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The Capacity of Integrated Small-Scale Agricultural Production in Realization of Food Security in Rural Kenya: A Case of Suwerwa Location

Valentine Jepkemoi Kirui
Lecturer, Department of Sociology, Psychology, and Anthropology, Moi University, Kenya
John Mwangi Kimingi
Student, Department of Psychology and Anthropology, Moi University, Kenya

Abstract:
Extreme poverty and hunger in many parts of Kenya is a common phenomenon. In recent years, there has been a deteriorating food supply. In the year 2011, approximately 4 million people were facing severe hunger and starvation. This has been attributed to multiple factors: poor traditional agricultural practices, over-reliance on maize and maize products as the major source of food, crop failure occasioned by erratic rainfall patterns, runaway food prices occasioned by a rise in global food price, poor logistics in the distribution of food to needy people and the influx of refugees from war-torn neighboring countries. Another factor that has contributed to food shortage is diminishing land sizes due to an increase in population. What used to be huge arable land suitable for large-scale commercial agriculture has been fragmented, making large-scale farming untenable. This has led to diminishing returns in food production and its attendant consequences. With dwindling agricultural output, household incomes have also been made worse, especially in arid and semi-arid regions. This study, therefore, examines the capacity of integrated agricultural production in the realization of food security in rural Kenya. The research was a case study of Suwerwa Location. The research instruments that were used included questionnaires, interview schedules and focus group discussions. The researcher used purposive and simple random sampling to generate a sample size of 200 respondents. The research used both descriptive and analytical methods of data analysis. This study found out that integrated small-scale agricultural production, as is practised in the Suwerwa location, has not ensured food self-sufficiency for all because of the numerous challenges that farmers face, ranging from financial and technical to those posed by weather. The study concluded that it is important to re-orient farming practices and adopt integrated farming systems on tiny land holdings. At the same time, farmers must be taught new ways of integrating farm activities. In addition, they must move away from rain-fed agriculture to irrigation so that they can grow food throughout the year and be provided with credit facilities and extension services. The study findings benefit policy-makers at the planning level because they inform them of the farming trends and food situation and reflect the country's capacity to attain food sufficiency through integrated small-scale agricultural production.

Keywords: *Integrated farming, food security, farm systems*

1. Background to the Study

Agriculture is the leading economic activity in Kenya. It is a way of life for people in rural Kenya. It provides occupation, culture, traditions, and values for rural people who have long existed in harmony with nature. For decades, it has continued to dominate the country's economy. In 2007, for instance, the agricultural sector accounted for roughly 26% of the country's GDP and 70% of the country's labor force (Ministry of Agriculture, 2009). In 2005, agriculture, including forestry and fishing, accounted for about 18% of wage employment, 60% of revenue from exports, and 24% of the country's GDP.

Small farms grow most of the corn and produce potatoes, bananas, beans, and peas. However, about half of Kenya's total output is non-marketed subsistence production (Kurt Larsen et al., 2009). Even in farming potential areas, agricultural practices are still traditional, and farmers rely on rainwater. Thus, the country's grain yield has remained flat over the past two decades (USDA, 2009).

Despite many well-intentioned efforts and a growing population of about 3% per annum, the country faces a daunting task to meet food sufficiency. Food production from 2001 is on the decline due to poor farming methods, erratic rainfall patterns, escalating farm inputs costs (FAO, 2009), and land fragmentation. In Trans Nzoia County, what used to be viable land has been subdivided into very tiny holdings, some as small as 0.1 acre, popularly referred to as "pointi", and are not agriculturally viable because with such small farms, much of the produce is used by the farmers. In addition, small-scale farmers are afraid to diversify their farming activities because the risk of trying a new crop is much worse than for a more prosperous farmer; the loss of a crop could mean not only monetary loss but also starvation (Cheng Leong & Gillian, 1973).

At the national level, extreme hunger and poverty is a recurrent phenomenon. In 2003, 56% of the population was still living below the poverty line, and it is projected that 65.9% of Kenya's population will be living below the poverty line by 2015 (UNDP).

