FACTORS AFFECTING ECONOMIC BENEFITS OF INDIGENOUS VEGETABLES GROWN BY SMALL-SCALE FARMERS IN KENYA: A CASE STUDY OF MWEA SUB-COUNTY, KENYA

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ABSTRACT
Indigenous vegetables have long been part of traditional diets in communities worldwide. They are valuable sources of nutrients with some having significant medicinal properties and contributing greatly to food security. Their consumption is by-passing the production in Kenya due to health check by many consumers. In Kenya, indigenous vegetables have been faced by various challenges that include land size, quality, and cost of input and agronomic factors that in turn reduce returns earned by farmers. This research was conducted in Mwea sub-County to assess the major factors that affect the profits earned by indigenous vegetables small-scale farmers. Stratified sampling and snowballing techniques were used in carrying out the research in four locations where indigenous vegetables are rigorously grown. Data was collected using questionnaires and observations and the population targeted was indigenous vegetables farmers only. The survey results demonstrate that land size affected profitability of small-scale farmers since cost of many inputs was constant regardless of farm size. More than 80% of farmers reported that size of land determined the profit returns of indigenous vegetables. Furthermore, agronomic factors like mode of management and type of seed used also affected production. Water availability, soil fertility, pests and diseases had a negative effect on leaf quality and therefore affected production. The study recommends policy interventions to reduce transaction costs as well as awareness creation on agronomic and post-harvest management on cultivation of indigenous vegetables.
Keywords: Indigenous vegetables, Profitability, Small-scale farmers, Agronomy

INTRODUCTION

Agriculture is under increasing pressure to produce greater quantities of food, feed and biofuel on limited land resources for the projected nine billion people by 2050. It is envisioned that agricultural production has to increase by seventy percent by 2050 to cope with an estimated 40% increase in world population (Andreas, 2014).Current by time, over-reliance on some major staple crops has been characterized by ecological, agronomic, nutritional and economic risks and is probably unsustainable in the long run and therefore, use of underutilized minor crops like indigenous vegetables provide more options to enhance resilience to both biotic and abiotic stress. Indigenous vegetables have long been part of traditional diets in communities worldwide. They are valuable sources of nutrients with some having significant medicinal properties (Hilou, Nacoulma & Guiguemde, 2006) and contribute significantly to nutritional balance and food security (Yiridoe & Anchirinah, 2005). Indigenous vegetables are of considerable commercial value and therefore an important source of household income in both rural and urban areas. Due to the increase in population especially in sub-Saharan Africa (UN-Habitat, 2007), consumption of indigenous vegetables will also increase at a higher rate. In Kenya, vegetables constitute a substantial portion of the horticultural output. In 2003, vegetables constituted about 18 per cent of the horticultural export volumes .Due to climatic change and effect of biotic and abiotic stress in exotic vegetables, more research has been emphasized on indigenous vegetables in Kenya to promote food security and nutritional value and this has led to commercial production with increased consumption in urban areas. This has subsequently increased the income level of famers and also created employment for many Kenyans. Despite the increase in demand for these indigenous vegetables in different areas, there are several challenges facing the small-scale farmers which reduce their profitability. These include reducing land size in rural areas, inadequate production and marketing skills of the farmers, climatic changes, inadequate water to support irrigation, effect of diseases and pest on the quality of leaf produced and the types of agronomy practices used. This has seen a decline in production of indigenous vegetables thus reducing economic returns to farmers. If these challenges are mitigated, production of indigenous vegetables can improve and help to increase income level of the farmers and also meet the nutritional needs of the society.

In Kenya, the rural population depends on indigenous vegetables both as a source of food and income (Abukutsa-Onyango, 2002). They have a huge potential of being income earners thus enabling the

poorest people in the rural communities to earn a living and making them economically stable (Onyango, 2003). They are also well adapted to harsh climatic conditions and infestation of disease and are easier to grow. Nonetheless, there is no explicit government policy that attempts to promote production and marketing of these products in the high-demand areas, such as Nairobi (Abukutsa-Onyango, 2002). This study assessed the various factors affecting the economic benefit of selected indigenous vegetable to small scale farmers in Kenya and the need for policy interventions.

