ksh per kg instead of 800 per kg.	Disease attacks. Price fluctuations. High capital investment. Cooking not understood by everyone.

				was more theory than practical.		
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#### 5.4 Quotes by the respondents.

Fdg1

- I could not start something on my farm yet I have never seen how it grows elsewhere.
- We had to choose between buying food and buying mushroom seeds that would take six weeks before we could reap the proceeds.

Fgd2

- A teacher needs to come back to mark what the student is doing and correct where he/she is going wrong.
- I did not understand properly how to prepare the substrate because the teachers just showed us ready-made bags they had come with; we did not see how they were made.

Fgd3

Even the lazy people can produce mushroom since with a little more cash you have ready-made bags that you only need to nurse for six weeks and you start reaping the fruits of your sweat.

It's not my own ability that am still farming mushroom, it's the strength I get from my fellow group members, encouragement and small loans from the group account.

## 6. RESULTS.

### 6.1 Data analysis.

According to Dey (2005) the core of qualitative data analysis lies in these related processes of describing phenomena, classifying it, and seeing how our concepts interconnect. This was the thought process applied in processing the collected data and come up with the following results.

### 6.2 Respondents background information.

Land ownership per household ranged from 0-2 acres with minimum land ownership being among the participants new the town that were also doing mushroom farming. Average household members ranged between 2-7 members.

Household activities included:

- Farming: maize, beans, avocado, mangoes, oranges and dairy goats. Growing of vegetables (kitchen gardening) was only among the group near the town.
- Other activities included petty trading at the nearby shopping centre. Working as labourers was only among the Kakuzi group who were working at the Kakuzi estate.

As far as group dynamics was concerned the different groups had their own background as follows:

**Bombo group:** Formed in 2008, for purposes of the trainings. Current leader has been there for 2 years, first leader chosen by world vision during trainings. New members are those growing avocado or passion fruits.

**Kakuzi group:** Formed in 2005 with 12 members, increased to 28 members in 2008 for purposes of organic farming trainings. Leader has been there for 5 years, elected by majority. Initially group kept rabbits, changed to dairy goats. Group shared mushroom production demo centre.

**Baraka group:** Formed in 2002 as a self-help group through merry go round. Set up a mushroom demo before other members set their own mushroom houses. Innovation- one member, a retired teacher sells ready-made mushroom bags ready with substrate, so all they need is the house. Members also buy rice straw from mwea for substrate as it's easier to chop than maize Stover.

### 6.3 Respondents Knowledge on the innovation.

By the end of the research it was evident that there were several knowledge gaps among the participants though at varying levels and sometimes different steps of the whole process.

#### **Room identification and construction**

Identification and construction of the mushroom was well understood by all of the participants of the research. This may mean that either during the training this aspect was well covered or this step is very easy as participants had prior knowledge about it.

### **Choice of growing medium and sources.**

The choice of materials for the preparation of the substrate was only a problem for the Kakuzi group. Given that they were taught that maize and beans remains were the best during the substrate preparation some people did not have them because they fed them to their animals. The participants were not aware of any substitutes for the same within their locality. This was not a problem for the rest of the groups.

### **Sterilization of medium and materials**

The sterilization step seemed to be the most difficult for all the participants. This step is the most important for optimum production. The participants expressed the challenges that they faced during this step. Fuel for some of them was a challenge as they lived near the town and getting firewood was a challenge. Getting a drum big enough to boil the substrate was also a problem to them. This step is the most important as it determines the success of the mushroom production. Disease attacks on the mushroom may also be prevented at this point as sterilization is supposed to kill all foreign microbes which ensure that there will be no competition for the growing mushrooms.

### **Seeding with spawn.**

According to the Bombo group most of the members were not aware of where to get the mushroom seeds from for seeding. The other groups were all aware of where and how to get the seeds for seeding the substrate bags.

### **Mushroom house practices and disease control.**

Pest and disease control was an issue. The beetles' attacking the mushroom was not taught during the training according to the Bombo group. The members were also not able to identify practically the diseases on their mushroom so as to take the appropriate measures.

### **Harvesting, eating and processing.**

Participants from both Kakuzi and Bombo said that they had a problem cooking the mushroom especially those who had never cooked them before. Baraka women group did not have this problem, this may be explained by the fact that they have been producing the mushroom and had learned with time. Processing of the mushroom was not adequately covered during the training. The participants from all the groups did not understand how they could dry their harvested mushroom to increase the storage period since they were rotting very easily, apparently this section was not covered during the training.

### **Cleaning room to start again.**

All the participants had full understanding on cleaning the mushroom house and starting the next cycle of production.

### **Practical skills.**

There was a problem with the practical skills bit for all the participants. During the training it was alleged that the trainers just brought ready-made mushroom bags. Mixing the substrate with other ingredients was a challenge to all especially for the first time. Specifically how to

spread the lime and urea evenly over the whole lot of substrate was a challenge. Also during soaking of the substrate detecting when the substrate had the right moisture content was a problem as some removed why it had slightly more water while others removed when had less moisture content. There was a need for practical for all the steps so that participants could get the hands on experience. The importance for practical skills and follow-up by KIOF was strengthened by some of the comments during the focus discussions:

*I could not start something on my farm yet I have never seen how it grows elsewhere-*  
Member from Bombo group.

