SMALLHOLDER FARMERS' ACCESS TO MARKETS: CASE OF INDIGENOUS VEGETABLES IN ZAMBIA

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BY

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ABBREVIATIONS

BCN	Biodiversity Community Networks
FAO	Food and Agriculture Organization of the United Nations
GAP	Good Agricultural Practices
ICART	Implementation and Coordination of Agricultural Research and Training
IFA	International Fertilizer Industry Association
ILV	Indigenous Leafy Vegetables
MAFF	Ministry of Agriculture, Food and Fisheries
NAP	National Agricultural Policy
SADC	Southern African Development Countries
SIWUP	Smallholder Irrigation and Water Use Program
SPSS	Statistical Package for Social Sciences
STATA	Statistical Analysis

ABSTRACT

SMALLHOLDER FARMER ACCESS TO MARKETS: CASE OF INDIGENOUS VEGETABLES IN ZAMBIA

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There appears to be little empirical evidence to support the claims that indigenous vegetables are the least produced and marketed vegetables in Zambia. Hence the main objective of this study was to determine the production level of indigenous vegetables among smallholder farmers. The study also determined the access of indigenous vegetable farmers to markets as well as establish factors that affect the marketing of indigenous vegetables in Zambia. Secondary data collected by Food Security and Research Programme (FSRP) was used for the study from which 4,087 respondents who produced vegetables were selected from a total sample of 8,094 respondents in Zambia.

Results show that some of the commonly produced and marketed indigenous vegetables in Zambia include: Beans leaves (*Vigna spp*), Sweet potato leaves (*Ipomeas spp*), Pumpkin leaves (*Cucurbita spp*), Cassava leaves (*Manihot esculenta*) and African eggplant (*Macrocarpon spp*). Most farmers also produced exotic vegetables such as Cabbage, rape and Chinese cabbage. The average quantity of indigenous vegetables that was produced among the respondents was 98Kg, with Pumpkin leaves having the highest average quantity of 162Kg in Eastern Province. About 4.2 percent of farmers sold their indigenous vegetables. Out of these who sold their vegetables, 66 percent sold to open markets, 22.5 percent sold to traders, while 11.5 percent sold to other households. The Probit model used in the analysis, established several factors that affect the probability of marketing the vegetables. The factors that were established varied depending on the type of vegetable. In the case of bean leaves, education ($p = 0.0140$), household size ($p = 0.0058$) and production assets ($p = 0.0082$) were statistically significant. In the case of African eggplant, age of the farmer ($p = 0.0183$) was statistically significant and in the case of sweet potatoes, gender ($p = 0.0524$) was statistically significant. With regards to gender, more women were involved in indigenous vegetable production and marketing. Men were only involved when the activity became formal and highly rewarding. In general the above results from the Probit model imply that a unit increase in any of the statistically significant variables, increases the probability of marketing the indigenous vegetables.

Therefore, there is need for more extension work to be done on indigenous vegetable production as well as improve the infrastructure in the country to encourage their marketing. Extension should target female as well as male farmers in order to encourage or promote to production and marketing indigenous vegetable. This will eventually to increase productivity and contribute to poverty reduction among smallholder farmers in Zambia.

CHAPTER ONE
INTRODUCTION

1.1 Introduction

Vegetable production is an important livelihood activity for many smallholder farmers in Zambia. The country's sub-tropical climate permits production of a wide variety of vegetable species throughout the year. Producing vegetables has many advantages. A well planned vegetable production system can significantly contribute to ensuring household food security for the farm family. As a rich source of protein, vitamins and minerals, vegetables are paramount in ensuring better health especially for low income groups who rely on them for relish. When produced timely, vegetables can provide a reliable and regular source of income to the grower. Due to the often low initial investment requirement, small-scale vegetable production and marketing are important employment creators for disadvantaged groups in society, particularly youth and women.

1.2 Background

Indigenous vegetables are known for their importance in providing nutritious food both in rural and urban areas. They play a more important role in poverty eradication, food and nutritional insecurity which are still major challenges in Zambia. Some of them have been attributed with having medicinal value properties and are grown for home consumption. Apart from that, they also encourage diversification as farmers will venture in different farm enterprises. The indigenous vegetables play a very significant role in income generation and subsistence especially with the advent of well organised and high value markets such as open markets, supermarkets and processors like Sylva catering. These markets provide a lucrative market for the farmer's product at premium prices with profits.

