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CROP DIVERSIFICATION AS A DETERMINANT OF HOUSEHOLD DECISION-MAKING IN THE PRODUCTION OF ROSELLE PLANT IN MWEA SUB-COUNTY, KENYA

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ABSTRACT

This study sought to analyze crop diversification as a determinant of household decision making towards production of the Roselle plant. The study employed a stratified sampling technique which involves dividing your population into homogenous subgroups and then taking a simple random sample in each group. The target population was 200 farmers drawn from four areas i.e. Karie, Kangai, Ngariama and Mutithi. A sample size of 133 respondents who consisted of employees working in the Roselle farms was selected. A confidence level of 95% which yields a margin of error of 5% which is 0.05 was used to arrive at the sample size. This study revealed that a majority of the respondents grow a variety of crops apart from Roselle. Crop diversification has a great effect on farmers' incomes since a high number of respondents indicated that diversification on crops grown increases the incomes generated through farming. The study concluded that crop diversification had an effect on decisions of farmers to grow Roselle plant from the study due to combating the challenge of seasonality, increase of income streams and also it helps to deal with pests and diseases.

Keywords*: Crop diversification, Roselle plant*

1. BACKGROUND OF THE STUDY

A large share of manufacturing in the early stages of development is agriculturally related. More importantly, rising incomes of rural households were seen as vital to providing a market for domestically produced manufactures and services. In addition, technological change and productivity growth in agriculture were linked to lower food prices in a closed economy model, which in turn held down urban wage costs and stimulated competitive exports of industrial products (Hsieh and Sadoulet, 2007).

This recognition of agriculture's broader roles for development started in the 1970s with the focus on equity and employment, and the growing evidence that productivity growth across millions of smallholders was strongly pro-poor. During the 1990s, the development community explicitly recognized poverty reduction as the major objective of development programs and a burgeoning literature started to demonstrate the links between agriculture and poverty reduction (Thirtle, Lin, and Piesse, 2003; Christiaensen and Demeny, 2007).

Meanwhile, since the 1992 Earth Summit in Rio, the central role of agriculture for meeting the environmental agenda has been widely recognized, given that agriculture is the major user and often abuser of natural resources. This broader agenda was enshrined in the eight Millennium Development Goals agreed to in 2000 by all 191 United Nations member states. Agriculture relates to nearly all these goals, and is central to at least

three of them—reducing poverty and hunger, fostering gender equality, and sustainable management of the environment. In addition, agriculture's role in economic growth remains critical to achieving all these goals. Second, even within a broader paradigm of agriculture for development, the world in which agriculture operates has changed drastically due to globalization, new technologies and institutions, and new more demanding markets (Haggblade, Hazell, and Reardon, 2008).

According to FAO (2007) Globalization has spurred rapid growth in demand for agricultural exports especially for higher value products, while opening the potential for developing countries to import food. At the same time, tightly coordinated supply chains have emerged that now operate on a far larger scale, which have unleashed a massive transformation in the organization of agricultural markets. Similarly new biotechnologies, as well as emerging new markets for agriculture such as the production of biofuels and the provision of environmental services for the mitigation of climate change, offer scope for faster growth of the sector.

Although the contribution of agriculture to gross domestic product (GDP) has declined from 40 % in 1963 to only 24 % in 2002, the sector continues to be dominant in the Kenyan economy and contributes largely to economic growth. The sector generates about 60 % of the country's foreign exchange and provides employment to about70 % of the total population. The sector also provides nearly all the food requirement for the nation and the bulk of raw materials needed in the industrial sector. Between 15 and 17 per cent of Kenya's total land area has sufficient fertility and rainfall to be farmed, and 7–8 % can be classified as first-class land. Because agriculture is a major sector of the Kenyan economy, its performance directly mirrors that of the overall economy. Therefore, whenever agricultural GDP declines, overall GDP for the whole economy correspondingly declines and vice versa (Odhiambo, Nyangito and Nzuma, 2004).

2. STUDY OBJECTIVE

The objective of the study is to analyze crop diversification as a determinant of household decision making towards production of Roselle plant.

3. LITERATURE REVIEW

Empowering farmers to grow Roselle plant is a way of increasing their capabilities since from the various crops through diversification they will be able to combat the challenges of seasonality which is common in agriculture. A variety of crops ensures that a farmer is income sufficient across the year because they all do well in particular seasons. Roselle plant for example is pest and disease resistant and also does not require a lot of water for its maturity therefore it is much suitable during periods when other conventional crops are not doing well.