As far as the food situation is concerned, Kenya's long-term goal of attaining food sufficiency remains unmet (FAO, 2010). Frequent droughts have always led to food shortages. The most affected group is the pastoral communities. In March 2011, an estimated 1.4 million pastoralists faced moderate to high food insecurity due to the impacts of consecutive poor seasons (WFP). In July 2011, an estimated 4 million people were seriously affected by famine, and the majority of them were unlikely to meet food needs until September 2011(FAO, 2011). It is against this backdrop that the government resorted to importing Genetically Modified Maize (GMM) from South Africa in order to meet the growing food demand for the people. However, this is not without controversy: Why should the country import genetically modified maize when other avenues have not been explored? Why should we rely on maize as our staple food crop? Is maize farming enough to meet our food requirements and eradicate extreme poverty? Should we diversify agriculture in order to meet food sufficiency? Is integrated small-scale agricultural production able to ensure food security?

1.1. Statement of the Problem

Since independence, Kenya has emphasized the need to develop agriculture to realize food self-sufficiency and rapid economic development. However, the information available shows that hunger is a recurrent phenomenon in Kenya and that food production has been on the decline since 2001. The strategies evolved to address problems facing the agriculture sector overlook the need to streamline integrated small-scale agricultural production to ensure food sufficiency in small farm holdings and improve household incomes. The research problem addressed in this study is that despite Kenya's dependency on agriculture as the backbone of the economy, little has been done to analyze the capacity of integrated small-scale agricultural production in the realization of food sufficiency, that is, integrated small-scale agricultural production capable of ensuring food security in Kenya?

2. Literature review

2.1. Integrated Small-Scale Agricultural Production

This refers to diversified agricultural practices within small farm holdings, where a large household permanently cultivates a small area of land (Woomer, 2005). For the purpose of this study, integrated small-scale agriculture refers to farming in small holdings ranging from 0.1 acres to 3 acres characterized by interdependence and interrelation of various farming activities; that is, this system is self-sustaining because it thrives on the interdependence of enterprises.

2.1.1. Food Security

According to FAO 2010, food security is when all people have physical, social and economic access to sufficient, safe and nutritious food that meets dietary needs and food preferences for an active and healthy life at all times. The words "at all times" stand out and need to be emphasized because even in Suwerwa location, just like many agriculture potential regions, most farmers do not have food at all times, that is, throughout the year. This is worse in ASAL areas inhabited by the pastoral communities, which experience severe hunger that is occasioned by drought, loss of pasture, and death of livestock, which, in most cases, is the sole source of livelihood.

2.1.2. Benefits of Integrated Small-Scale Agricultural Production

Integrated small-scale farming is productive. Where it is practised, it has been found to be a social safety net in terms of food security and a source of employment (Jitsanguan, 2001). This system has helped to improve food and food self-sufficiency. It has also cushioned farmers against the ravages of hunger often occasioned by natural hazards, such as drought and floods.

The advantage of this system of farming is that through the application of the waste products from one system as fertilizer or supplementary feed to boost the production in another system, the total output of the farm is increased beyond that which would be possible if the different production system were operated independently *(*Niroj, 1989). An example of integrated farming is when a farmer can keep fish and do small-scale farming. A major socio-economic benefit of integrated fish farming is that inputs to the various sub-systems tend to come from within the farm. Moreover, fish efficiently convert low-grade feeds into highly-quality animal protein and can be kept alive on maintenance diets without loss of condition, thereby allowing a greater degree of flexibility in harvesting stages. In this way, a high-value and nutritious source of food can be obtained with minimum effort and external inputs.

The important consideration for small-scale farmers and in the context of global food shortage is that an increase in yields can be achieved without resources due to costly manufactured inputs and by applying management strategies that are within the capacities of existing small-scale farming systems. These features of low external inputs and flexibility in the level of management which can be applied make an integrated crop-livestock-fish system a highly attractive solution, especially for those farmers who are experiencing undernourishment and lack of income because substantial returns can be obtained for relatively little cost in the form of labour investment.

Another advantage of this system is that it provides a stable income and food flow throughout the year. In addition, the waste product of one system can be used as fertilizer or supplementary feed in another system, so nothing goes to waste.

3. Results

More than 77.7% of all the respondents who grew maize, beans, potatoes, sukuma wiki, tomatoes and kept chicken and cows had enough of these foodstuffs to last them throughout the year. It is also observed from the table below that less than 60 % of the respondents lacked milk to last them throughout the year despite the integration of farming activities. It was observed that most farmers did not keep high-quality breeds that could produce enough milk. It also emerged that none of the respondents had a zero grazing unit and that in their small holdings, farmers tethered their cows and fed them with maize waste, Napier grass, and other farm waste. This resulted in low milk production. Also observed was that the chickens kept were of poor quality, that is, the traditional types that were left to roam freely and fed for themselves. This explained why farmers who kept chickens did not have enough cabbages, the reason being that chickens destroyed vegetables. If they were to be contained in special enclosures, it would be easy to collect their droppings, which would be used in other farm activities. With good quality breeds and better ways of integration, more farmers could be food secure.

