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Full Length Research Paper

Mushroom value chain analysis in Addis Ababa, Ethiopia

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Mushroom value chain analysis was conducted in Addis Ababa, Ethiopia. In rural areas of Ethiopia eating mushroom is a common practice in traditional way. The objective of the study was to measure the amount of value added along the chain. Primary and secondary data were collected from 120 producers, 5 traders, 8 spawn suppliers, 6 supermarkets, 7 hotels and restaurants and 40 end users. For analysis descriptive and inferential statistics such as, Percentage, value added, gross value added, t-test, χ^2 -test, F-test, were applied. On average, about 14.5 quintal mushroom is produced per season with the productivity of 4.4 kilogram per bed. The average price of mushroom range from 43.6 to 57.9 ETB per kilogram. Mushroom value chain actors were input suppliers, producers, traders, processors and end users. There were eight mushroom marketing channels in the study area. The highest and the lowest amount of the total value added were 171.87 and 20.77 ETB per kilogram. Spawn suppliers play the greatest role in the collection and distribution of mushroom along the marketing channels. Substrate left after mushroom production was disposed in different ways. Most 54.2% of mushroom producers were throwing it away because they believed it causes environmental pollution. About 31.4% of the respondent used spent spawn for compost. Based on the results it can be concluded that, demographic, cultural, socio- economic and institutional factors influences mushroom value chain. It is recommended that, higher educational and research institutes should release mushroom technologies and scale up suitable varieties and substrate. Relevant governmental bodies should also create awareness about the nutritional and medicinal values of mushroom, generate market information, facilitate licensing, establish standard and quality control mechanisms and link producers to potential market. Food processing companies should also give attention to add value to mushroom for local and international markets.

Key words: Ethiopia, Addis Ababa, mushroom, value chain and value added.

INTRODUCTION

Mushroom is a delicious food consumed throughout the world. It is also called the future vegetable which is a guarantee for food insecurity, malnutrition problem and has medicinal value. World production of mushroom is

growing and now exceeds three million tons that worth a market value of 10 billion USD. Major mushroom producers are China, USA and Netherlands, and they share 47, 11, and 7% of world supply, respectively. The

remaining 35% of the total production was from Italy, France, Poland, Ireland, United Kingdom, Canada and India (Harsh and Joshi, 2008).

According to Birhanu and Zerihun (2012), mushroom consumption habit in many parts of African countries is well developed. In rural area of Ethiopia, eating wild mushroom is a common practice in a traditional way (Tuno, 2001; Teferi et al., 2013). The prevailing mild temperature in Ethiopia, particularly in the highlands, is conducive to mushroom growing. In addition it can be produced indoor with small area of land and with little investment throughout the year using agricultural and industrial by-products as substrate (Abate, 1998).

Cultivated mushroom is fat and cholesterol free, low-sodium foods, rich in important nutrients (including some nutrients not usually found in great amounts in fresh produce) and containing antioxidants. Mushrooms satisfy the needs of health-conscious consumers and are a desirable alternative food, especially for vegetarians (USITC, 2010).

Since mushroom is an emerging business sector in Ethiopia, the information on value chain actors, activities and their interrelationships among themselves and with other institutions are not clearly known. In addition, the type of value addition and the amount of value added by the value chain actors were not identified. Therefore, in order to make interventions this study is expected to generate useful information.

The general objective of this study was to understand mushroom value chains which help to identify interventions in order to make the sector more competitive in the domestic and export markets, and thereby improve the livelihood of the urban people. The specific objectives were aimed to describe mushroom value chain, to measure the amount of value added along the mushroom value chain, and to identify the value chain functions, actors and activities.

METHODOLOGY

Description of the study area

The study is conducted in Addis Ababa, Ethiopia. Addis Ababa, the federal capital city of Ethiopia, was founded in 1886. The city is located at an altitude between 2300 in the south of the city and 3000 meters in the north. Addis Ababa is called "political capital of Africa" since it is headquarters of the African Union, numerous international organizations and embassies are located in the city. Geographically, Addis Ababa is located at 9°1'48"N and 38°44'24"E having area coverage of 526.99km² (Figure 1). It has a subtropical highland climate as well as complex mix of highland climate zones, with temperature differences of up to 10°C (18°F), depending on

elevation and prevailing wind patterns.

Data and sampling techniques

Both primary and secondary data were collected for this study. To collect primary data; household survey, focused-group discussion, key informants and personal observation were carried out. Secondary data were collected from, spawn suppliers, training providers and from Addis Ababa Administration Urban Agriculture Office. The study addressed 8 input suppliers, 120 producers, 5 collectors and traders, 7 hotels, restaurants and cafeterias, 6 supermarkets and 40 consumers and non consumers. Mushroom producers sample size was determined using a simplified formula provided by Yamane (1967).

$$n = \frac{N}{1 + N(e)^2}$$

Where, n = Sample size, N = Total active mushroom producers in the study area, e = precision at ± 5%.

A two stage random sampling was adopted for selecting mushroom growers. At the first stage, of the total 17 spawn suppliers 5 were randomly selected. Then a list of all mushroom producers was prepared based on the information provided by selected spawn suppliers and urban agricultural offices. Sample producers were proportionally drawn by simple random sampling technique.

Focused group discussion with producers and consumers were conducted at the study area. And a checklist was developed and used to facilitate the discussion. Key informants such as input suppliers, mushroom assemblers, hotels, restaurants, super markets and end users were also randomly identified and interviewed. For this purpose, different semi-structured guiding questionnaires were prepared and used.

Methods of data analysis

Descriptive statistics such as percentage, mean, standard deviation, costs and revenue were used to analyze the amount of value added along the chain. The major opportunities and constraints along the mushroom value chain were also addressed.

RESULTS AND DISCUSSIONS

Description of mushroom producers

Mushroom producers in Addis Ababa, Ethiopia were categorized into three; individual producers (sole proprietors), producer groups (partnership) and cooperatives. Variation in the distribution of female and male mushroom producers or members was seen among sole proprietors', partners and cooperatives (Table 1). The role of women's in the production and trade of

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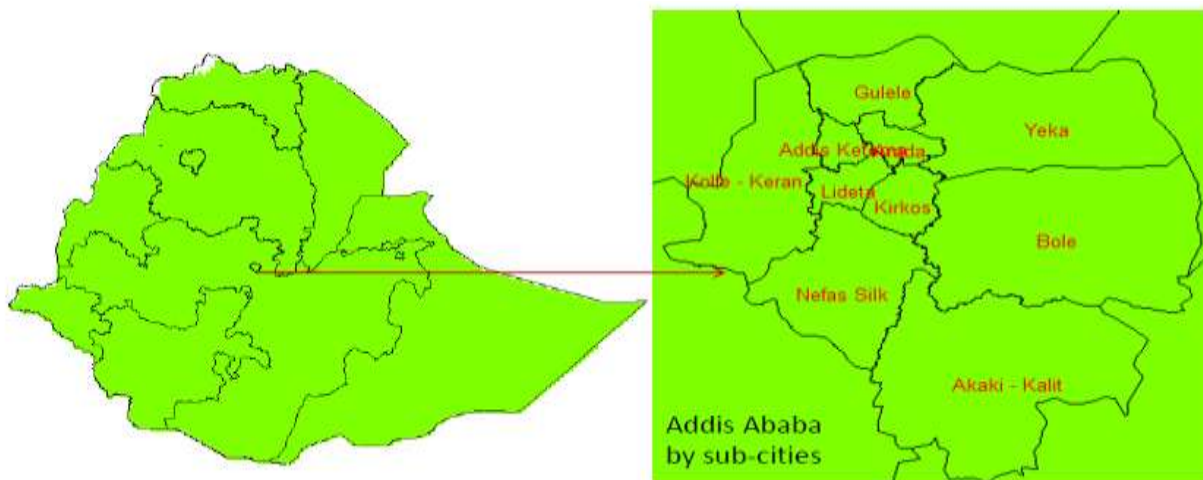


Figure1. Geographic map of Addis Ababa, Ethiopia.

Table 1. Gender distribution among business types.

Sex n	Sole prop. (%)	Partners (%)	Cooperative (%)	χ^2 -test
Female	30 (17)	55 (31.3)	91 (51.7)	62.794***
Male	55 (39.3)	29 (20.7)	56 (40)	

*** Significant at 1% significance level.

Table 2. Educational background of mushroom.

Education level n (%)	Type of the business			F-test
	Sole proprietor (%)	Partners (%)	Cooperative (%)	
Primary	7 (5.8)	1 (0.8)	4 (3.3)	0.065
Secondary	28 (23.3)	6 (5.0)	1 (0.8)	
Diploma/TVET	27 (22.5)	9 (7.5)	7 (5.8)	
BA/ B. Sc and above	23 (19.2)	3 (2.5)	4 (3.3)	
Total	85 (70.8)	19 (15.8)	16 (13.3)	

mushroom were higher than that of men (Birhanu and Zerihun, 2012).

The educational background of respondents in mushroom production showed that all mushroom business types have members from all education levels. It revealed that mushroom can be produced and managed by all people including those who have lower educational level with supplement of short time training (Celik and Peker, 2009). About 32.9% of respondents in sole proprietorship had secondary educational level, whereas 47.4% in partnerships and 43.8% in cooperatives had Diploma/TVET educational level. Generally, there was no significant difference in the highest education

level reached by members of mushroom producers (Table 2).

Mushroom value chain functions, actors, activities and market flow

Mushroom value chain actors in Addis Ababa were generally classified to input suppliers, producers, traders, processors and consumers. All actors along the chain add value in the process of changing product title. The main functions and activities performed along the value chain are shown in Figure 2.

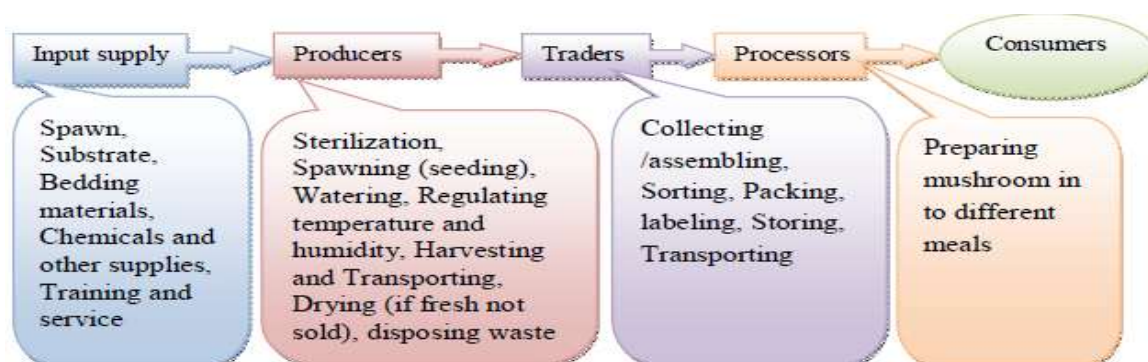


Figure 2. Processes and functions of mushroom value chain.

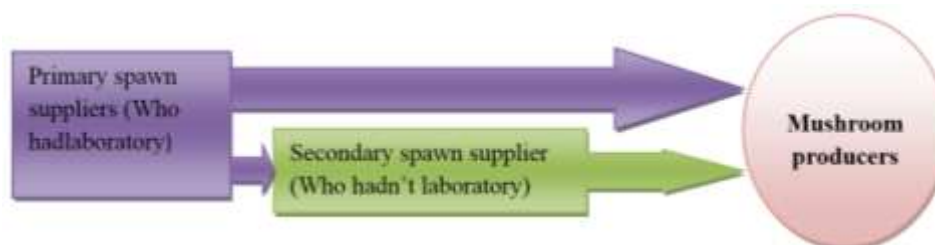


Figure 3. Spawn market flow.

Input suppliers

Spawn

During the study period, there were about sixteen spawn suppliers and five own spawn producers found in Addis Ababa. Fifteen of the spawn suppliers were private sectors and only one spawn supplier under the government. Producers have got the spawn from two channels. The first channels originate from primary spawn suppliers to the producer where as the second channel passed through primary and secondary spawn suppliers to reach mushroom producers (Figure 3).

Substrate

As shown in Figure 4, the dominant substrates used for mushroom production were cotton seed husk and wheat straw. About 95.8% of the total producers used cotton seed husk. Regarding four channels of substrate, 53.3 and 4.2% of producers were purchased substrate directly from the oil refinery and farmer, respectively. The remaining two channels provided substrate to the producer through spawn suppliers (39.2%) and local markets (3.3%). Other findings showed that substrates like coffee pulp (Martínez et al., 2000), saw dust (Oseni et al., 2012), maize straw, rice straw and sugarcane

bagasse and leaf (Amin et al., 2010) were also suitable for mushroom production.

Training

Mushroom producers obtained training from spawn suppliers (78.9%) on average of 6.4 h, and from governmental Technical Vocational and Educational Training (TVET) colleges (21.1%) on average for 22.5 days with 3.4 h. per day. TVET colleges provide training for jobless individuals organized by sub cities under small and micro institutions. Regarding to other inputs such as bedding materials, chemicals and other supplies, producers obtained from the local markets, pharmacies, and/ or *merkato* (the main market in Addis Ababa).

Credit service

Credit service helps for the development of any business sector. Since mushroom sector is a new business area to Ethiopia, producers urgently need credit facilities to run the business. Out of the total sampled producers, 86.7% had no access to credit in 2013 cropping year. For mushroom production even if 16.4% need credit, they did not have access due to restrictive procedure and other reasons while 83.6 percent of them did not face any financial problem.

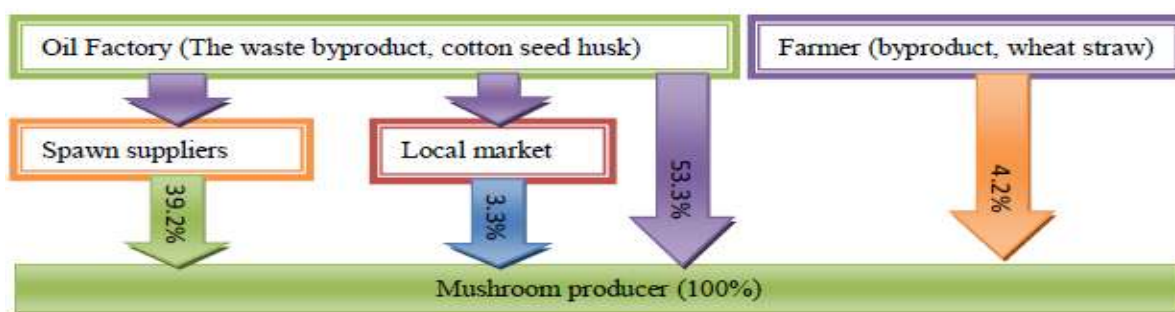


Figure 4. Flow of substrate for mushroom production.