Crop diversity is the variance in genetic and phenotypic characteristics of plants used in agriculture. Crops may vary in seed size, branching pattern, in height, flower color, fruiting time, or flavor. They may also vary in less obvious characteristics such as their response to heat, cold or drought, or their ability to resist specific diseases and pests. It is possible to discover variation in almost every conceivable trait, including nutritional qualities, preparation and cooking techniques, and of course how a crop tastes. And if a trait cannot be found in the crop itself, it can often be found in a wild relative of the crop; a plant that has similar species that have not been farmed or used in agriculture, but exist in the wild (Crop Wild Relatives, 2008).

Jarvis and Camplain (2004) argue that diversity in a crop can also result from different growing conditions: a crop growing in nutrient poor soil is likely to be shorter than a crop growing in more fertile soil. Furthermore, and perhaps most importantly, diversity of a harvested plant can be the outcome of genetic differences: a crop may have genes conferring early maturity or disease resistance. It is these transmitted traits that are of special

interest as they are passed on from generation to generation and collectively determine a crop's overall characteristics and future potential. Through combining genes for different traits in desired combinations, plant breeders are able to develop new crop varieties to meet specific conditions. A new variety might, for example, be higher yielding, more disease resistant and have a longer shelf life than the varieties from which it was bred.

Crop diversity and the economy

Agriculture is the economic foundation of most countries, and for developing countries the most likely source of economic growth. Growth is most rapid where agricultural productivity has increased the most. Growth in agriculture, although beneficial for the wider economy, benefits the poor most, and by providing affordable food these benefits extend beyond the 70% of the world's poorest people who live in rural areas and for whose livelihoods agriculture remains paramount (Smale and King, 2005). Ensuring agriculture is able to play this fundamental role requires a range of improvements including: the growing of higher value crops, promoting value-adding activities through, for example, improved processing, expanding access to markets, and lowering food prices through increasing production, processing and marketing efficiency, particularly for subsistence and very low income farming families.

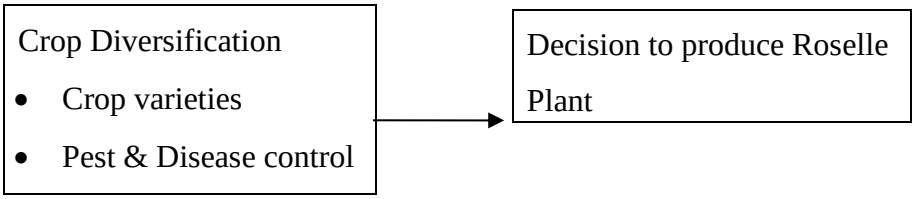
Disease threats to crops with low genetic diversity

One particular threat to mass-producing plants for harvest is their vulnerability to diseases. Ordinarily, a species has a range of genetic variability that allows for individuals and/or populations within that species to survive should a disturbance occur. In the case of agriculture, this is not an easy business to ensure, as seeds are planted under uniform conditions. For example, mono-cultural agriculture potentially elicits low crop diversity (especially if the seeds were mass-produced or cloned). It is possible that a single pest or disease could wipe out entire areas of a crop due to this uniformity. One of the more historically known examples of harvests that suffered from low crop diversity was the Irish Potato Famine of 1845-1847. Another example is when a disease caused by a fungus affected the 1970 US corn crop causing a loss of over one billion dollars in production. If the corn acreage had not been such a monoculture, the fungus would not have been able to spread as rapidly, as it would have encountered barriers of genetically resistant plants (Martinez, 2008).

Organizations, technology and solutions

According to the United Nations (2002) the implications of crop diversity are at both the local and international level, and numerous organizations are emerging with great global backing in response to this ideology. International Plant Genetic Resources Institute (IPGRI – now known as Biodiversity International), the International Institute of Tropical Agriculture (ITTA), the Borlaug Global Rust Initiative, and the International Network for Improvement of Banana and Plantain (INIBAP) are a few of the most prominent. Members of the United Nations, at the World Summit on Sustainable Development 2002 at Johannesburg, said that crop diversity is in danger of being lost if appropriate measures are not taken. One such step taken in the action against the loss of biodiversity among crops is called gene banking. There are a number of organizations that enlist teams of local farmers to grow native varieties, particularly those that are threatened by extinction due to lack of modern-day use. There are also local, national and international efforts to preserve agricultural genetic resources through ex situ (off-site) methods such as seed and sperm banks for further research and/or crop breeding.