3.1. Integration and Food Security

Crops	Maize	Beans	Vegetables	Potatoes	Milk
	Secure (%)	Secure (%)	Secure (%)	Secure (%)	Secure (%)
Cows	81	83	79	85	96
Goats	19	25	27	32	22
Chickens	89	90	96	95	90
Donkey	15	14	18	2	22
Sukuma wiki/Kales	84	91	99	100	91
Cabbage	39	45	51	61	46
Tomatoes	33	38	43	56	38
Sugar cane	44	50	49	71	51
Fruits	69	75	78	78	77

Table 1

3.2. Other Benefits of Integrated Small-Scale Agriculture

3.2.1. Increased Productivity

The researcher also studied other benefits accrued from integrated small-scale agriculture. According to Agriinfo.in (2010), integrated farming is beneficial because it provides an opportunity to increase economic yields per unit area per unit of time by virtue of the intensification of crops and allied enterprises. This ensures food self-sufficiency. Of the respondents interviewed, 55% said that the integration of farming activities had resulted in an increase in productivity, as shown in figure 1, while 45% did not realize this benefit.

3.2.2. Response to Increased Productivity

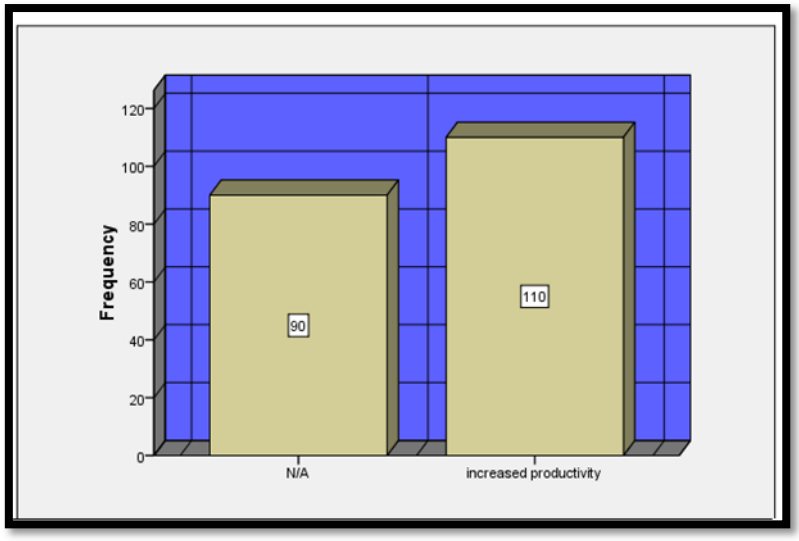

Figure 1

The researcher saw the need to verify if integrating farming activities increased productivity. The output of various food crops was compared to the expected yields per acre in the Suwerwa location, and the results are reflected below.

While the expected maize yield per acre, according to the Ministry of Agriculture, is between 20-25, 90-kilogram bags per acre, only 13 % of the respondents realized more than this. The rest of the respondents, 83%, had poor yields, i.e.,

below the expected yield. This might be attributed to numerous challenges that farmers faced, such as extreme weather conditions during harvesting seasons that resulted in the loss of harvest, shortage of labor, lack of certified seeds, and many more.