Table 3. Access to extension, demonstration and written materials.

Extension contact	Type of the business			χ^2 - test
	Sole. Prop. n (%)	Partners n (%)	Cooperative n (%)	
No extension contact	77 (65.3)	13 (11.0)	12 (10.2)	7.752**
Have contact	7 (5.9)	6 (5.1)	3 (2.5)	

**Significant at 5% significance level.

Extension and demonstration

Addis Ababa urban agricultural office organized and assist those engaged in urban agriculture through district urban agricultural offices. Even though professionals were recruited under different case teams for the agricultural sector including horticulture in all sub cities and districts, the extension service was not uniform among business types. The study result indicated significant difference in extension contact at 5% significance level within and among business types (Table 3).

Producers

Mushroom producers are the next major actors who perform most of the value chain functions start from mobilizing inputs to post harvest handling and marketing. The major value chain activities that mushroom producers perform include purchasing inputs, sterilizing substrates, spawning, managing the growing shade, disease and pest controlling, harvesting, post harvest handling and marketing.

According to mushroom producers, hot water and steam sterilization were the most difficult activity, since it is labor intensive and time consuming. The major actor in the production function of the value chain includes sole proprietors (individual mushroom producers), partners (producer groups) and cooperatives. These producers harvested their product early in the morning and immediately transported them to six market outlets. About

34.5% of the total product in the study area supplied to spawn suppliers followed by 31.6 and 14.6% to hotels and restaurants and supermarkets, respectively. The remaining 10.4% to consumers, and 9% were supplied to traders such as assemblers and retailers. The flow of input for the production of mushrooms towards the producers and the supply of output to different alternative market is depicted in Figure 5.

Traders

The major actors in mushroom trade are categorized into spawn suppliers, retailers and supermarkets. The activities of spawn suppliers and retailers were collecting, sorting, packing and transporting to the next destination market. As shown in Figure 6, spawn suppliers played the leading role in collecting and distributing fresh and dry mushroom from producers to alternative markets. Their destination markets were consumers, supermarkets, hotels and restaurants, and retailers. The main alternate markets for spawn suppliers were supermarkets, consumers and hotels and restaurants with the market share of 50.9, being 24.9 and 20.1% of the total supplied mushroom, respectively. Retailer market, found at Bole Ruanda *gullitgebeya*, collected fresh mushroom from producers and spawn suppliers. Hence, this market was well known by foreigners who live in Addis Ababa, almost the entire mushroom product sold for them.

Supermarkets sale both imported and locally produced mushroom. Their major activities are packaging, labeling and storing. The primary client of supermarkets for

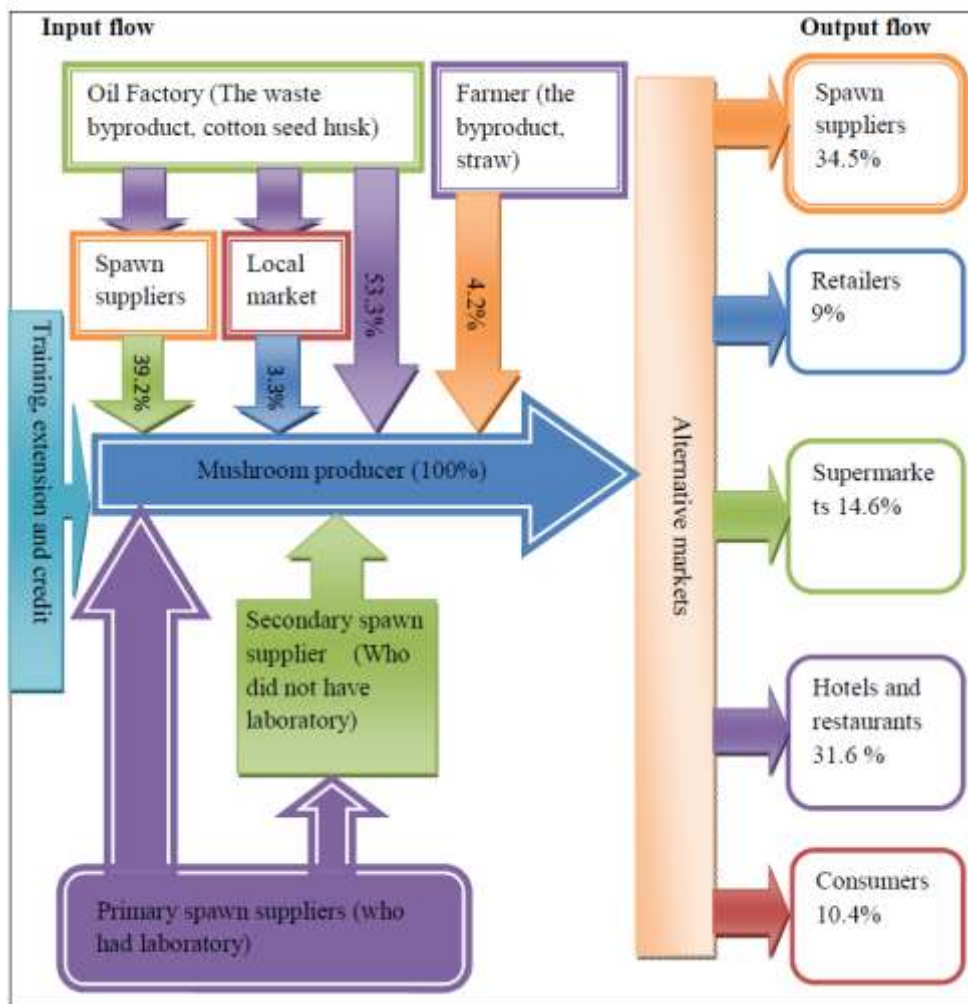


Figure 5. Input and output market flow for producers.

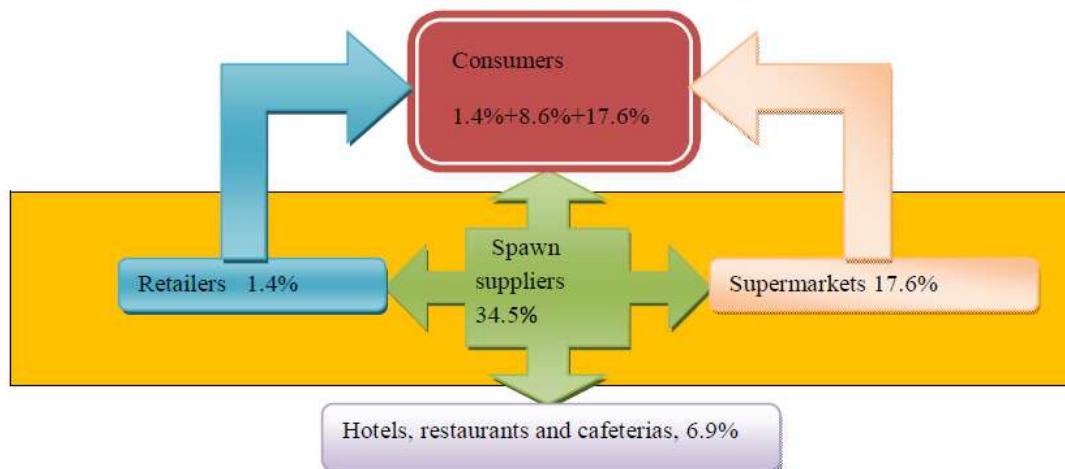


Figure 6. Mushroom market flows from spawn suppliers.

locally produced fresh mushroom were foreigners (66.7%) followed by Diasporas (16.7%) and local peoples (16.7%). On average, supermarkets sold 640 kg fresh mushrooms per month to end users. The shelf life of mushroom at supermarket, on average is 4.33 days, which is longer life than any other types of market actors for whom the life period is not more than a day.

Processors

Processing is one of the mushroom value chain functions. As stated by Tibrichu and Buykusenge (2009), there was no special mushroom processing and packaging company to local and international market. Rather, hotels, restaurants and cafeterias further process locally produced and imported mushroom into different dishes. Sampled hotels, restaurants and cafeterias prepared 48 types of 154 fasting and non fasting mushroom dishes per day. The main customers for mushroom dishes were foreigners (71.4%) and local peoples (28.1%).

Consumers

Consumers are end users of mushroom in the value chain. Consumers purchase and used mushroom from producers, traders and processors. About 67.5% of sampled consumers did not know about mushroom whereas 32.5% knew either wild, locally cultivated, imported or all types. Wild edible mushroom was well known (46.2%) than both locally cultivated (23.1%) and imported ones in the study area. Accordingly, 53.8% of those who knew mushroom have consumed it in the last twelve months. Whose monthly income of birr 3 551 and above were 66.6%, while the remaining 33.4% had below birr 1 400. Some of the reasons for those who knew but did not consume mushroom were due to non availability and expensiveness (50%), lack of awareness (33.3%) and prefer to consume meat (16.7%).

Institutional support

Like any agricultural sector, other originations' organizations' plays vital role for sustainability of the mushroom production. For instance, agricultural offices involved in facilitating mushroom training, licensing, organizing producers in small and micro- institutions, provide shade, extension service and spawn. Addis Ababa University contributes to the sector through training, research and development. Food and Health Research Institute give certificate for those producers who qualify for the edibility criteria of their produced mushroom. Forestry research center of the Ethiopian Institute of Agricultural Research is the other facilitator who conducts research on substrates under the non

timber forest product case team. TVET colleges provided training service for those willing to join mushroom production.

West disposal

Bulky substrate left after mushroom production, spent spawn, was disposed in different ways. Most mushroom producers (54.2%) were throwing it away believing that it leads to environmental pollution. About 31.4% of the respondent used spent spawn for compost which is in line with the findings of Polat et al. (2009). The remaining 12.7 and 1.7% used spent spawn for fuel and for livestock feed, respectively.

Mapping mushroom value chain

Mushroom value added along the market channels

Mushroom value chain actors added value when the product passes from one actor to another. The actors either change the form of the product through processing or improving the grade through sorting, cleaning, packing or creating place and time utility. Unlike Mabuza et al. (2013), who identifies four mushroom market channels, there were eight value chains in the study area. The chains were:

Producers → spawn suppliers → hotels, restaurants and cafeterias → consumers
 Producers → spawn suppliers → Retailers → consumers
 Producers → spawn suppliers → supermarkets → consumers
 Producers → spawn suppliers → consumers
 Producers → retailers → consumers
 Producers → supermarkets → consumers
 Producers → consumers
 Producers → hotels, restaurants and cafeterias → Consumers

Among the chains, the total values added to mushroom were highest in the first and the eighth chains, which was 171.87 Ethiopian birr (ETB) per kilogram. It showed that the producers' share of the value added were the lowest which is in line with the findings of Khatkar et al. (2005). In both chains, hotels, restaurants and cafeterias, processed mushroom into different meals, adding the highest gross values to mushroom. In contrast, the seventh marketing channel, direct flow of mushroom from producers to consumers, shows the lowest total value added to mushroom product (20.77 ETB/ kg). Spawn suppliers played the greatest role in the distribution of mushroom along first four marketing channels. Their percent of value added in these channels were 5.82, 24.78, 18.74 and 38.77%, respectively (Table 4).

Table 4. Mushroom values added along the chains in ETB per kilogram.

Channels	Producers	Spawn suppliers	Retailers	Super markets	Hotels and rest	Consumers	Total value added
Selling price, birr/kg	-	50	-	60	204.1	204.1	-
Cost of raw materials	32.23	50.00	-	60.00	-	-	-
Gross value added	17.77	10.00	-	144.10	-	-	171.87
Total value added (%)	10.34	5.82	0.00	83.84	0.00	0.00	100.00
Selling price, birr/kg	-	50	57.5	-	-	-	-
Cost of raw materials	32.23	50.00	57.50	-	-	-	-
Gross value added	17.77	7.50	5.00	-	-	-	30.27
Total value added (%)	58.70	24.78	16.52	0.00	0.00	0.00	100.00
Selling price, birr/kg	-	50	-	58.75	-	83.67	-
Cost of raw materials	32.23	50.00	-	63.51	-	-	-
Gross value added	17.77	8.75	-	20.16	-	-	46.68
Total value added (%)	38.07	18.74	0.00	43.19	0.00	0.00	100.00
Selling price, birr/kg	-	50	-	-	-	61.25	-
Cost of raw materials	32.23	50.00	-	-	-	-	-
Gross value added	17.77	11.25	-	-	-	-	29.02
Total value added (%)	61.23	38.77	0.00	0.00	0.00	0.00	100.00
Selling price, birr/kg	-	-	43.6	-	-	57.5	-
Cost of raw materials	32.23	-	43.60	-	-	-	-
Gross value added	11.37	-	13.90	-	-	-	25.27
Total value added (%)	44.99	0.00	55.01	0.00	0.00	0.00	100.00
Selling price, birr/kg	-	-	-	51	-	83.67	-
Cost of raw materials	32.23	-	-	55.78	-	0.00	-
Gross value added	18.77	-	-	29.91	-	-	48.58
Total value added (%)	38.56	0.00	0.00	61.44	0.00	0.00	100.00
Selling price, birr/kg	-	-	-	-	-	53	-
Cost of raw materials	32.23	-	-	-	-	0.00	-
Gross value added	20.77	-	-	-	-	-	20.77
Total value added (%)	100.0	-	-	-	-	-	100.00
Selling price, birr/kg	-	-	-	-	56.65	204.1	-
Cost of raw materials	32.23	-	-	-	56.65	0.00	-
Gross value added	24.42	-	-	-	147.45	-	171.87
Total value added (%)	14.21	0.00	0.00	0.00	85.79	0.00	100.00

Mapping the volume of mushroom along the chain

The volume of mushroom supplied varies along the alternative market channels. On average, the total amount of 13,477.5 kg of mushroom is supplied by sampled producers per month to different markets. Out of which individual producers supplied 59.4% followed by partners (32.3%) and cooperatives (8.3%). In the shortest channel, 10.4% of the total mushroom was supplied directly from producers to consumers. The largest volume of mushroom (34.5%), flow from producers through

spawn suppliers to retailers (1.4%), supermarkets (17.6%), hotel, restaurants and cafeterias (6.9%) and consumers (8.6%). Hotels, restaurant and cafeterias processed 37.5% of the total mushroom into different meals before being delivered to consumers (Figure 7).