4. CONCEPTUAL FRAMEWORK



Independent variable **Dependent variable**

5. RESEARCH METHODOLOGY

This chapter sets out the methodology which was used in carrying out the research. The researcher employed mixed method research design mainly because it allows the use of qualitative and quantitative approaches in analyzing data and thus provided an in-depth understanding of the phenomena being investigated. The target population for this research was farmers who have grown Roselle plant in their farms in Mwea Sub-County. The sample size was 133 respondents consisting of employees working in the Roselle farms. The researcher used a stratified sampling technique which involves dividing your population into homogenous subgroups and then taking a simple random sample in each group. Close ended questionnaires were used to collect information. In addition to the questionnaire, structured interviews were also used because it allowed for face-to-face contact with the respondents thus enabling provision of in-depth data which is in line with (Mugenda and Mugenda, 2009). SPSS tool was used to analyze the data. The data was analyzed quantitatively and qualitatively and descriptive statistics will be used to analyze, present and interpret data. A probit regression model was used to analyze the crop diversification as a determinant of household decision making towards production of Roselle, the dependent variable was a simple dichotomous variable (Y), which is a dummy equal to 1 if the respondent chose to grow and (Zero, otherwise).

6. FINDINGS OF THE STUDY

Table 1: Whether you grow any other crops

	Frequency	Percent
Yes	58	85.3
No	10	14.7
Total	**68**	**100**

The table indicates 83.8 percent of the respondents who were the majority indicated that they do grow other crops apart from Roselle 23.4 percent of them did not grow other crops. Those who said no were new farmers of the Roselle plant.