METHODOLOGY

Area of Study

The study was conducted in Mwea constituency where four wards were selected: Nyangati, Kangai, Kiarukungu/Tebere, and Mahiga-ini, since this is where the most farmers who grow indigenous vegetables are concentrated. The constituency is located in the southern part of Kirinyaga County with a total population of 190,512 people covering an area of about 542.8 km^2. The wards are served by two rivers, Nyamindi and Thiba for irrigation and domestic purposes. The Nyamindi river system serves Tebere, and Mahiga-ini, while the other two wards are served by the Thiba River. Water is extracted from both rivers by gravity and is distributed through unlined open channels (Mati, 2010) where farmers use the water through small canals or pumps. The area has an altitude between 1110 m to 1393 m above sea level with exception of hill tops, which have a higher altitude. It has two rainfall seasons with annual average precipitation of 950 mm (Kennenni, 2002). The area is mostly hot with average temperatures ranging between 23ºC and 25ºC.

Research Design

The study adopted the use of survey design in a natural research setting. The survey design was used because it is critical in determining the quality of research. The research design enabled the study of different groups of the population dispersed over the wide geographical area of Mwea SubCounty concentrated in selected wards through a sampling approach (Bartlett *et al*., 2001). This enabled the study of the selected wards within the sub-county. Population under study was drawn from indigenous vegetable farmers distributed in the 4 selected locations. The sample was drawn from a population of 95142 people living in these 4 locations according to statistic data from KNBS (2013). Stratified random sampling method was used to obtain data from the four wards each forming a stratum. A total of 96 farmers were sampled as shown in Table 1.

Table 1. Strata sample computation

Stratum(locations)	Population in each stratum	Strata sample prop*population in each stratum	Sample in each stratum(location)
Nyangati	25016	25016*0.001	25
Kangai	19300	19300*001	20
Tebere	31695	31695*001	32
Mahiga-ini	18331	18331*001	19
Total	95142		96

A semi-structured questionnaire was administered to farmers through face to face interviews. This covered demographic characteristics of the farmers, cost of production and agronomic skills. Observation was used to help in gathering primary data on the indigenous vegetables on the farm and how farmers and other stake holders do pre-and post-harvesting management. Secondary data was also collected through literature review of various articles to obtain information about land tenure system, water regulation, quality of vegetables required for export and the type and regulation of chemicals sprayed. Data was analyzed using the Statistical Package for Social Science (SPSS) version 20 and Excel. Descriptive statistics measures such as percentages, and frequencies were computed for all quantitative data and the results presented using pie charts and frequency distribution tables.

RESULTS AND DISCUSSION

This study ought to establish factors affecting economic benefits of indigenous vegetables grown by small-scale farmers in Kenya and what can be done to minimize them and make this sector profitable which in return will improve farmer returns, reduce poverty level and food insecurity.

Demographic characteristic of farmer respondents

The sample of farmer respondents was 96 of which 87% were female and 13% were males. This shows that majority of the farmers cultivating indigenous vegetables in Mwea county are female hence women have more control over the production process. Based on education levels, 39% of the respondents had primary level education, 50% had acquired secondary level education, while the rest had tertiary education level with either diploma or certificate (Fig. 1). Thus

majority of the farmers had acquired basic education, which is seen as key in shaping and influencing farmers' productivity. Highly educated farmers always demonstrate better means of crop production and adoption of new technologies as opposed to poorly educated farmers (Thirtle *et al.*, 2003).

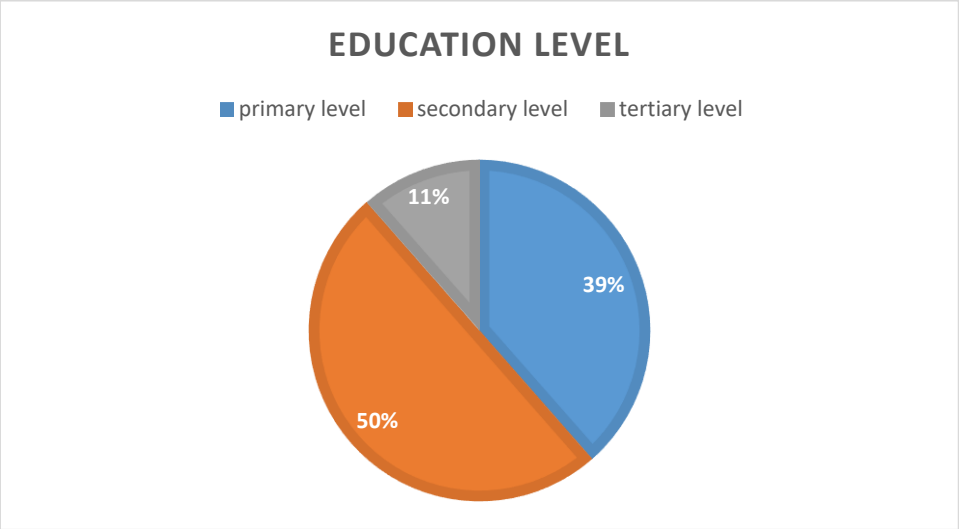

Figure 1. Education level of the farmer respondents

With respect to age distribution of the respondents, the study found that on average, most farmers were between the age of 31-40 years, followed by those between the age of 41-50 years, with least ranging between the age of 21-30 years and those above 50 years (Fig. 2). This shows that most of the farmers are within the economic active ages hence they will be more proactive and economic viable.