Mushroom value chain map in Addis Ababa, Ethiopia

Mushroom value chain map in the study area, depicted in Figure 8, summarizes the whole input and output flow

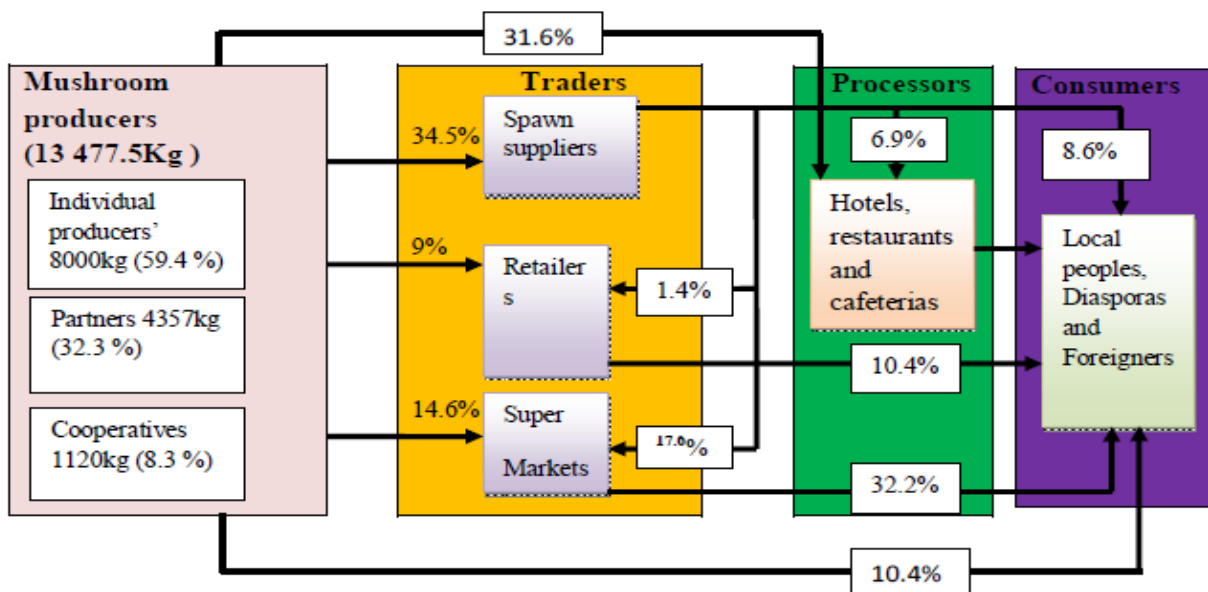


Figure 7. Volume of mushroom flow per month through the value chain function.

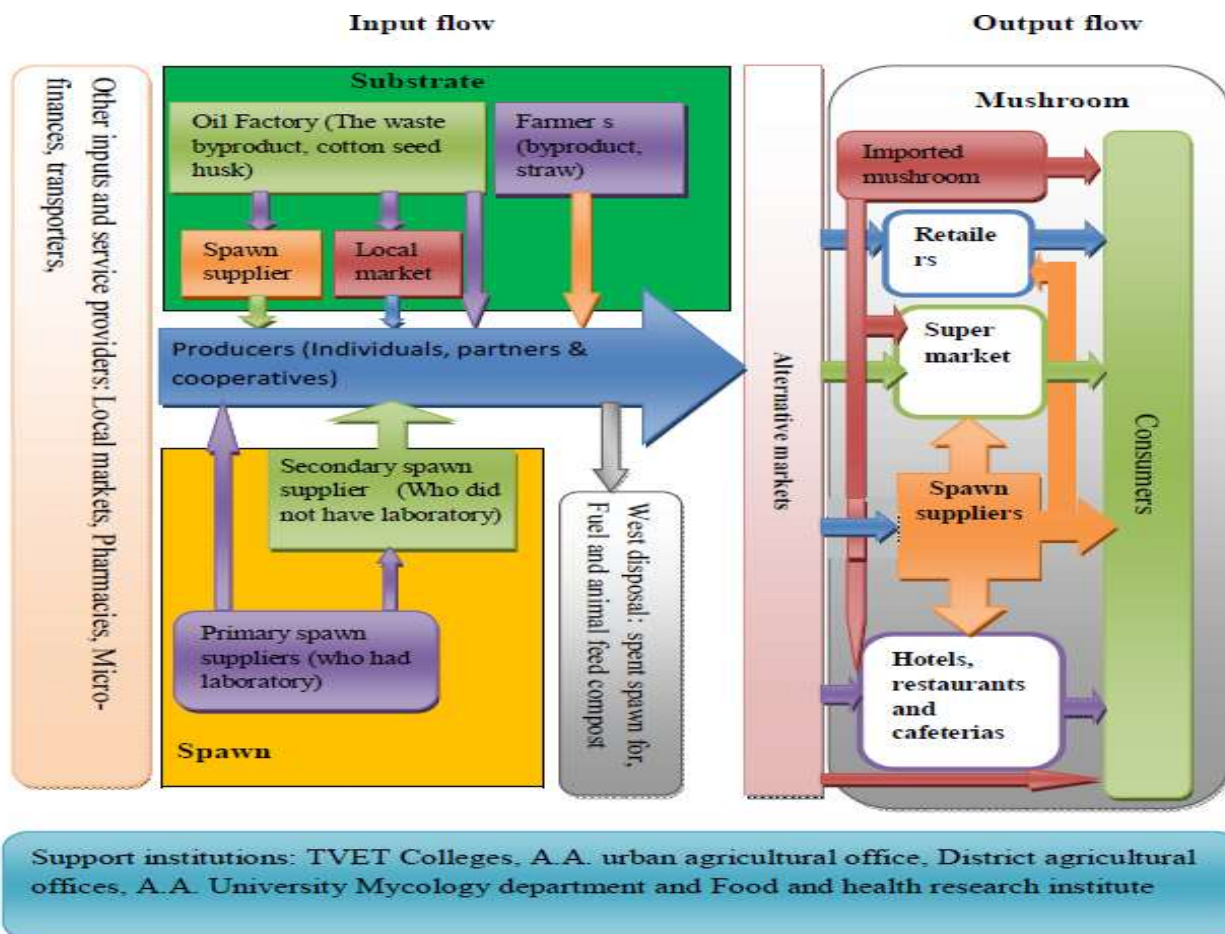


Figure 8. Mushroom value chain maps in Addis Ababa, Ethiopia.

Table 5. Summary of opportunities, constraints and weakness.

Opportunities	Constraints	Weakness
Availability of substrate and spawn	High cost of substrate and spawn and lack of quality of spawn High cost of processing equipments	Producers do not exploit their most relevant assests/resources (for example, growing shade)
Free training by TVET, attention given to urban agriculture	Lack of door to door extention services, lack of national management system and lack of access to affordable credit facitly	Lack of effective linkage among mushroom producers and bretween research institutes Lack of cooperstion and co-ordiantion among different mushroom producers, input supplier etc.
Increasing consumers awarness	Producers hardly get to the market during the oversupply of mushrooms	Producers did not have linkage to potential buyers of mushrooms, lack of promotion, most producers are unable to supply the required amount of mushroom product sustainably, low quality of mushroom product
The emerging world demand for mushroom	Lack of mushroom market organization and techniques, absence of mushroom value chain governance system Unable to exploit the emerging markets (Internet, website set up and development, E-commerce etc). lack of awareness to mushroom processing technology	Lack of enough skills, knowledge or experience in mushroom production technology . Unable to exploit the changed production technology (new production variety, new production substrate, new production method etc.)
Credit facilities	Lack of collateral, production knowledge abot mushroom other than oyster, unaffordable expansion cost for modern mushroom farming	Lack of shade for mushroom production, poor post harvest managemen and handling practies, poor financial management system
West recycling technologies	Bulky substrate cause environmental pollution	Serious production loss due to contarmination, unable to recycle substrate left after mushroom production. Lack to co-operate and network with other enterprises

along with the support institutions. As shown in the map spawn suppliers were the leading actors almost in all input and output flows along the mushroom value chains. It seems the mushroom business is centrally controlled by these actors.

Opportunities and constraints of mushroom value chain

Most of the mushroom producers in the study area don't have enough knowledge towards mushroom production technique and marketing. The most common opportunities include availability of spawn, substrate and increasing local consumers awareness about nutritional value of mushroom. In addition, special attention given by the government for urban agriculture in general and for mushroom in particular provides opportunity for mushroom producers to expand their business. Some of the constraints beyond the capacity of mushroom

producers are high cost of spawn and substrate, lack of quality spawn; extension service and market access (Table 5).

CONCLUSIONS

Mushroom value chain actors are classified into input suppliers, producers, traders, processors and consumers. Producers in the study area were sole proprietors, partners and cooperatives. Mushroom business was well suited for both females and males of all levels of education. Among the actors, spawn suppliers played the major role in the distribution of inputs, collection and marketing of the product.

Eight mushroom value chains identified with the highest, 171.87 ETB, and the lowest, 20.77 ETB, were value added per kilogram to the mushroom. The largest proportion of mushroom was supplied by sole proprietors followed by producers and cooperatives.

The most familiar opportunities of the value chain were availability of spawn, substrate and the increasing awareness of local consumers about the nutritional value of mushroom. In contrast, high cost of spawn and substrate and lack of market access were the major constraint in the study area.

RECOMMENDATIONS

Most mushroom producers had limited choice to spawn and substrate. As a result, they are constrained to produce mushroom using only cottonseed husk. Therefore, having substitute substrate ensure sustainable mushroom production. In addition, spawn should be available in terms of quantity, quality and sustainability. Thus, there is a need to link higher educational and research institutes to urban agricultural offices and producers to scale up suitable spawn and substrate technologies.

Mushroom and spawn market are concentrated in the hands of spawn suppliers which makes mushroom market imperfect. As a result, most of the mushroom producers are exploited and discouraged. Therefore, government intervention required in terms of generating mushroom market information like other agricultural commodities, establish standard and quality control mechanism and link producers with potential markets. In addition, producers should communicate with each other and establish cooperatives and unions to overcome the problem.

Mushroom is perishable vegetable cash crop and producers have limited market options. As a result, they dispose it during over supply. Therefore, there is a need to increase the shelf life through value addition process. In addition, continuous promotion may contribute to improve the awareness of the society about the nutritional and medicinal values of mushroom. Moreover, providing mushroom processing technologies at fair price needs focus of relevant body.

Conflict of interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Assessment of traditional African vegetable production in Burkina Faso

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Lack of dietary diversity is a key causal factor of malnutrition in Burkina Faso because the population consumes mostly cereals crops. Nutrient-dense traditional African vegetables provide an excellent means to complement cereal staples for better nutrition, in particular for women and children, as well as for income generation. This study characterized the production of traditional African vegetables in Burkina Faso based on a questionnaire administered to 250 respondents. Results indicate the majority (75%) of the producers had no formal education and generally practiced gardening in lowland areas near water dams and streams. Tomato was cultivated by 35% of the respondents, followed by okra (32%) and African eggplant (20%). Overall, more land was used for traditional African vegetables compared to exotic species, but individual global vegetables occupied more space than traditional vegetables; tomato was produced on 467 m² and okra on 315 m². About 98% of the producers practiced manual irrigation with watering cans, compared to only 1% for drip irrigation. Soil and water conservation options such as mulching and *zai* were practiced by 76 and 21%, respectively. The producers were quite familiar with and had access to improved seeds (73.2%), chemical fertilizers (72.4%) and nursery techniques (69.6%), but were less knowledgeable about postharvest handling, integrated pest management and biological control. There is ample scope for improving vegetable production practices through capacity building coupled with sensitization for increased consumption of traditional African vegetables.

Key words: Traditional African vegetable, production, Burkina Faso.

INTRODUCTION

Sub-Saharan Africa is home to more than a quarter of the world's undernourished people, owing to an increase of 38 million hungry people since 1990 to 1992 (FAO, IFAD

& WFP, 2014). Most countries in West and Central Africa, including Burkina Faso, fall within the worst affected countries globally with respect to the proportion of

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chronically undernourished children (FAOSTAT, 2015). Overcoming food and nutritional insecurity among women, pregnant and lactating mothers, and children under five years of age remains a challenge in many developing countries in sub-Saharan Africa (Andersen et al., 2003). The food harvest has been very poor in Burkina Faso for several successive years, which has aggravated the country's persistent problems of food insecurity and malnutrition. Prevalence rates of acute malnutrition far exceed the World Health Organization (WHO) cut-off point for high public health significance in Burkina Faso. The national nutrition survey using Standardized Monitoring and Assessment of Relief and Transitions (SMART) conducted in 2013 revealed global acute malnutrition (GAM) rates of 10.2% nationally (7.8% as moderate and 2.4% as severe acute malnutrition) (WHO, 2006). The most important forms of undernutrition are inadequate intake of protein and deficiencies in vitamins A and C, folate, iodine and zinc. Annually, Burkina Faso loses USD 158 million to vitamin and mineral deficiencies (World Bank, 2006; UNICEF, 2004). Lack of dietary diversity is a key causal factor because the population consumes mostly cereals crops. These crops are high in carbohydrates but low in nutrients and vitamins. Scaling up core micronutrient interventions would cost less than US\$10 million per year (WHO, 2006). Nutrient-dense traditional African (leafy) vegetables provide an excellent means to complement cereal staples for better nutrition, in particular for women and children, as well as for income generation.

Traditional vegetables are valuable sources of nutrients (Nesamvuni et al., 2001; Yang and Keding, 2009), with some having important medicinal properties (Hilou et al., 2006). Vegetables contribute substantially to food security (Yiridoe and Anchirinah, 2005). Traditional vegetables often provide higher amounts of provitamin A, vitamin C and several important minerals than common, intensively bred vegetables both on a fresh weight basis and after preparation (Ojiewo et al., 2010). With usually shorter growing cycles than staple crops, vegetables can be less affected by environmental threats such as drought. In general, they require less space than staple crops and can maximize the use of natural resources when water and nutrients are scarce (Tenkouano, 2011). Traditional vegetables are adapted to specific marginal soil and climatic conditions, and often can be grown with minimal external inputs (Hughes and Ebert, 2013). The diversification of production systems with traditional vegetables will increase their heterogeneity and will subsequently lead to better resilience to abiotic and biotic stresses (Newton et al., 2011). USAID (2009) is engaged in addressing food insecurity and improving nutrition in Burkina Faso through diversifying rural livelihoods.