*A teacher needs to come back to mark what the student is doing and correct where he/she is going wrong.*

*I did not understand properly how to prepare the substrate because the teachers just showed us ready-made bags they had come with; we did not see how they were made-* Two members from Kakuzi group.

## **6.4 Claims and benefits according to the respondents.**

### **6.4.1 Benefits.**

The understanding of the benefits by the participants was varied as shown in the following points:

*Source of income for households producing them-* sale of mushroom can earn the households extra income above their normal farming activities. This was alluded to by all the participants, this shows extensive understanding pertaining to income from mushroom. The Baraka women group even additional advantage as they confirmed that members were paying their monthly contributions to their group on time.

*Maximum utilisation of space.* This was very attractive for the farmers who have small land or landless since mushroom production needs a small space which can even be in the main house. Though most of the participants confirmed this benefit the Baraka group amplified it more; this may be explained by the fact that they were living near the town and they had the highest number of households who were landless. Mushroom farming may have provided a very convenient way of farming from limited space.

*Season independent.* Since the mushrooms are grown in a controlled environment they can be grown at any time of the year. This benefit was only raised by the Baraka group. Additionally this fact made them able to spread their labour throughout as other farming activities were dependent on the rainfall.

*The mushroom can be consumed.* This means that even if they are not sold to get income they can be consumed as food and above food they had medicinal value. This means that the more you consumed mushroom the more your immunity grew strong. All groups were showing an understanding of this benefit.

*Mushroom production offers a diversification option for households.* This means that the household will have more farming activities hence distributing the risks associated with farming especially in drought prone areas. This was only raised by the Baraka group who

also happened to have many other activities which were lacking from the other groups, these included kitchen gardening and fishponds.

#### 6.4.2 Claims.

The participants also identified some of the challenges they associated with the mushroom farming though at varying degrees as follows:

*Limited market for the harvested mushroom.* This was according to Kakuzi and Bombo groups, Baraka group had no problem with market. The members were selling in the local town and sometimes they could not sell them as the demand was sometimes low. The Baraka women were more organised in selling their mushroom and the group was able to supply their market constantly without shortages even though they had a minor problem of price fluctuations from time to time which was also alluded to by the DEO.

*High initial labour requirement.* This was during house construction and substrate preparation which was most of the time being done by the women. All the groups alluded to this problem even though Baraka group were quick to add that it was only for the first time; from then onwards everything has been simple. Several projects were introduced at the same time by World Vision. The members received trainings on dairy goat rearing, mushroom farming and avocado production (Hass variety). This could have put a lot of burden on the women as they still had other farming activities to attend to; additionally women play a double role at household level namely productive and reproductive roles. This was even more difficult for them since they were the only who had the full knowledge on mushroom farming.

*Delay of inputs.* According to all the groups and even the DEO getting the mushroom seeds was a problem since some of them did not know where to get the seeds. Other members especially from Baraka group claimed that after placing their orders for the seeds they took time before they got them yet they had prepared all other items. Availability of inputs is crucial for any type of production; Marshall & Nair (2009) capture this clearly in the following assertion:

*Access to sufficient, suitable and locally-sourced substrate and spores are key determinants as to whether mushroom cultivation is likely to be successful and sustainable or not. Both rural farmers and peri-urban cultivators should be able to obtain agricultural by-products easily and cheaply to use as substrate.*

*The initial capital requirement was very high for the members.* The capital needed for buying the seeds, materials for room construction and for some hiring of labour. Refrigeration was also required for harvested mushroom to avoid decay since the mushroom variety was alleged to have a very short shelf life, making it difficult to store after harvesting. This was however the case with Kakuzi and Bombo groups, Baraka group had no problem as they said the materials were affordable.

*Lack of group cooperation:* The two groups (non- adopters) alleged that there was no cooperation among the group members in the management of the mushroom demo that they established. There was also the problem of misappropriation of the proceeds from the mushroom. This may have contributed in mistrust among members and abandoned the group demo. This had a negative impact on the adoption as during the planning phase of the project the members were expected to set up the demo that would serve as the learning



centre for the members so that they would be able to start their own mushroom farming houses. Organisation could also have solved the problem of marketing and credit services as can be seen from one of the respondents from Baraka Group:

*It's not my own ability that am still farming mushroom, it's the strength I get from my fellow group members, encouragement and small loans from the group account.*

## 7. CONCLUSIONS AND RECOMMENDATIONS.

Using above results from the research it was possible to come up with several conclusions and recommendations.