According to Figure 3, the highest percentage of the respondents had their source of income in crop growing (70%) with 20% practicing combined livelihoods. This indicates that most of the farmers solely depend on farming hence if the profit is reduced this reduces their income and may affect their living standard. In addition, 50% of the respondent preferred doing both cash and food crop farming. Furthermore, 40% of the farmers cultivated only exotic vegetable while 10% cultivated indigenous vegetables only with 50% cultivating both indigenous and exotic vegetables. This variation is because when the exotic vegetables were introduced, the indigenous vegetable were termed as weeds which resulted in many people opting not to cultivate them leading to a decline in their cultivation.

According to the observation, the most consumed type of indigenous vegetable variety was cowpeas (67.8%) followed by the African nightshade (64.4%) and spider plant (62.7%), while the least consumed vegetable was pumpkin (leaves) (Fig. 4). This is because most farmers preferred using the pumpkin to produce fruit rather than leaves.

Cost of production on indigenous vegetables

According to the data collected, 50% of the farmers cultivate less that an eighth of an acre while 40% of the farmers had less than or equal to a quarter of an acre. Only 10% of the farmers cultivated more than an acre of the farm. This indicates that cultivation of indigenous vegetables is not well done due to lack of land hence the economic benefit to the farmers is not fully met since they can only cultivate one type of crop at a given time which increases cost of production and reduces returns due to small size. This is brought by the fact that the cost of production is constant regardless of the size of the land.

The total cost of input of indigenous vegetable an average per acre was Ksh 12,100 where the cost of fertilizer was Ksh 2,600, which increased with time (Fig. 5). Over usage of the inorganic fertilizers increases acidity in the soil and hence requires another basic fertilizer to reduce the acidity in the soil, which in turn increases the cost of production. The cost of labour was the highest (Ksh 5,300) in terms of cost of production. This is accelerated by manual usage of labour since there is no mechanical mode introduced and in turn reduces the profit return of the farmers. The cost of chemical was Ksh 1,200 and the cost of rent per acre was Ksh. 3000.