Nearly one-third of Burkina Faso is acutely malnourished and child malnutrition rates are among the highest in the world (FAO, 2012). More than half of rural households are poor and do not own land. Agriculture is

central to reducing malnutrition and food insecurity, which currently affect more than 2.8 million people (FAO, 2012). The production of traditional African vegetables could be an effective means to cope with food shortages, especially if they are grown during the dry season, when most farmers become inactive due to lack of water. Vegetable gardening is an intensive production system that can be carried out on small areas of land. The production, sale and consumption of traditional African vegetables will strengthen income, food and nutrition security in locations with erratic rainfall.

Traditional African vegetables have been gaining attention in recent years and have become more economically competitive compared to global species. However, these crops receive little research attention compared to other food crops despite their economic potential, their role in ensuring food security, and their cultural acceptance. Local statistics remain poor on these crops, which prompted us to conduct a field survey. This study sought to characterize traditional African vegetable production in Burkina Faso.

METHODOLOGY

The study was conducted in six villages of two provinces (Figure 1): Bapla, Nanè, Moutori and Saapariin the Southwest region and Gampela and Gonsé in the central region. The Southern region is located in the Soudano Guinean zone, where rainfall ranges from 650 to 1100 mm for 5 months (June to October). In the central region, the growing season starts in July and ends in mid-October, with rainfall ranging from 450 to 600 mm.

Sampling

The groups targeted for the survey were selected based on the extent of involvement in the production of traditional African vegetables. An exhaustive survey of vegetable producers conducted in all six villages in 2012 identified more than 500 producers. A total of 250 interviewees were randomly selected from this population for the survey. Table 1 describes the geographical distribution of surveyed farmers.

Data collection

Data were collected mainly by means of semi-structured questionnaires. The questionnaires were jointly developed by the University of Development Study (UDS) in Ghana and AVRDC – The World Vegetable Center. Additional data was collected through focus group discussions where necessary. The questionnaire had seven components: general information; producer and household characteristics; land use; farm household resource endowment; production of vegetables; traditional African vegetable field characteristics and management; processing and marketing of traditional African vegetables, and training needs of traditional vegetable farmers.

Data analysis

All data sheets were processed manually to check the quality of the

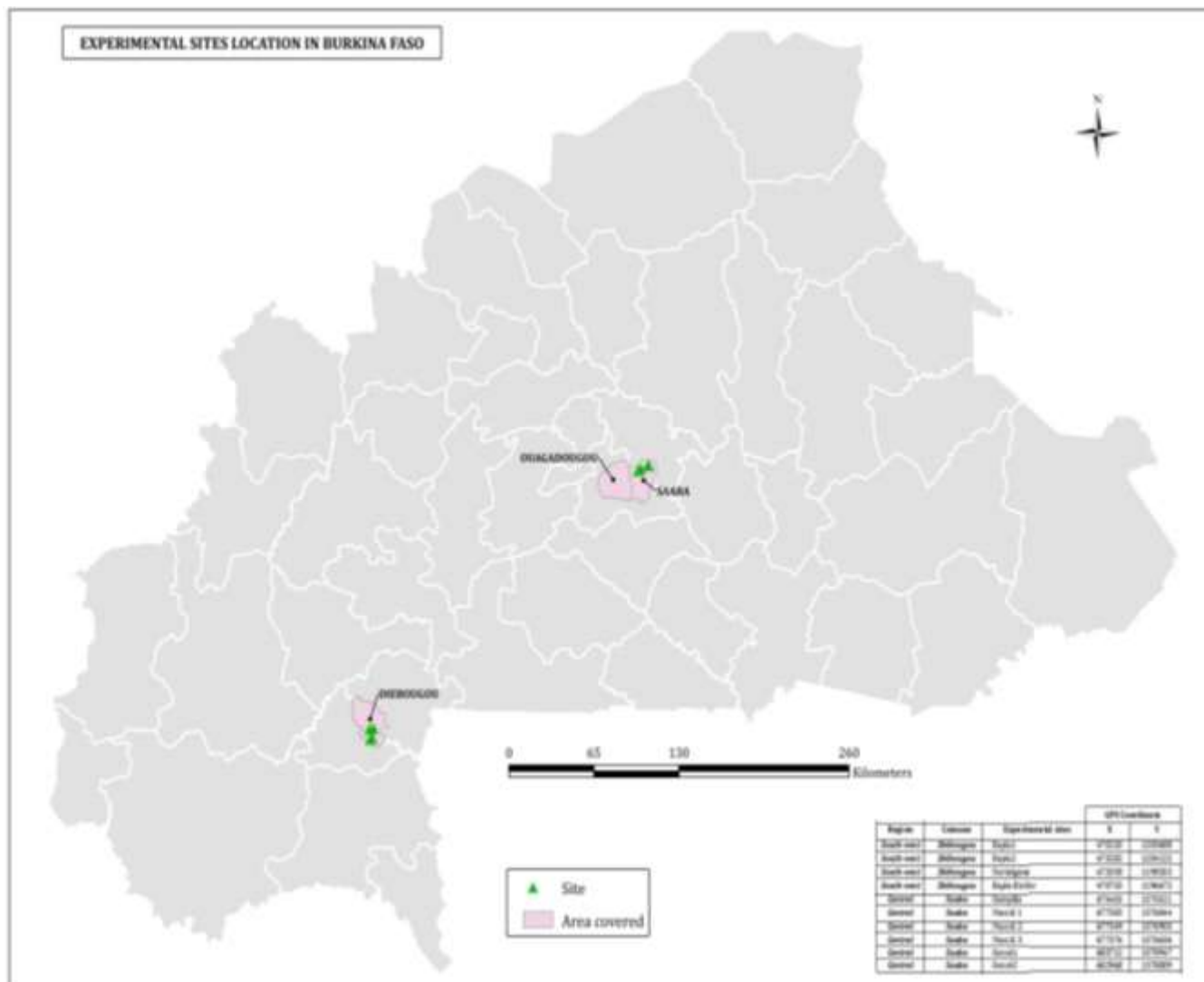


Figure 1. The study area.

Table 1 . Distribution of producers surveyed per village (Survey Data, 2014).

Region	Villages	Number	Percentage
Southwest region	Bapla	58	23
	Nanè	40	16
	Moutori	44	18
	Saapari	58	23
Central region	Gampela	10	4
	Gonsé	40	16
Total	6	250	100

information collected. Erroneous information was corrected either by contacting the investigator who conducted the survey, or by

going back to the farmer respondent. Validated data were entered using Epidata software, and then transferred to SPSS for analysis.

Table 2. Distribution of interviewees by sex (Survey Data, 2014).

Gender	Frequency	Percentage
Male	230	92
Female	20	8
Total	250	100

Table 3. Ethnic background of respondents (Survey Data, 2014).

Social group	Frequency	Percentage
Native	220	88
Non-native	30	12
Total	250	100

Excel software was used for calculation of percentages and ratios.

RESULTS AND DISCUSSION

General characteristics of the producers and the survey sites

Gender

Out of the 250 farmers surveyed, 8% of the interviewees were women (Table 2). Most of the interviewees were heads of households, meaning that the 8% of women in this survey were the owners of their gardens and heads of their households. This result demonstrates the situation confronting women in agricultural production, they are poorly resourced and have limited access to resources for agricultural production, particularly land. Moreover, married women are expected to support their husbands to cultivate the family farm in addition to their household responsibilities. Consequently, most women have little time to undertake agricultural production on their own.

Ethnicity

Eighty-eight and 12% were native and non-native, respectively (Table 3). The non-native respondents either benefited from usufruct rights to the land they farmed (83%) or were tenants (17%). The majority of the native traditional vegetable farmers (85%) were owners of their land, with only 15% of them borrowing the land they were cultivating.

Education

The majority (75%) of producers had no formal education

(Figure 2). This is not surprising, as the overall adult literacy rate for Burkina Faso is about 40% (UNICEF, 2013). The lack of education could slow down the process of capacity building for traditional vegetable production and efforts to promote increased consumption. This calls for innovation in farmer education by adopting methods that would ensure effective delivery of extension and nutritional information to farmers. Effective partnership between civil society organisations, which are active in the rural areas could significantly improve access to information by vegetable farmers.

Types of vegetables cultivated

The commonly cultivated vegetable crops at all sites were okra, tomato and African eggplant produced by 20, 32 and 35% of the respondents, respectively (Table 4). These crops respectively yielded 22, 23, and 25 t/ha. Tomato covered the largest cultivated area (467 m²), followed by okra (315 m²). Despite the fact that more land was used for traditional vegetables (1448 m²) compared to global species (1126 m²) (Table 4), individual global vegetables occupied more space than traditional vegetables. Other crops such as papaya, spinach and cassava were also found at some sites.

Characteristics of the production system

Access to water

Gardening was generally practiced in lowland areas near water dams and streams. However, the Gampela site was an exception; land was cultivated around a borehole equipped with a solar pump system. At this site, special emphasis is put on drip irrigation. Water availability is a key factor in vegetable production. Four main sources of water were identified namely: surface water (dams),

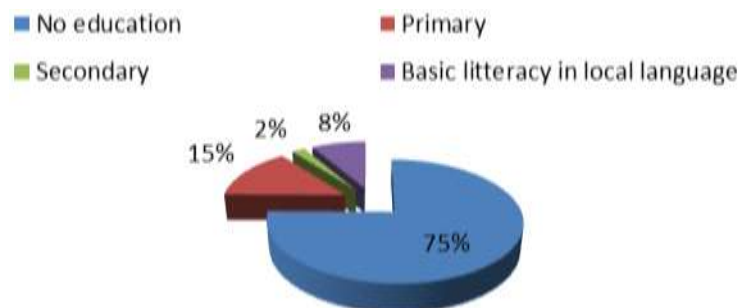


Figure 2. Level of education of the farmers interviewed.

Table 4. Major vegetable crops produced in the study area (Survey Data, 2014).

Vegetable type	Growers (%)	Area per grower (m ²)	Yield (t/ha)
African eggplant	20	158.8	23
African nightshade	3.8	150	32
Amaranth	9.5	150.9	16
Jute mallow	3.5	197.5	12
Okra	32	315	22
Gourd	10.7	193.2	35
Sorrel	17.3	193.2	17
Beanleaf	3.2	89.6	12
Total traditional vegetables		1448.1	21.2
Onion	13.1	158	25
Tomato	35.0	467	25
Cabbage	21.9	201.2	22
Cucumber	10.9	150	15
Zucchini	19.1	150	35
Total global vegetables		1126	24.4

shallow wells, boreholes, and streams (Figure 3).

More than 95% of the respondents used surface water dams and streams as primary water sources for irrigation. Most of these producers were based in the southwest region (Bapla, Nane Moutori and Saapari) and Gonsé. It is important to note that effective water harvesting is critical for sustainable vegetable cultivation as these areas are located in the arid and semi-arid savannah zones. Any effort to promote large scale vegetable production must therefore, be supported by measures to ensure adequate access to water during the long dry season by harvesting and storing water during the rainy season when water is usually abundant. Shallow wells and mechanized boreholes were used by 7 and 4% of the respondents, respectively. The use of shallow wells for vegetable production is only possible in valley bottoms and other lowland that allow easier access to water by farmers. However, most of these shallow wells dry up in the course of the dry season and are only able to sustain

vegetable production for 2 to 3 months during the dry season. In recent times vegetable gardening in lowlands has reduced in scale as a result of poor rains resulting in early drying of lowlands. Farmers cultivating vegetables along streams take advantage of the annual flooding of rivers and streams during the rainy season to establish vegetable gardens along such rivers. Vegetable production usually ends when the rivers and streams dry up and does not go far into the dry season. The gardeners based around dams and boreholes started their activities less than 20 years ago when these facilities were made available. Those along the stream have been doing gardening for a far longer time.

Although water availability is one factor that determines participation in gardening, water management remains critically inappropriate and unsustainable. For instance, the garden plots were set up in the immediate vicinity of water bodies without appropriate conservation measures. This exposes the soil to erosion, resulting in the silting up

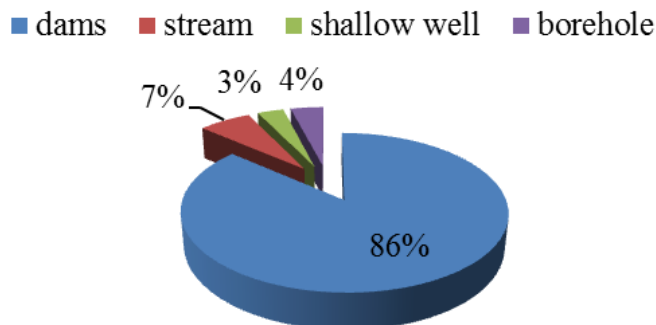


Figure 3. Water sources for vegetable production.

of the water bed. At all sites, producers indicated that water bodies dry up much earlier than before. Water levels in the dams and wells at the different sites have decreased considerably in recent times, further constraining vegetable production by forcing producers to suspend their activities until the following year. The silting of reservoirs and rivers also explains frequent flooding in the study regions, which many producers do not relate to their bad soil and water management practices.

Access to tools and equipment

Apart from small hand tools such as pick axes, hoes, and watering cans which all producers had, only 10.4% owned a water pump, 2.8% owned a treadle pump and 0.4% used other irrigation equipment. Nearly, all (98%) producers practiced manual irrigation with watering cans, compared to only 1% for drip irrigation (Figure 4). About 24.8% had a pesticide sprayer. This justifies the fact that access to irrigation equipment is a major constraint to vegetable production among vegetable farmers in Burkina Faso. Vegetable farmers are smallholder farmers who are generally constrained by access to resources. For vegetable farmers, most of whom cultivate vegetables during the dry season, this situation is even more critical as they must irrigate their crops. The general lack of irrigation equipment therefore, restricts the scale of production.