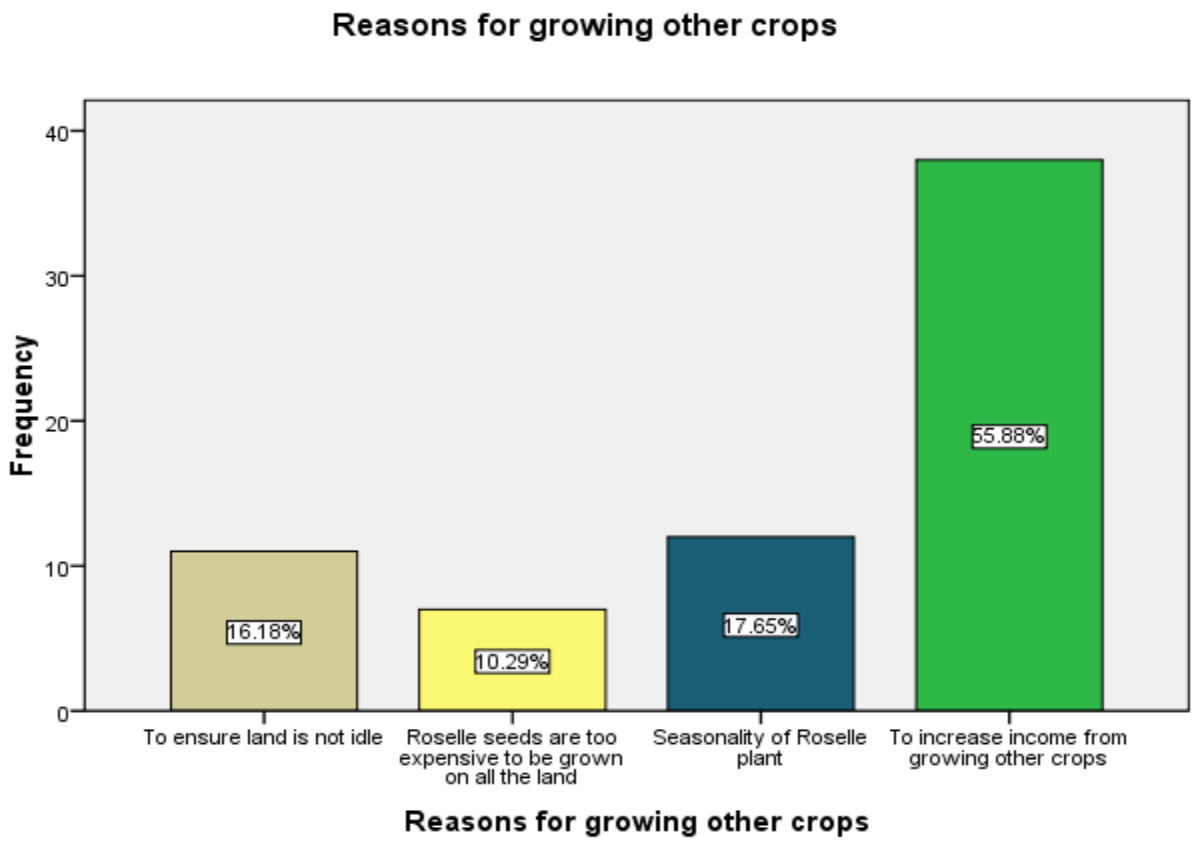


Figure 1. Reasons for growing other crops

Figure indicates that majority of the respondents were in agreement that growth of other crops helps to increase income generation as shown by a percentage of 55.88. Repondents were involved in growth of other crops because of the seasonality of the plant meaning it cannot be grown across the year. 16.18% of the respondents on the hand grew other crops so as to ensure the land is not idle when Roselle is not there whereas 10.29% of the respondents grew other crops because they felt that Roselle seeds are too expensive to be grown on all the land. These findings coincide with Jarvis and Camplain (2004) who noted that the practical use of crop diversity goes back to early agricultural methods of crop rotation and fallow fields, planting and harvesting one type of crop on a plot of land one year, and using a different crop the next based on differences in a plant's nutrient needs.

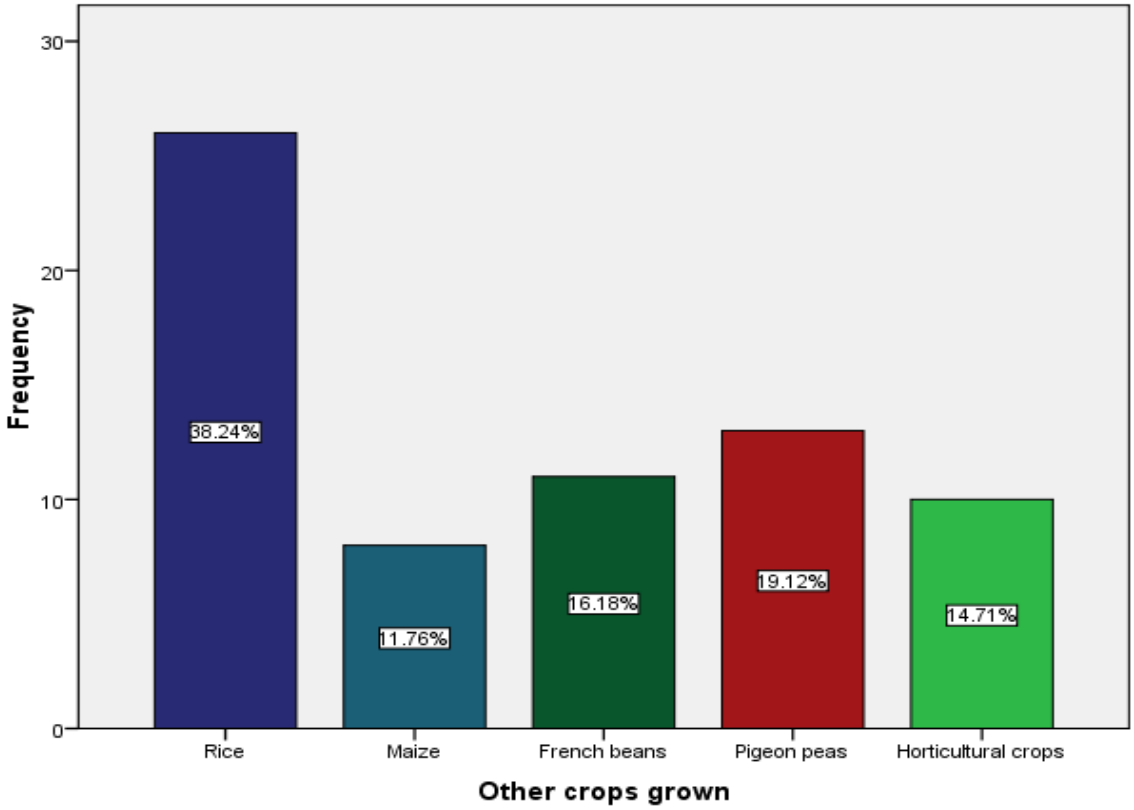


Figure 2: Other crops grown

Mwea is well known for growth of rice and this explains the reason why majority of the respondents were involved in rice cultivation as indicated by 38.24%. 19.12% of respondents were involved in growing pigeon peas whereas 16.18% of them grew French beans. 14.71% of respondents were involved in growing horticultural crops like vegetables and tomatoes. Some of the respondents were involved in growing maize as shown by a percentage of 11.76.