- There exists knowledge and skills gap among the trained farmers. On knowledge the farmers are not very well conversant with sterilization and disease control in mushroom. The practical bit was not well covered for the farmers to get the hands on experience of the procedures for substrate preparation. Some important aspects were also not covered during the training notably value addition and marketing. It is therefore recommended that KIOF reviews its training manual to include marketing and value addition of the mushroom. There is also a need for KIOF to include a follow-up program of the trained farmers so that in case of hitches they can be handled. The trainings should also be held on-site to enhance practical. “The most effective way to impart skills to the potential mushroom growers is to teach the fundamental aspects of the mushroom farming system and to provide hands-on training on site. Although requiring good planning and coordination, a very positive and practical way of providing this training is through Farmer Field Schools (FFSs)” Marshall & Nair (2009).
- The farmers did not get to understand fully the benefits associated with mushroom farming. There is a need to emphasize in detail the benefits of mushroom during the training so that the farmers can weigh between the benefits and claims before they make a choice.
- KIOF did not fully involve the most important stakeholders in the planning of the training. The stakeholders would have included the input suppliers like JKUAT who were supposed to provide the inputs like seeds and bags for mushroom farming. This would have ensured that JKUAT is aware of the new requests for mushroom seeds and adjust accordingly. The involvement of financial institutions would have ensured that the farmers would have been aware of where to go credit in case they needed more cash in the initial stages of mushroom farming. Given that market for some groups was a problem involvement of potential market outlets would have solved the market problem as the participants would have been able to link up with the potential markets. The importance of prior knowledge is captured in Marshall & Nair (2009) where they posit “An alternative approach to training includes a study of market opportunities followed by community skills assessment and the provision of training on site, bringing trainers to the community rather than sending villagers to a training centre. This also allows other members of the family or community to benefit, learn the relevant skills, and become involved in the cultivation process”. The involvement of only women in the project may have put more burdens on the women. It would have been better to involve households without specifying whether men or women. Given that some of the activities involved especially construction of the mushroom house, it would have been good to also involve men so that would be able to carry out some of the difficult steps that could not be undertaken by the women. A complete stakeholder analysis would have identified all the stakeholders including marketing outlets which was also a problem for some of the farmers.
- The planning of the training also contributed to the low adoption of the mushroom farming. The timing coincided with other activities which increased the labour for the households and hence they had to choose how to allocate their limited labour. The

multiple projects that were being implemented at the same time had a negative effect on adoption of the technology as it increased the labour at household level.

- The learning on mushroom farming was expected to be extended at group level where the members were supposed establish a demo centre. The functioning of the groups who participated in the training was overlooked. Given that highest failure was observed in the groups which had just been formed for purposes of the training it is possible to conclude that the functioning of the groups was a factor. It is therefore recommended that KIOF should work with functional groups that have existed for some time and have a shared goal. Alternatively the newly formed groups should be trained on group dynamics so that they can be more cohesive and cooperative during the implementation of the expected activities.

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## ANNEXES.

### 1. Checklist for group discussions.

Background information.

- Size of land
- Household size
- Household activities
- When the group was formed, purpose.

**Main.**

*Knowledge*

1. Room identification and construction
2. Choice of growing medium and sources.
3. Sterilization of medium and materials
4. Seeding with spawn.
5. Mushroom house practices and disease control.
6. Harvesting, eating, processing.
7. Cleaning room to start again.
8. Practical skills.

*Willingness.*

Benefits.

1. Income.
2. Food source
3. Maximum utilization of small land.

Claims (disadvantages)

1. Market.
2. Labour.
3. Decision making.
4. Investment(capital)
5. Group dynamics.

## 2. Leaders' interview questions (semi structured).

### Background

How long have you been the group leader?

How were you chosen to lead the group?

What activities has the group been involved in?

What is the criterion for membership?

### Main

Do you think your group has sufficient knowledge on the following aspects of mushroom production?

1. Room identification and construction
2. Choice of growing medium and sources.
3. Sterilization of medium and materials
4. Seeding with spawn.
5. Mushroom house practices and disease control.
6. Harvesting, eating, processing.
7. Cleaning room to start again.
8. Practical skills.

Do your group members understand the benefits of mushroom production? What are some of the benefits that the members know?

Do your group members have any claims on mushroom production? Mention some of the common claims from members.

### 3. DEO interview questions (semi structured.)

#### **Background.**

For how long have you been working in Makuyu division?

What are the common farming activities in Makuyu?

What other economic activities are the people of Makuyu engaged in?

Did you participate in the mushroom trainings?

Do you understand the mushroom production practices?

On what agriculture aspects do you assist farmers in Makuyu?

How often do you visit the farmers?

#### **Main**

From a technical point of view which step among the following do you think is a challenge for mushroom farmers in Makuyu?

1. Room identification and construction
2. Choice of growing medium and sources.
3. Sterilization of medium and materials
4. Seeding with spawn.
5. Mushroom house practices and disease control.
6. Harvesting, eating, processing.
7. Cleaning room to start again.

What benefits do you think would be associated with mushroom production in Makuyu?

What are some of the claims of mushroom production in Makuyu?



Figure 6 pictures showing different focus group discussions.