Access to improved technologies

The technologies mostly accessible to traditional African vegetable producers were improved seeds (73%), chemical fertilizers (72%) and improved nursery techniques (70%) (Figure 5). Some good agricultural practices such as improved postharvest handling, integrated pest management and biological control of pests that can enhance traditional African vegetable production and improve yield and income were not accessible to producers.

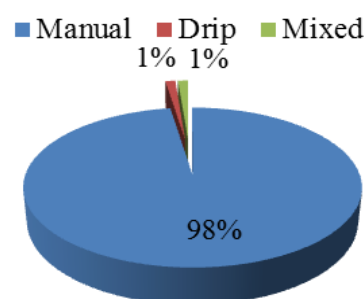


Figure 4. Irrigation techniques used on project sites.

The soil and water management techniques identified were mulching (76%), *zaï* (22%), drip irrigation (1%), gravity irrigation (1%) (Figure 6). *Zaï* is a traditional land rehabilitation technology developed by farmers in Burkina Faso to rehabilitate degraded dry lands and restore soil fertility. *Zaï* are small pits 20 to 30 cm in diameter and 10 to 20 cm deep dug into degraded soils. Farmers place about two handfuls of organic material at the bottom of the pits. The *zaï* collect and concentrate water at the plant root zone, which reduces the risk of water stress.

Access to inputs

Chemical fertilizers were the most used input in vegetable production (Figure 7). Farmers stressed that these fertilizers were available on the market at an acceptable price. Manure and compost were both used to maintain soil fertility. However, compost was less used as there was a lack of water for processing it, and many farmers had not received any training in composting techniques.

Farm machinery is expensive for gardeners, which was why only 2% of respondents used it. Vegetable gardening sites were usually too small and confined to justify the use of such bulky equipment. The use of pesticides among vegetable farmers has increased in recent times.

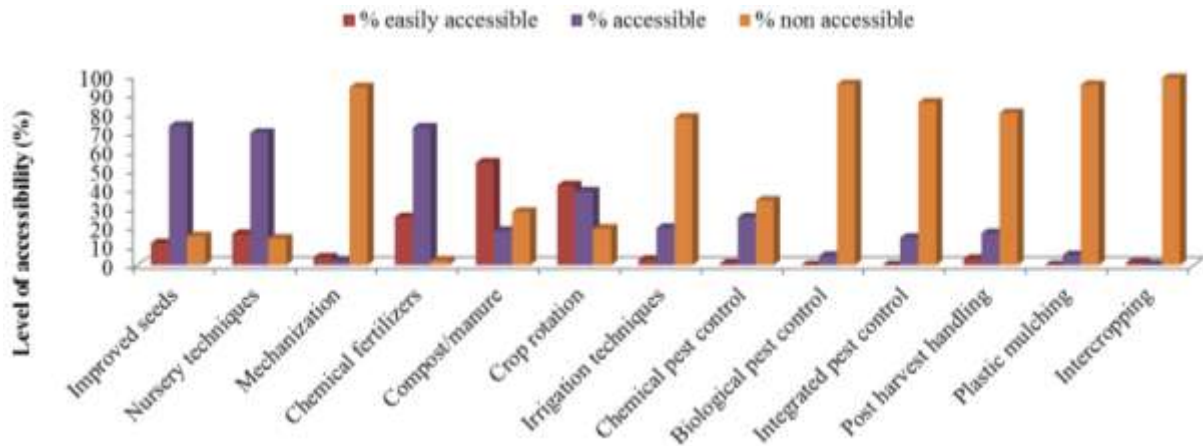


Figure 5. Level of adoption of technologies

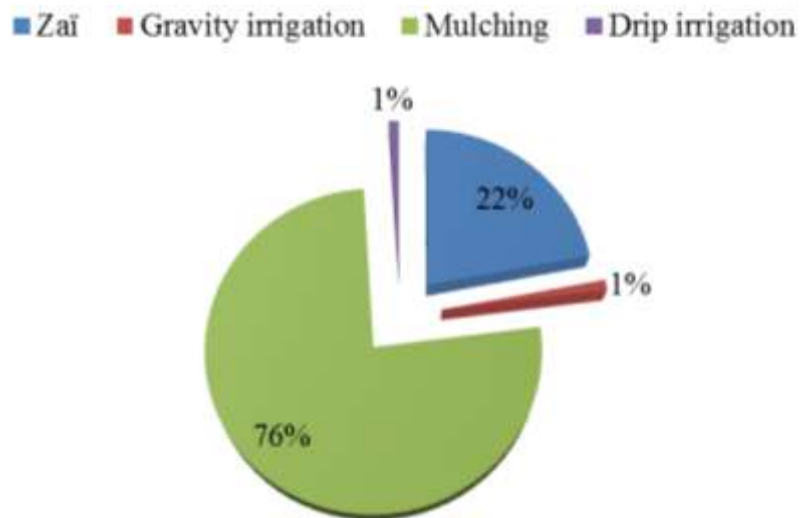


Figure 6. Soil water management techniques.

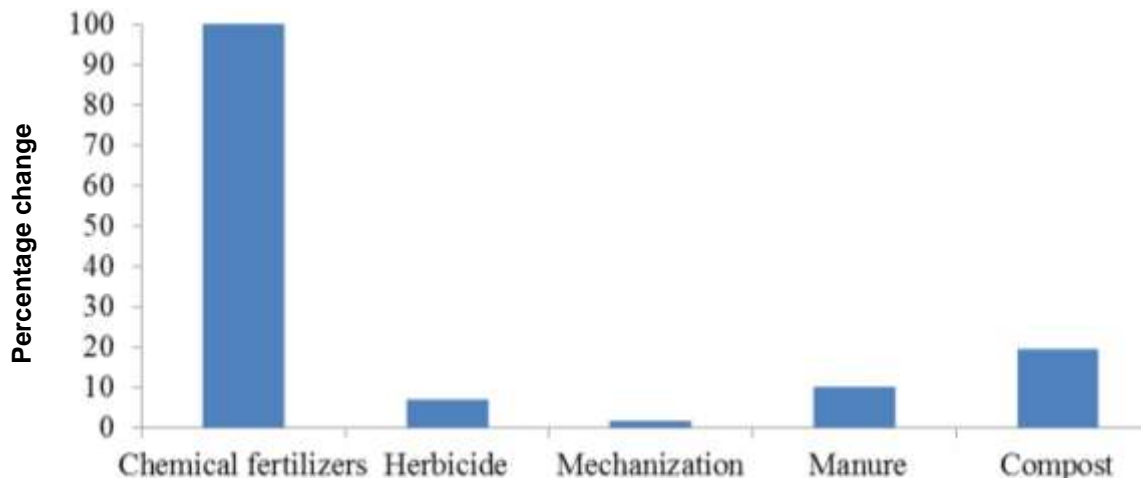


Figure 7. Changes in practices over the past 5 years.

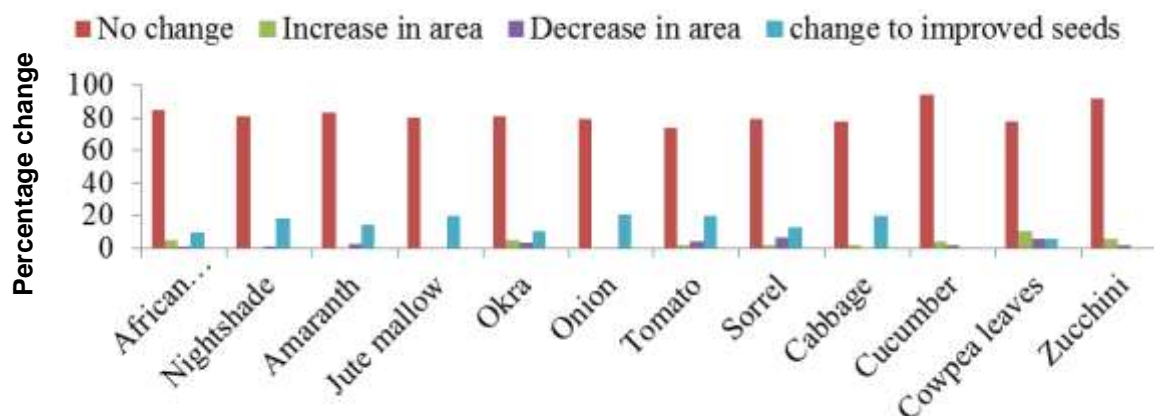


Figure 8. Variation of production over the last 5 years.

Table 5. Local and improved varieties of targeted traditional African vegetables found at survey sites (Survey Data, 2014).

TAV	Percentage	Variety (%)		Area (%)	
		Local	Improved	upland	Lowland
African eggplant	29.6	29.2	0.4	28	1.6
African nightshade	5.6	4.4	1.2	5.6	0
Amaranth	14	14	0	10	4
Jute mallow	5.2	5.2	0	5.2	0
Okra	45.6	16	29.6	40.8	4.8

This raises some concerns about the safety of vegetables produced by farmers who use such chemicals. This is because the proliferation of such chemicals is hardly regulated with farmers using different kinds of pesticides, some of them prohibited. Consequently, effective regulation of chemical inputs in vegetable cultivation is required in order to safeguard the safety of consumers.

Evolution of the production over the past 5 years

During the past 5 years, the most important change observed for the different crops was related to seed (Figure 8).

All the producers emphasized that they obtained good yield with improved seeds. The production of African eggplant, okra, cowpea leaves and zucchini has increased as a result of an increase in their respective market prices. Priority seems to be given to high value crops.

Analysis of targeted traditional African vegetables

Five traditional vegetables were targeted for the study: African eggplant, African nightshade, amaranth, jute

mallow and okra.

African eggplant

African eggplant was produced by 29.6% of the respondents (Table 5). The total area harvested was estimated at 1.18 ha with an associated production of 27.5 t. The yield varied between 15 and 25 t/ha. The share among the different uses of African eggplant showed that it was mostly consumed (Table 6). The market price of local eggplant was estimated at 150 FCFA/kg in the southwest, although it sometimes exceeded 200 FCFA in the Ouagadougou peri-urban area (Gonsé and Gampela).

African nightshade

African nightshade was cultivated by 5.6% of the respondents, but exclusively in the southwest area. The total area cropped was approximately 0.21 ha, with a total production of 6.72 t, yielding between 2 and 35 t/ha. The share among the different uses of African nightshade shown most was sold (Table 6). The sale price of the African nightshade was estimated to be 110 FCFA/kg.

Table 6. Share among the different uses of the local traditional African vegetables (Survey Data, 2014).

Vegetable	Sale (kg)	Storage (kg)	Consumption (kg)	Seed (kg)	Losses (kg)
African eggplant	2 0224	300	6 315	781	896
Nightshade	4 340	250	1 640	270	220
Amaranth	6 890	0	1 465	15	130
Jute mallow	2 910	0	625	182	83
Okra	58 888	2114	18 293	1772	633

Amaranth

Amaranth was produced by 14% of the respondents, both in the southwest and in the central regions. The total area cropped was approximately 0.5 ha with a corresponding total production of 8.4 t and a yield between 12 and 28 t/ha. The share among the different uses of amaranth show that most was sold (Table 6). Amaranth was sold either in bags (wholesalers) or in heaps (retailers) and its price was estimated between 100 and 125 FCFA/kg at all sites.

Jute mallow

The production of jute mallow was done by 5.2% of the respondents, and the total production was 3.8 t on an area of 0.25 ha, both regions combined. However, it was more commercialized in the central region than in the southwest. The yield varied between 12 and 15 t/ha. The share among the different uses of jute mallow shows that most was sold (Table 6). Jute mallow is sold either in bags (whole sellers) or heaps (retailers) and its price was estimated between 100 and 125 FCFA/kg at all sites.

Okra

Okra was produced by 45.6% of the respondents. This vegetable is very popular at all sites. The total cropped area in 2013 was estimated at 3.7 ha with a corresponding total production of 81.7 t. The yield varied between 20 and 25 t/ha. The share among the different uses of okra shows that most was sold (Table 6). Okra was sold either in bags (whole sellers) or by heaps (retailers) at about 150 FCFA/kg in the southwest and 175 FCFA/kg in the Ouagadougou peri-urban area.

Constraints to production of traditional African vegetables

Lack of water

Vegetables are mainly cultivated during the dry season by more than 4,000 women and men, most of whom are

youth. However, although the dry season extends for 6 months in the south and 9 months in the north, vegetable production is limited to 3 to 4 months, when water is available in lowland areas around streams and along rivers. The farmers are forced to wait until November or December for the water to recede and free the land for cropping. Evapotranspiration is high in the hot and dry climate, resulting in rapid drying of streams, and cycling down of gardening activities beginning in March.

Lack of skilled producers

Good command of appropriate production techniques and market operations are prerequisites for good yields and sale of traditional vegetable crops. It was observed that 92% of the respondents had never received training on vegetable production. All the farmers surveyed practiced gardening as a secondary activity, just to meet their daily needs of cash and food. This could explain why they tended to overlook appropriate technologies, and why their yields were low. Damage due to pests was widely observed as a major constraint to vegetable production, yet only a few farmers had training in pest management. A lack of water and poorly functioning markets were also factors discouraging farmers to fully invest in vegetable production.

Poor organization

Only 4.8% respondents belonged to a producer group. This low level of organization made the supply of inputs and the sale of products very difficult.

Low level of investment

Farmers did not invest in vegetable production in part due to a lack of business skills.

Storage and conservation

Although most vegetable produce are perishable, very little processing and storage was carried out in the survey

areas. This justified the high rate of losses observed (Table 6) from decay, dehydration and deformation. Most farmers had not been trained in processing and storage techniques.