Table 2: Number of times annually Roselle calyces is harvested

	Frequency	Percent
Once	5	7.4
2 times	29	42.7
3 times	34	50
4 times	0	0
Total	**68**	**100**

From the table it is clear that most of the respondents harvest Roselle calyces 3 times annually represented by 50% and they are closely followed by those harvesting 2 times annually represented by 42.7%. 7.4% of the respondents harvested only once in a year. No single respondent managed to harvest 4 times annually. The differences in the harvesting periods can be explained by the fertility of the farmers' cultivation land and also the effort used towards growing of the plant.

Table 3: Whether growth of Roselle helps to control pests and diseases

	Frequency	Percent
Yes	55	80.1
No	13	19.1
Total	**68**	**100**

From the table, it is evident that majority of respondents do believe that Roselle contributes in controlling pests and diseases as shown by 80.1 percent. Only 19.1 percent felt that the plant does not help to control pests and diseases.

Table 4: How Roselle plant helps to control pests and diseases

	Frequency	Percent
Roselle is resistant to pests	32	58.1
Before a pest gets used to a certain crop another one is introduced	15	27.3
The area is not prone to pests and diseases	8	14.5
Total	**55**	**100**

Table above indicates that majority of the respondents felt that Roselle plant is resistant to pests and therefore contributed to controlling pests and diseases. 27.3% of the respondents also agreed that the plant contributed to control of pests and diseases since before a pest gets used to a certain crop another one is usually introduced. 14.5% respondents indicated that the area where crop is grown is actually not prone to pests and diseases. Heald and Chapman (2012) noted that Crop varieties that are resistant to pests and diseases can reduce the need for application of harmful pesticides; more vigorous varieties can better compete with weeds; drought resistant plants can help save water through reducing the need for irrigation; deeper rooting varieties can help stabilize soils; and varieties that are more efficient in their use of nutrients require less fertilizer.

Probit regression results

Dependent variable is the decision to produce Roselle.

Variable	Coefficient	Standard error	z-statistic	p>/z/
Crop diversification	-.743555998	.2345694	-3.17*	0.002

Significant at 95% percent level

Key

It was assumed that Roselle plant was viewed as a diversity plant by the farmers and this influenced their decisions to take it up. The model was to show the benefits the plant has in regards to other crops and how this affects their decisions to grow it.

Discussion of results

The dependent variable is Decision to produce Roselle. This was measured by a dummy variable which was given a value of 1 if one chooses to take up production of Roselle because of a particular determinant and zero for otherwise. The probability of producing Roselle was estimated against it being a diversity crop.

Crop diversification was measured by looking at the number of farmers growing other crops apart from Roselle and the benefits from involving themselves in Roselle production. The researcher sought to find out whether the plant's resistance to pests and diseases and its role in more income generation influences the respondents decision to grow the plant. The coefficient of crop diversification was negative but significant. It indicated that crop diversification is a determinant for the decision to take up production of Roselle.

6. SUMMARY OF THE MAJOR FINDINGS

This study revealed that a majority of the respondents grow a variety of crops apart from Roselle. 17.65% respondents planted varieties of crops to combat the risk of seasonality in plantation of one crop which supports the arguments of Jarvis and Camplain (2004) who noted that the practical use of crop diversity goes back to early agricultural methods of crop rotation and fallow fields, planting and harvesting one type of crop on a plot of land one year, and using a different crop the next based on differences in a plant's nutrient needs. Crop diversification has a great effect on farmers' incomes and this was shown by 55.88% of the respondents who indicated that diversification on crops grown increases the incomes generated through farming. Additionally, crop diversification contributes a lot to controlling pests and diseases as reported by 80.1% of respondents. This is supported by Heald and Chapman (2012) who noted that Crop varieties that are resistant to pests and diseases can reduce the need for application of harmful pesticides; more vigorous varieties can better compete with weeds; drought resistant plants can help save water through reducing the need for irrigation; deeper rooting varieties can help stabilize soils; and varieties that are more efficient in their use of nutrients require less fertilizer.

7. CONCLUSIONS

The conclusions that were made in this study were based on the findings discussed above and respondents. It was concluded that crop diversification had an effect on decisions of farmers to grow Roselle plant from the study due to combating the challenge of seasonality, increase of income streams and also it helps to deal with pests and diseases. All these factors enhancing crop diversification were rated high by the respondents. Most respondents considered Roselle plant as being resistant to pests and diseases compared to other crops.

8. RECOMMENDATIONS

There is need for farmers to take up growth of the plant as a crop diversification strategy since the crop is not costly to produce as it does not require a lot water application like other crops, does not require fertilizer application as that could affect its medicinal abilities and is not prone to diseases.

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