3.3. Integration and Maize Output per Acre

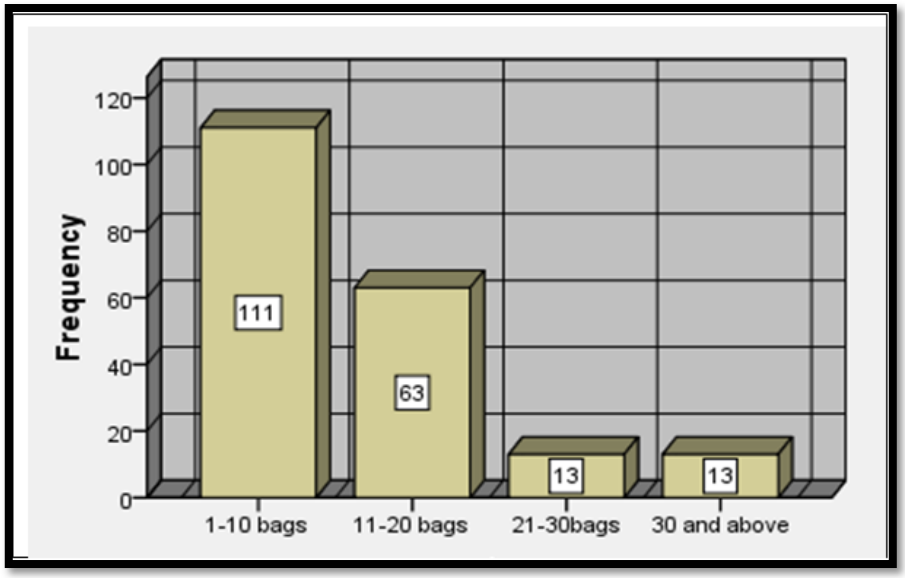

Figure 2

The researcher also studied the relationship between integration and bean production. According to the Ministry of Agriculture 2011, the expected yield per acre was about 10 bags. Of the respondents interviewed, 80% harvested more than 10 bags. This implies that with the integration of various farm activities, farmers got higher bean yields.

3.4. Integration and Beans Production

Beans Output per Acre in Bags		Frequency	Percent
	less than 1	40	20
	1-10	150	75
	11-20	7	4
	21-30	1	.5
	30 and above	2	1
	Total	200	100

Table 2

It was important to find out if integration can lead to an increase in vegetable production. Vegetables are a part of the diet because they complement ugali, and therefore, it is important to boost its production through integration. The study found the following: 58.5% of the respondents harvested less than 1 bag of cabbages per acre. This was low and below the average of 20 bags per acre. The researcher found out that vegetable farming, especially growing cabbages, was not fully embraced because they take more time to mature than sukuma wiki and other indigenous vegetables. Owing to their small land size, farmers preferred growing vegetables that take a short time to mature, such as kunde, sukuma wiki/ kales and other traditional vegetables. Cabbages were also not the best accompaniment for ugali, which is the staple foodstuff in Suwerwa.

3.5. Respondents' Vegetable Output per Acre

Vegetable Output per Acre in Bags		Frequency	Percent
	less than 1	117	59
	1-10	68	34
	11-20	7	4
	21-30	3	2
	30	5	3
	Total	200	100

Table 3

As for potato output, the study found that the harvest was poor, as shown in table 4. About 74% of the respondents harvested less than a bag of potato per acre. The focus group discussion attributed this to various key challenges, including frost, pests, and floods.

3.6. Potatoes Output per Acre

Potatoes Output per Acre		Frequency	Percent
	less than a bag	147	74
	1-10 bags		27
	Total	200	100

Table 4

3.6.1. Income

Other studies revealed that integrated farming is beneficial because farmers get constant income throughout the year due to the interaction of enterprises with crops, eggs, fish, milk, mushrooms, honey, maize, cabbages and many more (Agriinfo.in, 2011). The study also sought to verify if integrated small-scale farming, as practised in Suwerwa, ensured constant income. Of the 200 respondents interviewed, 98 of them answered in the affirmative. This translated to 49 %. This number was slightly lower than those who said that they did not have income throughout the year. By the time this study was conducted (January to March), farmers had harvested and were waiting to plant again in April when they expected rain. November to March is a dry season in Trans-nzoia; April marks the beginning of long rains up to September. The rainy season is the growing season for farmers in this location. Almost all the respondents rely on rain-fed agriculture, and that is why land was bare after harvest. This explains why they did not earn income throughout the year. If they were to move away from rain-fed agriculture to integrated irrigation farming during dry seasons, they would insulate themselves from the ravages of hunger and, at the same time, ensure that at no time was their land idle. This would enable them to be food secure throughout the year.

3.6.2. Response on Constant Income

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	98	49	49	100
Total	200	100	100	

Table 5

3.7. Low Cost of Production

The researcher also found out that only 38% of the respondents benefited from a low cost of production. As noted in the literature review, this is one of the benefits of integrating farming activities because waste products from one farming system are used as input in another section. In this way, farming becomes self-sustaining because of the interdependence of various enterprises. This reduces the costs of inputs, for example, fertilizers. The finding points out that only 76 respondents cited this as an advantage of integration of farm activities, as shown below in figure 3. Focus group discussion informed the researcher that all farmers were unable to reap the full benefits of integrated farming, such as low cost of production because they had not transformed their farms into farm systems that are characterized by the interdependence of all the activities. Their farm activities were practised as separate single entities. This is not only labor-demanding but also expensive because farmers rely on external inputs as opposed to integrated farm systems where waste from one system is used as input in another activity. This explains why farmers in the Suwerwa location did not reap this benefit.