Conclusion

This study assessed the share of traditional African vegetables in dry season gardening in Burkina Faso. These vegetables are generally produced in the same way as global ones. However, their importance and production varies among locations, and they were mostly produced in the southwest region. The limited availability of water and poor access to training for farmers seem to be the most important constraints to traditional vegetable production. Water limitations in particular determine the size of the garden plot, the quantities of vegetables produced, the duration of production during the dry season, and the low level of investment and organization observed. Most traditional African vegetables were produced for sale, except for African eggplant. There is a need for sensitization and awareness about the health benefits of consuming traditional African vegetables.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

The influence of organizational arrangements on effectiveness of collective action: Findings from a study of farmer groups in the East African Highlands

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Farmer groups are important socioeconomic safety nets for rural communities in sub-Saharan Africa. They provide mutual support to farmers through collective action to enhance improvement of livelihoods. These groups have been increasing in number in the post liberalization period in East Africa. However, it is not clear how these groups' organizational arrangements have been changing over time, and the contribution of these changes on effectiveness of collective action. This study, therefore investigates the various organizational changes in groups and how these changes influence effectiveness of collective action of farmer groups in East Africa. Data were collected from 195 farmer groups in Kenya and Uganda through a structured questionnaire survey, supplemented by focus group discussions. Results show that changes in leadership and governance structures were more important in influencing effectiveness of groups. These include having a considerable number of leadership positions, introducing clear leadership tenure, having committees in groups, holding frequent committee meetings and putting in place more enforcement mechanisms for regulating group conduct. This study proposes adoption of effective leadership and governance structures by farmer groups to enhance effectiveness of collective action.

Key words: Organizational structures, organizational changes, small-holder farmers, farmer groups, group objectives.

INTRODUCTION

Agriculture is a large employer and big contributor of GDP in sub-Saharan Africa. Majority of the population in the region are small-holder farmers who reside in rural areas and depend mainly on agriculture for their

livelihood (Saliu et al., 2009). However, small-holder farmers still grapple with challenges of low agricultural production and income (Salami et al., 2010). Farmer groups are important vehicles through which farmers can

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organize themselves to access agricultural services and address constraints that hinder agricultural productivity and income (Adong et al., 2013; Salau et al., 2014). Farmers can also benefit socially and economically through collective activities within the groups (Ates and Terin, 2011; Fischer and Qaim, 2012; Ayinde and Torimiro, 2014).

The number of farmer groups in sub-Saharan Africa has progressively increased, following adoption of structural adjustment programs. The programs were put forward by International Monetary Fund (IMF) and the World Bank in the 1980 and 1990s (Economic Commission for Africa, 2014). These programs, which also resulted to economic liberalization, reduced governments' control of cooperatives in the region (Temu, 2009). The withdrawal of government regulatory powers in cooperatives led to mismanagement and widespread corruption (Donovan et al., 2008). As a result farmers pulled out from these cooperatives and formed farmer-driven grass root groups (Temu, 2009).

Farmer-driven groups are nonetheless faced with managerial challenges in the current liberalized economy (Shiferaw et al., 2011). This is because farmers were not well prepared to take over the role of managing groups after retreat by the governments (Abaru et al., 2006). Moreover, the recent market volatility has negatively affected performance of most groups (Onumah et al., 2010). As a result, these groups have not been able to compete effectively with large market forces (Markelova et al., 2009). While some groups have survived the liberalization squall and have continued to perform well, others have been unfavorably affected (Wanyama, 2009). Groups that are poorly organized have experienced more adverse impacts, hence hindering their success (Abaru et al., 2006).

In the liberalized economy, farmer groups have taken on different organizational structures. Which include leadership, governance, functional and social structures (Ampaire et al., 2013; Barham and Chitemi, 2009). These structures change with time. The changes are influenced by both internal and external factors (Paumgarten et al., 2012). Resulting to variation in arrangements across different groups (Odindo, 2009). Despite the various structural changes, improvement of production or income remains fundamental for farmer groups.

Improvement of members' livelihood is dependent on capacity of groups to attain their goals. However, not all groups have the ability to meet their objectives effectively. According to Shiferaw et al. (2006), poor organizational arrangements is the major inhibiting factor for the success of groups, while effective organizational arrangements enable groups to successfully meet their objectives (Paumgarten et al., 2012). The challenge therefore is fostering appropriate changes in organizational arrangements, to enhance effectiveness of groups.

Previous studies have focused on temporal as opposed to organizational changes in groups. Thereby, missing

key lessons on the appropriate organizational arrangements that needs to be incorporated to enhance effectiveness in groups (Hellin et al., 2009). There is therefore need to establish changes experienced by groups and the impacts of these changes. This study aims to understand the organizational changes that groups experience and the extent to which the changes influence effectiveness of collective action. In order to achieve the research objectives, this study was guided by the following research questions:

- (1) What are some of the organizational changes that groups experience?
- (2) To what extent do groups' organizational arrangements influence effectiveness of collective action?

Conceptual framework

Organizational arrangements of groups have been identified to include: group size; group age; gender composition; wealth endowment of members; age of members; education level of members; internal rules and regulations; enforcement mechanisms for regulating group conduct; frequency of meetings; number of executive committee; presence of additional committees (besides the executive committees); use of record books; number of activities undertaken by a group and changes in group activities overtime (Place et al., 2004; Davis et al., 2004; Barham and Chitemi 2009; Gyau et al., 2011; Ampaire et al., 2013). Different scholars have assessed the effectiveness of collective action differently. According to Place et al. (2004), effectiveness of groups can be measured in many ways, because groups engage in various activities. Moreover benefits from groups are diverse and realized at different levels such as household/individual, group level and at supra level such as community. Shiferaw et al. (2006) argues that, depending with the problem under study, certain indicators can be identified as proxies to measure the degree of effectiveness of groups in attaining their stated objectives.

Based on literature review, a conceptual framework was developed. The groups' organizational arrangements were conceptualized to include social structure, leadership structure, governance structure and group functions. Effectiveness of collective action was measured by the ability of groups to meet objectives. The conceptual framework is as shown in Figure 1.

MATERIALS AND METHODS

Study area

Kapchorwa district, Uganda

The study was undertaken in 6 sub-counties in Kapchorwa district: Kaptanya, Tegeres, Chema, Kawowo, Sipi and Kapchorwa town council. The district is located in the eastern region of Uganda, on

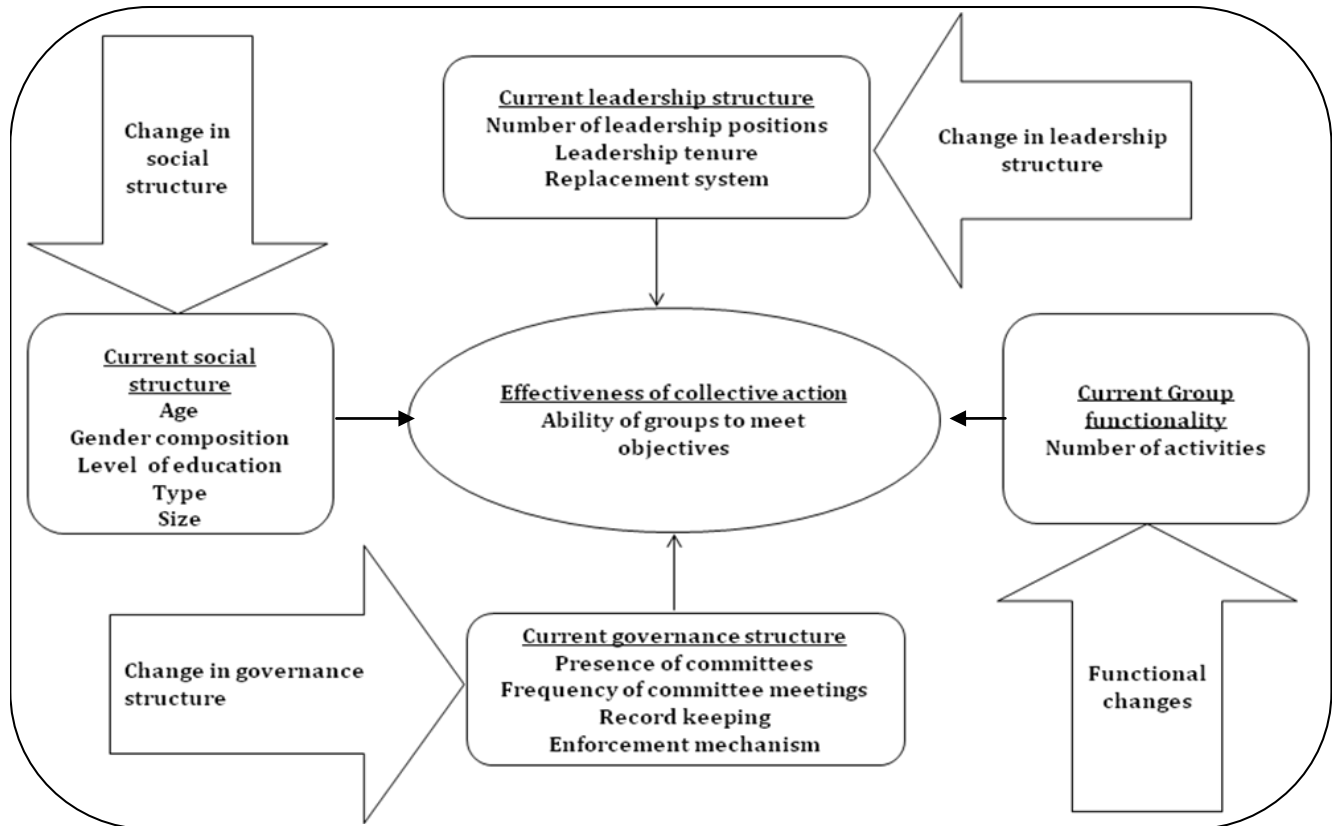


Figure 1. Conceptual framework.

the slopes of Mount Elgon in a mountainous forested ecosystem. It borders Kenya and covers an area of 354.6 km (Ministry of Water and Environment, 2010). The district is characterized by a mixed rain fed crop-livestock system, dominated by small and medium scale farmers. Coffee is the main cash crop, while maize and beans are the main food crops (UNDP and BCPR, 2013). The district has an average population of 104,580, average number of households are 21,652, average household size is 4.8 and population growth rate is at 2.85 (Uganda Bureau of statistics, 2014). The population that lives below the poverty line is at 35.5% (Uganda Bureau of statistics, 2011).

Bungoma county, Kenya

The study was conducted in four sub-counties of Bungoma county: Bumula, Tongaren, Kanduyi and Webuye East. The county is located in Western Kenya along the border with Uganda (Kenya Open Data Survey, 2014). Agriculture is the major occupation and source of income that drives the economy of the county. The major crops grown are maize, beans and sugar canes. The main livestock breeds include cattle, sheep and goats (Agricultural Sector Development Support Programme, 2014). The county has an average population of 1,630,934, covers a surface area of 3593 km², the population density is 454 per km² and 52.9% of the population live below the poverty line (Commission on Revenue Allocation, 2011). Majority of the households have an average of 4 to 6 members (KNBS and SID, 2013), population growth rate is at 3% and land sizes average 1.5 acres (Shames et al., 2015).

Sampling procedures and Data collection

Sampling was based on the baseline survey conducted by the IFAD funded Strengthening Rural Institutions Project led by World Agroforestry Centre (ICRAF) between 2011 and 2014. The total population of groups in each site were stratified based on the gender composition of the farmer groups (Men, women, mixed) and group location. A total of 195 groups were selected randomly across each stratum over the two study sites. Specifically, 85 groups were selected in Bungoma county and 110 groups in Kapchorwa district. Data were collected using questionnaires, supplemented by focus group discussions. The data collected aimed to identify the structural changes in groups and the extent to which structural arrangements influence effectiveness of collective action.

Data analysis

Chi-square test (χ^2) was utilized to establish whether there is an association between organizational arrangements in groups (independent variables) with the effectiveness of the groups (dependent variable). Additionally, analysis of variance (ANOVA) was used to assess significant differences in group size (number of members) and group age across farmer groups at different levels of effectiveness (dependent variable). Effectiveness of groups (dependent variable) was measured by the ability of the groups to meet their objectives. The ability to meet group objectives was evaluated on a 5 point Likert scale in which 1 = non-achievement, whereas 5 = achievement of group objectives in totality. The midpoint of the scale was three and all scores above three were

Table 1. Continuous variables.

Description	Unit	Min	Max	Mean	SD
Group age	Years	1	32	7.71	5.092
Group size	Number	5	445	26.11	48.121
Number of leadership positions	Number	1	7	4.59	1.169
Number of enforcement mechanisms	Number	1	6	2.41	1.394
Number of records	Number	1	4	2.54	1.146
Number of extra activities	Number	0	8	2.29	1.425

considered to indicate high achievement of objectives and those below three were considered as low achievement of objectives. Scores equal to three were considered to show moderate achievement of objectives.

Description of the independent variables

The continuous variables in the study include: group age, which is the number of years that a group has been in existence; group size, indicating the number of members in a group. The number of leadership positions, showing the number of executive leaders in place such as chairperson, vice-chairperson, secretary and treasurer. Enforcement mechanisms are systems put in place for regulating group conduct. The enforcement mechanisms include payment of fine, warnings, suspension and expulsion. Number of extra activities refer to the additional undertakings that groups engage in apart from their main function. This is shown in Table 1.

Categorical variables in the study comprise the gender composition of groups, these include men only group, women only group and mixed gender groups. Group types identified consisted self-help groups and other larger group types, such as inter-group associations/unions, cooperative societies, community-based organizations, farmer field schools and federations. Leadership tenure is the duration of time that leaders could serve in office before they are replaced. Replacement system is the structure put in place for replacing leaders after their term in office comes to an end, these include elections and consensus.

Committees are structures put in place to involve members in managing group activities apart from having the executive committees in place. Other variables include level of education of members in a group, whether primary, secondary, tertiary (certificate/diploma) or degree level. Composition of groups in terms of age includes youth groups, groups comprising of only the elderly and mixed groups (comprising members of different age groups). Wealth status in groups shows whether a group consists of members with similarities in wealth endowment (either the rich or the poor) or the group encompass members with mixed wealth endowment (consisting of both the rich and the poor). This information is shown in Table 2.

RESULTS AND DISCUSSION

Formation process

Findings from this study indicate that most of the groups were formed by group members as opposed to external actors. In Bungoma county, 91% of the groups were formed by the group members, 5% by government and 5% by non-governmental organizations (NGOs). In

Kapchorwa district, 94% of the groups were formed by group members, 5% by government, whereas 1% was formed by NGOs. These results are comparable to the findings of Salifu et al. (2012) who identified that farmer groups are mainly formed by members. However, the results differs with the findings of Place et al. (2004) who established that most farmer groups were likely to be initiated by external organizations as opposed to individual farmers. Patently, most farmer groups were formed by group members as opposed to external actors in the two East African nations.