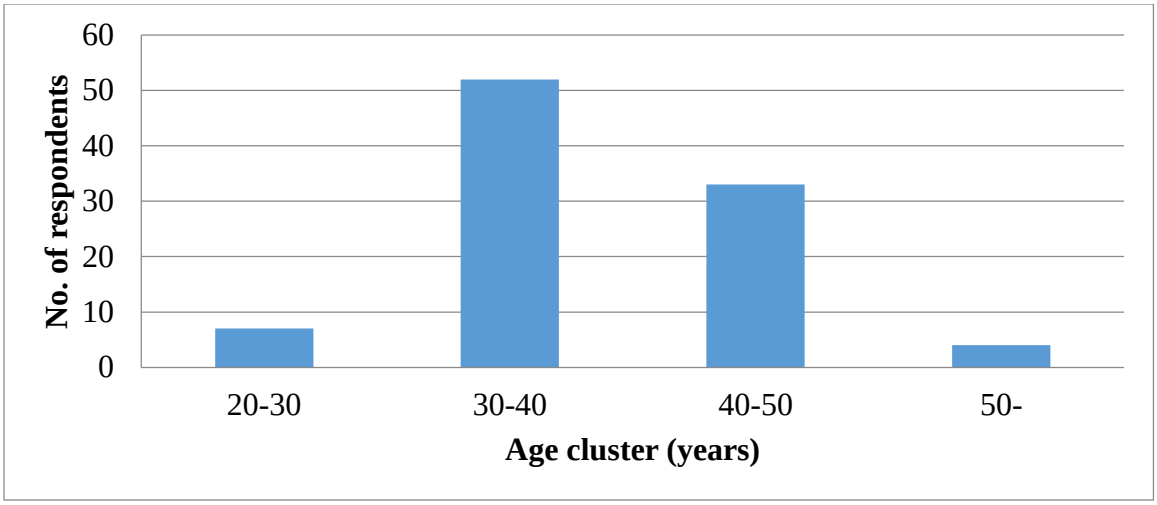

Figure 2. Age of respondents

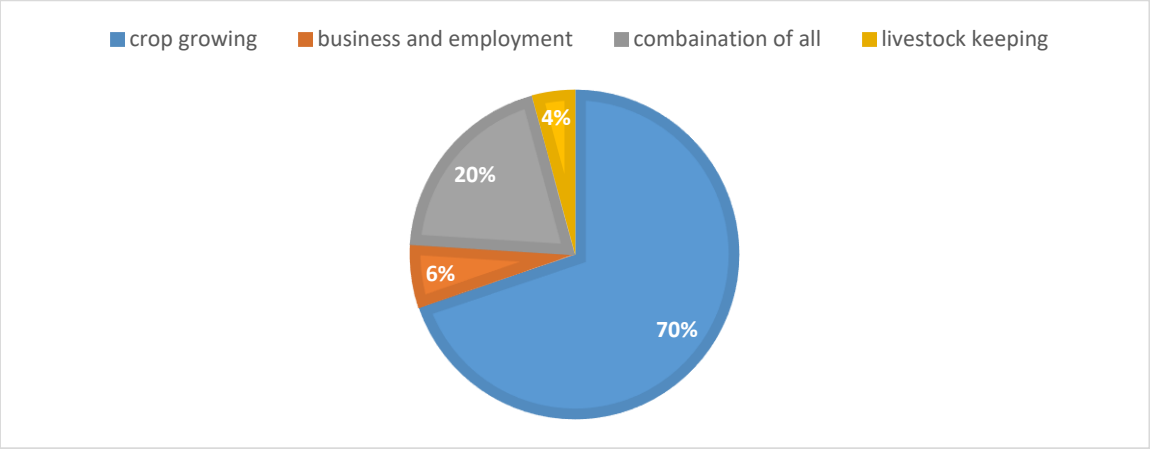

Figure 3. Source of income and occupation

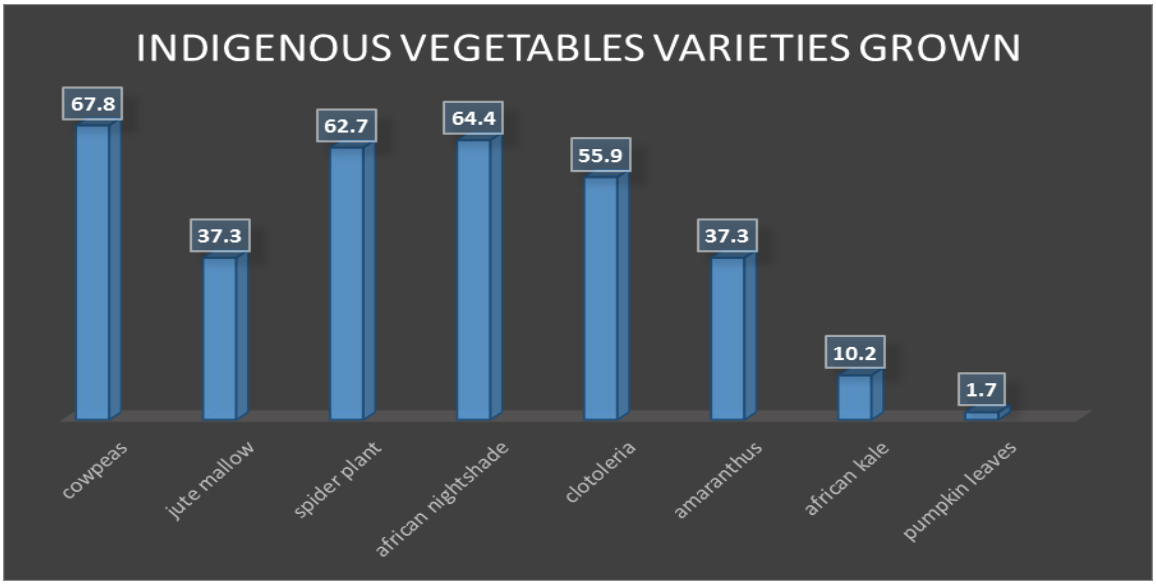

Figure 4. Indigenous vegetable varieties consumed

Market and agronomic skills

The mode of marketing affects the profitability of the IVS produces. According to the farmer respondents, 85% of the farmers sell their produce in the markets or to the brokers while 15% of the farmers do contract farming which controls their production and marketing as well. Where they do a contract annually, price is negotiated at the beginning of production hence even if there will be price fluctuations in the market these farmers will sell their product at the contracted price thus are assured of the market. On the other hand in an open market, the produce dictates the price due to economic factors of demand and supply. This affects the prices and subsequent returns to farmers of indigenous vegetables.