3.8. Integration and Low Cost of Production

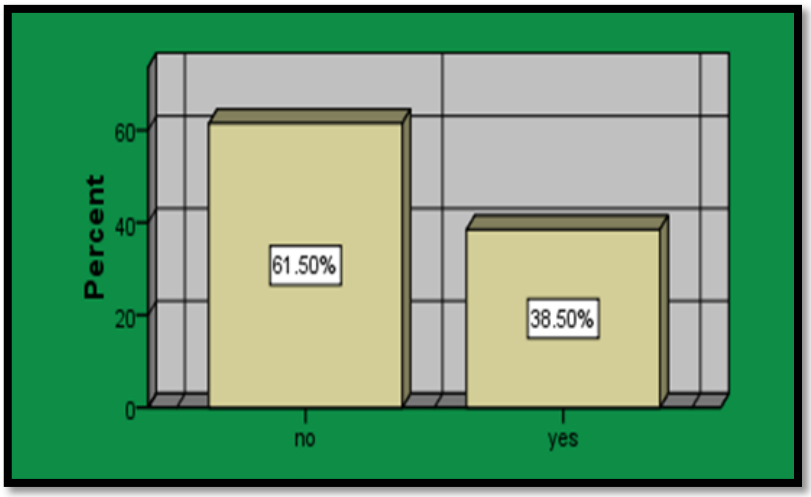

Figure 3

3.9. Variety of Food and Nutrition

Integrated agricultural production allows for diversity in food production because farmers produce everything and achieve food sovereignty and all nutrition requirements: carbohydrates from cereals such as maize and rice, sugarcane, potatoes and many more, vitamins from vegetables and fruits and proteins from chicken, eggs, and fish among others. The researcher wanted to find out if this is replicated in Suwerwa. Figure 4 shows that out of the respondents interviewed through questionnaires, 59% (118 respondents) cited this as a benefit, and 41% did not benefit from this.

The study revealed that there is a wide range of foodstuffs, including beans, peas, sweet potatoes, fruits, milk, fish, vegetables, maize, and others. However, they were not given much priority, like maize. They were secondary crops. That is why only 59 % had a variety of food. This has a policy implication: farmers should diversify farming practices to ensure that they have a wide range of food and nutritional requirements. This is the way to go if they intend to cushion themselves against risks that are associated with monoculture.

3.10. Integration and Food Variety

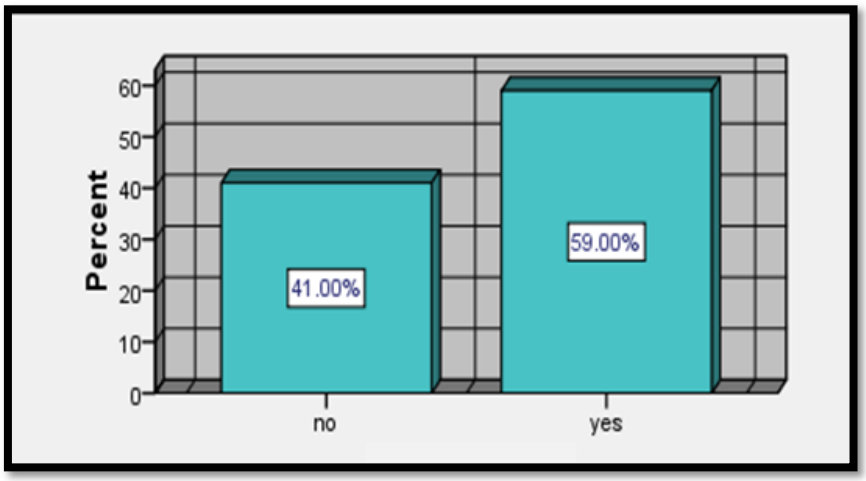

Figure 4

3.11. Reduced Risk of Monoculture

The research also revealed that 59% of the respondents had reduced the risk associated with monoculture, as shown in figure 4. In the Suwerwa location, maize was the dominant crop grown, as cited earlier. This is risky because a poor maize harvest can lead to severe hunger.