Results from focus group discussions show that groups were formed for various purposes. These include revolving funds (merry-go-rounds), soil and water conservation and to increase agricultural productivity. Other reasons for formation were to enable members engage in collective activities such as sourcing for agricultural inputs and marketing of agricultural products. These results are consistent with the findings of Fischer and Qaim (2012) and Baah (2008) who identified that members were likely to form and participate in groups if their membership would be of benefit to them. Thus, farmers in the study sites organized themselves into groups to benefit from collective activities.

Group characteristics

General group characteristics

The general group characteristics include the main function of the group, average age of group members, highest level of education of members and wealth status. This is shown in Table 3. In Kapchorwa district, 38% of the groups engaged in crop farming and 25% in animal keeping, as their main function. In Bungoma county, 45% of the groups were mainly involved in animal keeping and 30% of the groups practiced crop farming. Evidently more than 60% of the farmer groups in both sites had mixed farming (crop farming and livestock rearing) as their main activity. This is because farmers mainly organize themselves in groups in order to acquire skills on effective farming practices, source agricultural inputs collectively and market their agricultural products collectively. These results are akin with the findings of

Table 1. Categorical variables.

Variable	Description	Frequency	Percentage
Gender composition	Men only	3	2
	Women only	29	15
	Mixed gender group	163	84
Group type	Self-help groups	168	86
	Inter- group associations /unions	8	4
	Community-based organizations	14	7
	Cooperative ocieties	3	2
	Farmer field schools	1	1
	Federation	1	1
Frequency of replacing leaders	Yearly	35	19
	Bi-annually	40	22
	Tri-annually	56	31
	Above three years	31	17
	No timelines	19	10
Replacement systems	Regular elections	123	72
	Consensus	48	28
Committees	Have committees	147	75
	Do not have committees	47	24
Record keeping	Keep records	189	97
	Do not keep records	5	3
Highest level of education in group	Primary	10	5
	Secondary	68	37
	Tertiary (Certificate/Diploma)	73	39
	Degree	35	19
Composition of group in terms of age	Mixed	127	94
	Youth	3	2
	Elderly	5	4
Wealth status	Mixed (Difference in members' wealth)	133	97
	Equal (Similarities in wealth status)	4	3

Adong et al. (2013), who identified that most farmer groups engage in agricultural activities.

Bungoma county however mainly keeps animal compared to Kapchorwa district, given that the county has a more favorable environment for animal rearing. According to Mudavadi et al. (2001), livestock management is practiced in Bungoma due to its role in the livelihood of the communities as well as its resistance to diseases. The county has good livestock breeds which have resulted to growth in beef and dairy industries (Agricultural Sector Development Support Programme, 2014). The farmer groups in the hilly highlands of Kapchorwa

district mainly engage in crop farming compared to Bungoma county. This can be attributed to the environment being more favorable for crop farming. The district has good soils and experience heavy rainfalls favorable for both food and cash crops (Republic of Uganda, 2000). Food and cash crops are therefore the main source of income in households of Kapchorwa district (UNDP, 2013). In addition, natural resource management is practiced more in Kapchorwa district than Bungoma county. This is because the locale is highly likely to experience soil erosion, due to the highly terrain of the district (UNDP, 2013). Thus, farmer groups engage

Table 3. General group characteristics.

General group characteristic	Kapchorwa district (%)	Bungoma County (%)
Main function		
Crop farming	38	30
Animal keeping	25	45
Financial (Revolving funds, lending and borrowing)	17	18
Natural resource management (NRM)	11	1
Enterprise/Marketing	4	5
Capacity development/Empowerment	4	1
Average age of members		
	n=3109	n=1865
Below 20 years	2	2
20-29 years	17	14
30-39 years	31	27
40-49 years	28	23
50-59 years	16	23
60 years and above	6	11
Highest level of education of members		
	n=2317	n=1847
Degree	2	1
Tertiary (College Certificate/Diploma)	12	13
Secondary	28	32
Primary	58	54
Wealth status		
Mixed (Difference in members' wealth)	96	97
Equal (Similarities in wealth status)	4	3

in soil and water conservation activities mainly through planting trees and terracing to prevent soil erosion.

The study identified that the highest level of education of group members ranged from primary level to degree level. However, the percentage of members with university degree certificates was the least, whereas those with primary and secondary education were the majority. Generally, farmer groups operate in the rural areas, and the more educated members of these areas moved to urban areas in search of formal employment. Most of the highly educated members (degree, diploma and college certificate holders) in these groups were mainly teachers, professionals working in the rural areas and retirees.

Most members of the groups were aged between 20 and 59 years; these comprised of 92% of group members in Kapchorwa district and 87% of group members in Bungoma county. Group members that were under 20 years and those that were above 60 years had the least number. This could be attributed to the fact that members in the age group 20 to 59 are more productive than members who are under 20 years and those that are above 60 years. Ordinary individuals under 20 years are more likely to still be in school and dependent on their parents. Similarly, those that are above 60 years are less

productive by virtue of age and age related issues, such as health.

This study also identified that over 96% of the groups in both sites comprised members with mixed wealth status. This indicates that wealth endowment is not a criteria used for a farmer to join a group in most groups in the two study sites. Majority of the groups thus consists of members with mixed wealth status, indicating that the rich and the poor come together to form groups without discrimination in terms of wealth endowment.

Characteristics of group leadership

Characteristics of group leadership include criteria for selecting leaders, mandate of leaders, how leaders guide group members and the level of education of leaders. This is shown in Tables 4 and 5.

In both sites, majority of the groups selected leaders based on performance and leadership skills. This indicates that performance and leadership skills were considered more important, while selecting group leaders. Experience in running group activities was also considered key, while selecting leaders in Kapchorwa district. It was also noted in Bungoma county that a good

Table 2. Characteristics of group leadership.

Group leadership	Kapchorwa (%)	Bungoma (%)
Criteria for selecting leaders		
Experience	55	35
Performance	69	51
Leadership skills	57	51
Capacity	6	19
Level of education	37	8
Social status	20	11
Democratic voting	22	43
Mandate of leaders		
Report back to group after meetings	71	57
Ensure regular meetings	65	70
Transparency with funds	78	92
Record keeping including reports	51	68
How leaders guide group members		
In group meetings	73	38
Participation in group activities	53	68
Lobbying for support from development partners	18	35
Mobilizing group members for training, meetings, etc.	59	73
Sensitization of the group through provision of regular progress reports	35	62
Effective management through best practices	31	46

Table 5. Education level of leaders.

Group leaders	Education level					
	Un-educated (%)	Primary (%)	Secondary (%)	Tertiary (Certificate/ Diploma) (%)	Degree)	
Bungoma (n=275)	Chairperson	1	31	63	4	1
	Vice- Chairperson	-	43	54	4	-
	Secretary	-	19	69	11	1
	Treasurer	4	41	44	10	-
Kapchorwa (n=317)	Chairperson	2	30	56	7	5
	Vice-Chairperson	4	46	39	9	2
	Secretary	-	13	70	12	5
	Treasurer	3	28	56	10	4

number of groups (43%) considered democratic voting important when selecting leaders.

Transparency with funds was identified to be the most important mandate of the leaders by groups in both sites. The second most important mandate of leaders in Kapchorwa district was to report back to group in every meeting. While in Bungoma county, the second most important mandate of leaders was to ensure regular meetings. In Kapchorwa district, leaders guide members mainly through group meetings, mobilization of members

for trainings and meetings and participation in group activities in that order. In Bungoma county, leaders guide members mainly by mobilizing them for trainings and meetings, participation in group activities and finally by sensitization of the group through provision of regular progress reports.

Majority of group leaders had primary and secondary education, while un educated leaders and those with university degrees had the least number. In both sites, it was identified that secretaries were the most educated,

Table 6. Partnerships with groups.

Partnership	Kapchorwa (%)	Bungoma (%)
Presence of partners		
Have partners	77	88
Do not have partners	23	12
Types of partners		
Government	38	36
Non-governmental organizations (NGOs)	35	60
Farmer groups	27	4
Role of partners		
Capacity development (trainings)	50	61
In-kind support	39	30
Financial support	11	10
Major Influence of partnerships		
Practice change	64	47
Increased production	21	16
Increased income	9	15
Acquisition of skills	3	13
Market access	3	4
Improved infrastructure	1	3
Provision of farm inputs	-	4

owing to the fact that all the secretaries had at least formal education. Compared to the other leadership positions, secretaries had the highest number of those that had attained tertiary education (certificate and diploma). Worth noting in both sites, is that the number of secretaries with secondary education surpassed those with primary education by a very high margin. Additionally, the presence of secretaries with university degrees was also evident in both sites. This could be attributed to the role of secretaries which involves mainly documentation, such as minute taking, writing reports and reading them to members. Thus, the position is definitely a preserve of members with the ability to read and write.

Partnerships with groups

The study identified that the majority of the groups in both sites had interacted with various partners. These partners include government, non-governmental organizations and other farmer groups. In Bungoma county, 88% of the groups have had partners compared to 77% of the groups in Kapchorwa district. This is shown in Table 6. Partner types in the two sites included non-governmental organizations, government and other farmer groups. Most groups cited that NGOs and government were the major partners. The roles of the partners include capacity

development (mainly trainings), in-kind support (such as provision of farm inputs) and financial support in form of loans or grants. Capacity development was ranked the highest form of partner support, while financial support was ranked the least.

Practice change, which involves aspects, such as change of livestock and crop breeds from indigenous to improved breeds, adoption of effective farming techniques and value addition of products was identified as the major influence of these partnerships. This was followed by increased production and income. Additionally, some partners helped groups construct roads and collection centers for their farm products, whereas other partners supported groups to access markets for their products.

Changes in organizational arrangements experienced by the groups

Farmer groups in both sites experienced varied changes in organizational arrangements. This is displayed in Table 7.

Organizational arrangements that experienced moderate and high changes

Organizational arrangements that had experienced

Table 7. Changes in organizational arrangements of groups.

Organizational arrangements that experienced moderate and high changes		Bungoma (%)	Kapchorwa (%)
Change in group size	Increase in number of members	60	30
	Reduction in number of members	25	16
	Number of members remained constant	15	54
Record keeping	Do not keep records	-	5
	Kept records since the group was formed	51	44
	Started keeping records years later, after formation	49	51
Committees	Have no committees	15	30
	Had committees since the group was formed	14	22
	Added committees years later after formation	71	48
Activities	Diversified their group activities	100	86
	Engage in only one collective activity	-	14
Organizational arrangements that experienced minimal changes		Bungoma (%)	Kapchorwa (%)
Gender composition	Men group to mixed gender group	8	3
	Women group to mixed gender group	14	5
	Mixed gender group to women group	-	1
	Mixed gender group to men group	-	1
Group type	Self-help group to a federation	1	-
	self- help group to community-based organization	-	6
	Self-help group to cooperative societies	-	1
	Self-help group to inter-group association/union	-	1
Leadership positions	Increase	18	5
	Decrease	5	1
Leadership tenure	Reduction of leadership tenure	5	7
Replacement system	Consensus to elections	1	4
	Elections to consensus	1	1
Enforcement mechanisms	Diversification of enforcement mechanisms	7	10

moderate and high changes include group size, record keeping, committees and diversification of group activities. More farmers are recognizing the need of joining groups and engaging in collective activities. For that reason, the percentage of groups in both sites that had increased in size was higher compared to those that had decreased in size. Findings from focus group discussions indicate that group size had increased, because new members wanted to benefit from the group activities. These results are consistent with the findings of Abaru et al. (2006) who identified that groups increase in size as new members join groups in order to benefit from group activities. While the groups that had

decreased in size cited aspects, such as misunderstanding, failure to abide by the rules and regulations, death and relocation as the factors that led to decline in group size.

In Kapchorwa district, it was evident that 54% of the groups had neither increased nor decreased in size. This can be attributed to the preference by farmers in Kapchorwa district to form new groups as opposed to joining existing groups. Consequently, Kapchorwa district has more new groups which were formed 1 to 5 years ago, compared to Bungoma county which had less of these younger groups. In Bungoma county, only 15% of the groups had their size remaining constant, because

most farmers in Bungoma prefer to join the already existing groups as opposed to organizing themselves in a new group. This explains why there are more farmer groups in Kapchorwa district than Bungoma county.

Groups started keeping records, such as minutes, financial records, progress reports and group activity reports for various reasons. In Bungoma county, the reasons given for keeping these records were: for future reference (32%), to monitor progress (28%), to enhance accountability (23%), to facilitate group performance (9%) and requirements by their partners (8%). In Kapchorwa district, the reasons for keeping records were: for future reference (42%), to monitor progress (30%), to facilitate transparency and accountability (27%), to enhance group performance (1%), and requirements by stakeholders (1%). Evidently, the main reasons for keeping records in this study are for future reference and to monitor progress.

In Bungoma county, the major reason for appointing committees is to facilitate effective management of the group activities (80%). Other reasons are to make work easier (13%) and to ensure effective participation of the group members (7%). In Kapchorwa district, the main reason for appointing committees is to facilitate effective management of the groups (79%). Other reasons are to enhance effective participation (11%) and to make work easier (9%). Over 80% of the groups in both sites cited that committees were appointed to facilitate effective participation of members and for the management of groups. These show that in the study sites committees are appointed in groups mostly to enhance effective participation of members and for effective management of the groups.

All the groups in Bungoma county engaged in additional activities (Besides the main activity). Similarly, a large number of groups (86%) in Kapchorwa district had diversified their undertakings. These results are consistent with the findings of Aldana et al. (2007) and Thompson et al. (2009) who established that groups that were initially formed for one purpose took on other activities with time. The reasons given for diversifying activities were to enable members obtain more benefits through participation in group activities to meet their interests. Additionally, group members cited that capacity development support from partners, such as government, non-governmental organizations and other farmer groups also influenced them to take on other activities.

Organizational arrangements that experienced minimal changes

Organizational arrangements that underwent minimal changes include gender composition, group type, number of leadership positions, leadership tenure, replacement system of leaders and enforcement mechanisms for regulating group conduct. Over 80% of groups in the

study sites were mixed gender groups, this shows that most farmers prefer forming mixed gender groups as opposed to single gender groups. Additionally, majority of the groups that changed their gender composition had changed to mixed gender groups as opposed to single gender groups. The highest number being change from women only group to mixed gender groups and from men only group to mixed gender groups. In both sites, men and women are increasingly recognizing the importance of working together and are moving towards mixed gender groups.