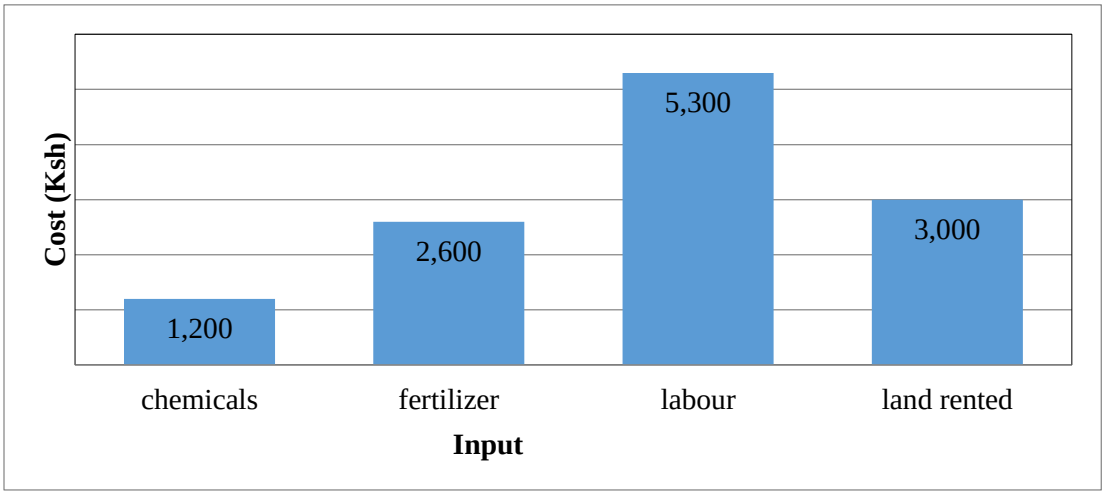

Figure 5. Cost of input on average

There were various agronomic factors that were mentioned as affecting profitability of the indigenous vegetables. These include the type of seed used. Most respondents got planting seeds from their previous production (44%) and 43% got their seeds from their neighbours. Nonetheless, there was a risk in transferring diseases to the new plots, which increased the cost of production by using more chemicals to control pest and diseases and also more fertilizer to boost production. Only 13% of the respondents used certified seeds which are more productive with 95% germination rate. However, even though certified seeds were the best, they were regarded as expensive compared to the others and therefore increased the cost of production. Another factor mentioned was the mode of management. The pre- and post-management of the indigenous vegetables affected productivity where 83% of the farmers used own management method while 17% used contract farming. Those who were under contract farming had high yields because under contract farming the contacting company provided the expertise on the type of certified seeds to use, type of pesticides and how much fertilizer to apply. They were also assured of the market compared to those who did self-controlled production.

From the survey, leaf quality was one of the major considerations in the market. Healthy leaf fetches higher prices in the market hence more returns to the farmers. According to the farmer respondent the health of the leaf is affected by different factors such as pests and disease, water availability and soil fertility. The respondents indicated that pests and diseases affected the quality of the leaf and hence reduced the profits. Pest like aphids results in leaf curl as they suck water from the leaf. Others are cut worms, spider mites, crickets and root-knot nematodes which affect the uptake of water thus resulting in plant death or low quality. Diseases like leaf spot and late blight contribute greatly to reduced leaf quality and profitability in the market. In addition, water also affected the quality of the leaf from the period of germination to maturity. Lack of water reduced the produce and also contributed greatly to disease infection. Furthermore, the respondents pointed out that soil fertility affected the average produce per acre.

CONCLUSION AND RECOMMENDATIONS

This study shows that various factors affect production of indigenous vegetables. These include the land size, soil fertility, use of labour, mode of marketing and various agronomic factors. There is also a great relationship between the quality of leaf and the profitability where healthy leaf fetches high prices in the market hence more returns to the farmers. However, the quality of leave is affected by pests and diseases, water availability and soil fertility.

In order to improve the growth and production of indigenous vegetables by small-holder farmers, there is need to educate farmers on various agronomic practices such as crop rotation, use of organic fertilizers and certified seeds. Contract farming should also be encouraged because the contracting companies provide experts who guide the farmers on these practices. In addition, policies that can assist in reducing the cost of production to farmers should be established and implemented. These include creation of irrigation schemes for cultivation of indigenous vegetables. Furthermore, researchers should carry out research to come up with high yielding variety of indigenous vegetables which will have a high output even if the land is reduced. They should also come up with biological methods of controlling pests and diseases rather than using pesticides and herbicides which are expensive and may harm human health.

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