3.12. Integration and Reduced Risk of Monoculture

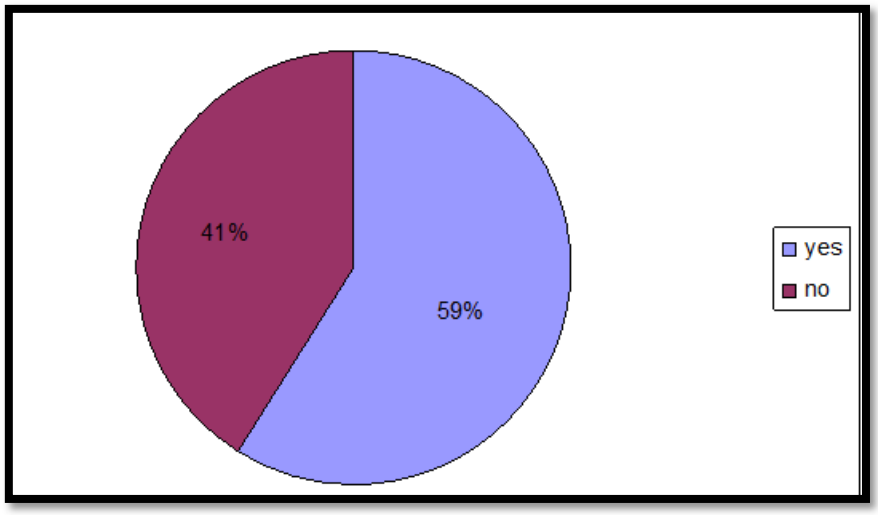

Figure 5

Those who had diversified their farming activities planted bananas, sweet potatoes, cassava, and nappier grass to feed cows and maize.

The researcher sought to find out if respondents realized all the above benefits and found that only 14%, that is, 28 respondents, did so, as shown in figure 6. However, 86 % of the respondents interviewed realized some of the benefits mentioned above. As seen in the third objective, farmers were bedevilled by a myriad of challenges that made it impossible for them to reap the full benefits of integration. In addition to this, their farming activities were not mutually reinforcing. They should transform their separate farm activities into interacting systems which are synergic in order to have a greater total effect than the sum of their individual effect.

3.13. Benefits of Integration

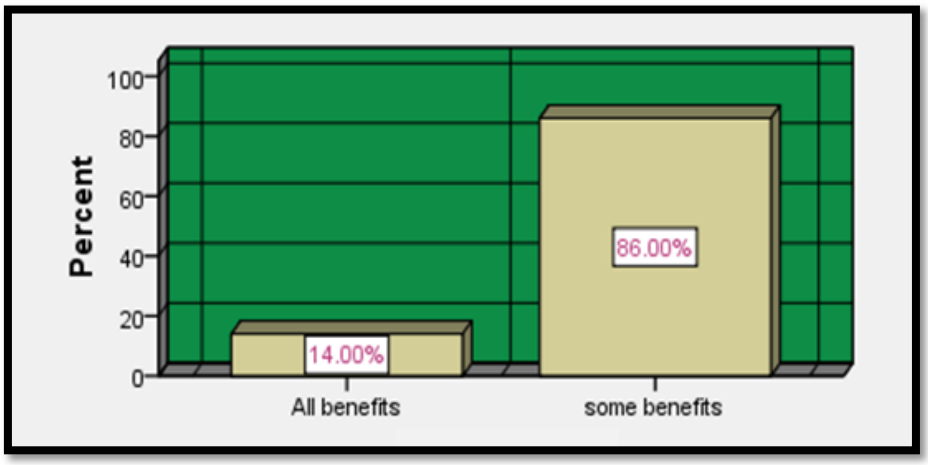

Figure 6

4. Recommendations

In view of the fact that land size is ever dwindling, it is important to lay emphasis on the need to integrate farming activities on tiny land holdings in order to ensure that Kenya's population is food secure. This is the way to go. Farmers should be taught different systems of integration, such as chicken-fish farming, tree-fruits-bee keeping, cow-farming, maize-chicken keeping, and fish farming, among others. They should come up with a farm system in their tiny land holdings. The Ministry of Agriculture should come up with demonstration farms and training centres to make it easy for farmers to learn novel ways of integrated farming.

5. Conclusion

Integrated small-scale agricultural production, as practised in the Suwerwa location, ensured food security for only 59% of the population. However, this system of farming could ensure food self-sufficiency for all if farmers were to re-orient their farming activities to embrace modern technology and evolve better farm systems characterized by high-quality animals, certified seeds, better farm tools and improved storage facilities even for perishable farm produce. In the same breath, the Ministry of Agriculture should assist farmers in changing and adopting better integrated agricultural practices.

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