Kapchorwa district exhibited more changes in group type than Bungoma county. Groups in Bungoma county preferred to form an umbrella organization, such as a federation to address their collective needs rather than changing their organization type. Farmers in Bungoma county formed a federation comprising of 111 self-help groups and 11 community-based organizations. The federation was formed mainly for improving production and for the purposes of collective marketing of agricultural produce. Farmers also cited that they wanted to benefit from economies of scale and negotiate for better prices in the market.

The groups in Kapchorwa district changed from self-help groups to inter-group association/union (1%), community-based organizations (6%) and cooperative society (1%). The group types had changed to enable members attain certain benefits and engage in new activities. These include attracting more farmers to the groups, engaging in collective marketing to benefit from economies of scale, providing credit to the community to earn interest and recognition by government and other stakeholders to get their support. Generally, most groups do not form new organizations as evidenced by the few groups that had changed their group type. These results are comparable to the findings of Place et al. (2004) which showed that most groups in Central Kenya did not form new organizations, but instead diversified their activities.

Change in leadership structure included number of leadership positions, increase and reduction of leadership tenure and replacement system. Leadership positions were increased by the groups to provide support to leaders who were already in place. Other factors include the requirements by government for registration purposes. Groups that had reduced the number of leadership positions cited that redundancy and duplication of roles influenced them to reduce the number of leaders. Some groups had changed their replacement system from consensus to regular elections, while others had changed from regular elections to consensus. Consensus as a system of replacing leaders is a process in which group members discuss and agree on whom to give the leadership positions. Election is a formal decision making process whereby group members cast votes to elect individuals for leadership positions.

The groups that changed their leadership replacement

Table 8. Analysis of variance of group size and age with the ability to meet objectives.

Analysis of variance	Variable	Sum of squares	Df	Mean square	F	Sig.
Ability to meet objectives	Group age	9.894	2	4.947	0.190	0.827
-	Group size	3459.916	2	1729.958	0.744	0.476

system from consensus to elections cited that this was as a result of dominance by a few members of the groups who imposed leaders of their choice without acceptance by the whole group. Additionally, the groups had also been enlightened through trainings on the role of elections in enhancing participation of all members both dominant and quiet members. While groups that had changed the replacement systems from elections to consensus stated that all the group members made a decision that they discuss and agree collectively on the leaders to choose. Change in the duration of leaders' term in office included reduction of leadership tenure. The reasons for change were reducing the domination of few individuals who over stay in office and grant other members an opportunity to participate in leadership, advised to reduce the leaders' term in office by their partners to lessen conflicts and to enhance sustainability by allowing other members to take charge.

The changes in the enforcement mechanisms were inclusion of written warning from initially giving verbal warnings. Other changes include incorporating payment of fine, suspension and expulsion from only giving warnings. Enforcement mechanisms were diversified mainly because most members were not abiding by the group's rules, which hindered development. Other reasons include trainings on governance, which prompted groups to consider incorporating other enforcement systems. Verbal warning was not being taken seriously, hence written warning was incorporated to make the disciplinary system official and keep evidence for future reference. Payment of fine was included to discourage members from coming late during group meetings and when undertaking group activities. Suspension was incorporated in groups to allow the members time to reform and make them law abiding. Finally, expulsion was included by some groups to get rid of stubborn/uncooperative members in the group.

Contribution of organizational arrangements on the effectiveness of collective action

Farmer groups in the study sites had changed differently by adjusting their organizational arrangements. Organizational arrangements that had moderately and highly changed include diversification of group activities, change in group size, record keeping and inclusion of committees. Organizational arrangements with minimal changes include group type, gender composition,

leadership positions, enforcement mechanisms, replacement system of leaders and leadership tenure. To what extent do the changes in the organizational arrangements influence effectiveness of collective action?

Analysis of variance of group size and age with the ability of the group to meet objectives, shows that there was no significant difference ($p > 0.10$) between group size and age with the groups' ability to meet objectives. This is shown in Table 8.

From these results, it is evident that the number of years a group has been in existence does not have any influence on the ability of groups to meet objectives. Young and old groups are equally likely to perform well. Younger groups could have more committed members and effective organizational structures in place that enable groups to meet their goals. Older groups could be composed of undedicated members and poor organizational structures hindering achievement of their goals. This is consistent with the findings of Place et al. (2004) and Sonam and Martwanna (2012) who observed that there was no significant relationship between group age and effectiveness of groups. However, the results differ with the findings of Barham and Chitemi (2009) who concluded that older groups are more mature; hence, they performed better than younger groups.

It is clear from these results that group size does not have any significant difference with the ability of groups to meet objectives. Groups that have many members and those that have few members are equally likely to perform well. Therefore, increase or decrease in group size does not necessarily influence effectiveness of groups. These results are consistent with the findings of Shiferaw et al. (2006), Friedman (2008) and Barham and Chitemi (2009) who identified that group size does not have any influence on the effectiveness of collective action. However, the results contradict the findings of Place et al. (2004), Njoku et al. (2009), Gyau et al. (2011), Sonam and Martwanna (2012) and Ampaire et al. (2013) who established that favorable group size positively influences effectiveness of collective action.

Chi-square statistic test results shows that the organizational structures that have a significant relationship ($P < 0.10$) with the ability of the groups to meet their objectives include number of leadership positions, the number of enforcement mechanisms for regulating group conduct, presence of committees to support executive leaders, frequency of committee meetings and having clear timelines that leaders can serve in office

Table 3. Relationship between organizational arrangements and ability to meet objectives.

Variable		Non-achievement (%)	Moderate achievement (%)	Highly achieved (%)	sig.
Group type	Self-help group	14	26	60	0.923
	Other group types	11	26	63	
Gender composition	Mixed gender group	12	27	61	0.623
	Single gender group	19	25	56	
Number of leadership positions	1-3 positions	11	37	52	0.009***
	4 positions	11	27	62	
	5 positions	6	19	76	
	Above 5 positions	29	29	43	
Frequency of replacing leaders	Have specific timelines	14	24	62	0.071*
	Do not have specific timelines	16	47	37	
Replacement system	Elections	15	25	60	0.675
	Consensus	13	32	55	
Presence of committees	Have committees	10	28	62	0.067*
	Have no committees	23	21	55	
Frequency of committees meetings	Weekly	12	27	62	0.015***
	Monthly	7	27	66	
	Semi-annually	33	28	39	
Enforcement systems	1-2 systems	16	31	53	0.041**
	3 and above	11	19	71	
Highest level of education in group	Primary and secondary	15	18	67	0.135
	Tertiary-Certificate, Diploma, Degree	11	31	58	

Pearson Chi-square test for significance: ***at 1%, **at 5%, *at 10%

before replacement. Whereas the gender composition of groups, group type and replacement system of leaders does not have any significant relationship ($P > 0.10$) with the ability of groups to meet their objectives. This is illustrated in Table 9.

It is clear from these results that as the number of leadership positions increases, the ability of the groups to meet their objectives also increases. However, it reaches an optimum number of leadership positions beyond which the ability of groups to meet their objectives declines with an increase in number of leadership positions. A considerable number of leaders in groups are therefore viewed as essential in influencing effectiveness of collective action. This is as shown in Figure 2.

More leadership positions in the group reduce the domination of a few individuals in running the group activities. Hence, groups are able to meet their objectives

better. However, too many leadership positions in groups can probably bring in duplication of roles and conflicts which hinders the attainment of group objectives. More leadership positions as opposed to few number of leaders are fundamental in influencing the effectiveness of groups, however, too many leadership positions are detrimental to group effectiveness.

Groups that had put in place definite timelines on duration of leadership tenure were more effective than groups that did not have specified timelines. Therefore, clear specific timelines that leaders could serve in office before they are replaced, has a significant relationship with the ability of groups to meet objectives. Groups that did not have specific timelines on leadership tenure cited that leaders served in office as long as they still want to take charge and resign from office voluntarily. Clear timelines on leadership tenure gives other members an

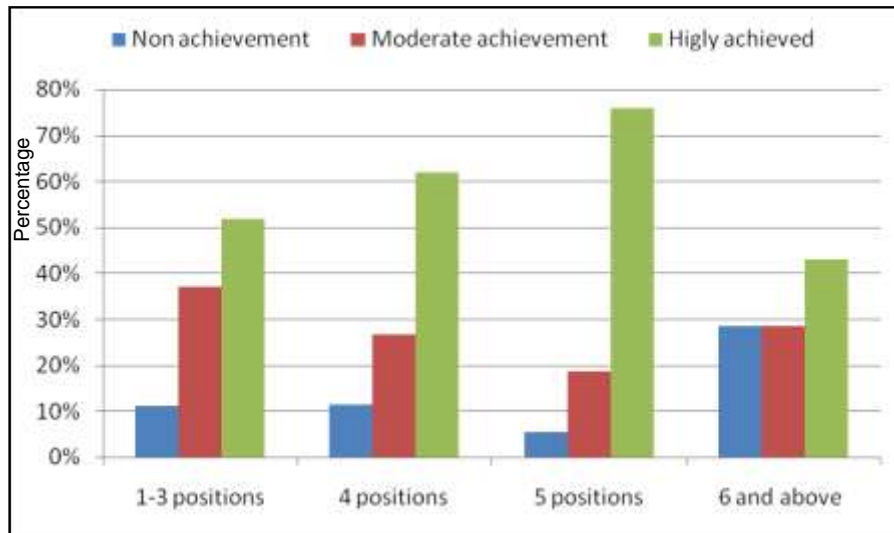


Figure 2. Number of leadership positions and ability of groups to meet their objectives.

opportunity to take charge, eliminates domination of a few individuals and enhances democracy leading to progress.

Groups that had committees who frequently held meetings were more effective in achieving their objectives. Involving members in committees rather than having only the executive leaders (chairman, secretary, treasurer), serves to influence commitment of members as they are involved in management of group activities and projects. These results agree with the findings of Ampaire et al. (2013) who identified that the factors that positively influence effectiveness of rural producer organizations include having numerous sub-committees. Committees that met more often were more effective as compared to those that met less often. Frequent meetings (Weekly and Monthly), as opposed to less frequent meetings (semi-annually) show commitment in group activities and projects. Holding frequent meetings gave committees an opportunity to timely plan and implement the tasks that they had been assigned. Aldana et al. (2007), agree that frequent meetings increases cohesion and strength of groups.

Institution of more enforcement mechanisms enhances the groups' ability to meet its objectives. As such, groups can handle different cases of misconduct with gross misconduct leading to suspension and expulsion. The more systems in place enhance progress in groups as they prompt members to abide by rules and regulations and avoid negative repercussions due to non-adherence. These results are comparable with the findings of Gyau et al. (2011), Fatemi and Jafari (2011) and Salifu et al. (2012), who established that efficient norms, rules and regulations adopted by groups positively influences their effectiveness.

Chi-square tests results however indicate that there

was no significant relationship between group types with the ability of the groups to meet objectives. Whether a group is cooperative society, community based organization or a self-help group, does not influence the ability of the groups to meet objectives. These results are consistent with the findings of Kitetu (2005) who identified that group types do not have any influence on their effectiveness. Accordingly, self-help groups such as merry-go-rounds even though they are small groups, they can meet their objectives better than large movements such as cooperatives. Friedman (2008) elaborates that not all large organizations are effective others still struggle with administrative weaknesses and fail to meet their objectives.

From these results, it is evident that gender composition of groups does not have any relationship with the ability of groups to meet their objectives. Thus women only group, men only group and mixed gender groups were equally likely to perform well. Similarly, Barham and Chitemi (2009) found that gender composition did not have any significant association with group performance. However, the results contradicts the findings of Westermann et al. (2005) who identified that women only groups were more effective than men only groups and mixed gender groups. Results further show, replacement system of leaders, whether elections or consensus did not have any statistical relationship with the ability of the groups to meet objectives. Instead, the number of leadership positions and having clear timelines group leaders can serve in office before they are replaced were important leadership structures that have a relationship with the ability of groups to meet objectives. Results show that there is no relationship between education levels of members with the effectiveness of groups. Groups whose members' highest level of

education was primary/secondary and those that had members whose highest level of education was tertiary, were likely to perform the same. However, this study could not identify whether there is an association between age of members in a group (mixed, youth, elderly), wealth endowment of members (mixed/similar) and record keeping (whether groups keep records or not) with effectiveness of groups. This is because most groups had mixed membership in relation to age and wealth endowment; majority of the groups also kept records. For this reason, a statistical relationship between these variables and group effectiveness could not be established.

Findings from focus group discussions show that groups that had diversified their group functionality provided their members with more benefits than groups that engaged in one activity. The more activities groups engaged in, the more benefits members obtained from the groups. Given that the majority of the groups in both sites had diversified their activities, it was not statistically possible to establish whether groups that had diversified their activities were more effective than those that engaged in one activity. Barham and Chitemi (2009), however found out that groups that take on more than one activity performed better than groups engaging in only one activity. This could be attributed to more activities requiring effective structures in place for sustainability purposes.

CONCLUSION AND RECOMMENDATIONS

Findings from this study show that organizational changes in groups varied. Some changes were highly pronounced than others. Organizational arrangements that had moderately and highly changed include diversification of group activities, change in group size, incorporation of record keeping and committees. Organizational arrangements that had undergone minimal changes include group type, gender composition, number of leadership positions, enforcement mechanisms and duration of leadership tenure.

The organizational arrangements that were identified to have a relationship with effectiveness of groups are effective leadership and governance structures. Effective leadership structures include a considerable number of leadership positions and clearly outlined leadership tenure. Effective governance structures include committees, frequent committee meetings and putting in place more enforcement mechanisms. Additionally, groups that had diversified their activities provided their members with more benefits than groups that engaged in only one collective activity.

While leadership and governance structures were found to have a relationship with effectiveness of groups, it was evident from the study that these structures registered minimal changes. Even though group size registered high changes, it was identified not to have a

relationship with the effectiveness of groups. Findings from this study also show that group age did not have a relationship with effectiveness of groups, thus older and younger groups were equally likely to perform well. This study thus proves wrong the assumption that older groups are more developed than younger groups.

The implication of these findings to development practitioners, who work with farmer groups at the grassroots level, is to provide well-targeted capacity development support that enhances the adoption of effective leadership and governance structures. The study proposes incorporation of suitable organizational structures in farmer groups that will enable them to achieve their objectives.

Conflict of Interests

The authors have not declared any conflict of interests.

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