Indigenous Leafy Vegetables (ILVs) can be defined as "Plants that are native or whose leaves have been used for long time and hence become part of the culture & tradition of a community" (Maundu, 1997). These vegetables include but are not limited to Amaranthus (*Amaranthus spp*), Cowpea leaves (*Vigna spp*), Nightshade (*Solanum Spp*), Spider plants (*cleome spp*), Sweet

potato leaves (*Ipomeas spp*), Pumpkin leaves (*Cucurbita spp*), Cassava leaves (*Manihot esculenta*), African eggplant (*Macrocarpon spp*). They have been targeted because they are highly dominated by small-scale farmers and have low production costs; therefore it gives us good reason to determine their production amd marketing extent as well as identify the factors that affect their marketing.

According to FAO (1988), indigenous vegetables are all categories of plants whose leaves, fruits or roots acceptable and used as vegetables by rural and urban communities through custom, habit and tradition. Before the introduction of exotic species, they were widely consumed, particularly during famines or natural disasters. While most of them were gathered when in season or were grown in home gardens as intercrops with staples, they may find their way to urban markets. However majority of these vegetables are considered as underutilized and accounts of those utilized in Africa have been given by, Okigbo (1977), Okigbo (1990), FAO (1988) and Van Sloten (1984). Traditional or local vegetables include many species which are wild, semi-cultivated or are protected in some way. They may also include species mainly cultivated for their pods, fruits, roots or tubers, but whose leaves are sometimes consumed as a vegetable. The majority of rural people in Zambia rely on traditional vegetables for their relish and were used by 52-95% of the respondents in a survey.(Ogle et al. 1990). The diversity in traditional vegetables offers variety in family diet and helps ensure household food security. More than 175 different species have been documented as local vegetables in Zambia (Johansson, 1989; Ogle et al., 1990).

Indigenous vegetables have a low production cost and can be produced on large scales with low costs and over a short period of time. Costs incurred in producing these vegetables are less than it would cost to produce other exotic vegetables. For example, it only costs $34.53 to produce 170Kg of Amaranthus on a 200m^2 piece of land and earn a profit of $33.33 and sales unit cost of $0.40. On the another hand, it costs $37.52 to produce 250Kg of Spider plant on a 200m piece of land and earn a profit of $37.33 at a sales unit of $0.30 (SADC-ICART, 2009). Despite this tremendous difference in the gross margins in production of indigenous vegetables, there are more exotic vegetables on the Zambian market than the indigenous vegetables.

The Market potential of indigenous leafy vegetables on the other hand is very large, but has not been exploited. The SADC-ICART Project report for 2009 reported that there had been an increase in the consumption of ILVs, which had raised demand in the markets, but, the supply of ILVs in the market had not been exploited due to lack of knowledge on marketing of ILVs. It also reported the risk of losing ILVs in Tanzania, Zambia and Botswana due to farmers replacing them with improved varieties, lack of seed and information about their performance, input requirements and marketing. However, the agricultural reforms' main thrust has involved the decontrol of agricultural prices and the liberalisation of crop marketing. The agricultural policy emphasized government withdrawal from direct involvement in agricultural marketing and input supply, freeing prices, removing subsidies, inputs and machinery and removal of constraints and distortions to international trade in farm products (Haantuba, 2003). The study however, focused on the production level of indigenous vegetables and the access of the smallholder indigenous vegetable farmer to markets as well as factors that affect their ability to market these vegetables.

1.3 Problem Statement

Indigenous leafy vegetables are highly nutritious vegetables that are being encouraged for consumption especially by people seeking medical attention. People suffering from diseases such as high blood pressure, HIV/AIDS, cancer and hypertension have been advised to consume ILVs because of their medicinal value (Lyatuu et al., 2009). The vegetables have a high production and marketing potential and have the ability to increase the income and livelihood of the farmers (ICART, 2007). Market potential of indigenous leafy vegetables in Zambia is very large and has not been exploited (SADC, 2009). However their production has been reducing over time and their appearance on the market displays has been reducing. According to Ngugi, (2006) indigenous vegetables are considered as minor, and do not feature significantly in the research agendas of international or local organization, that have tended to focus on improved exotic varieties. Local varieties have been replaced by improved or exotic varieties and species.

Over the years, farming for crop production in Zambia has been biased towards maize production. This emphasis led to the neglect of other traditional crops important for food security (BCN, 2006). The findings of Ogle *et al.* (1990) on the low utilization of African Leafy

Vegetables and associated underutilized crops and plants in Zambia underscore the importance of these species in the livelihoods, food security, nutrition and health, and household incomes of the Zambian majority. There are over 1.4 million small scale farmers in Zambia and they are the leading producers of fresh vegetables (NAP, 2004). Despite the large number of small scale farmers in the country and the low production costs that the indigenous vegetables have, the majority of the small-scale farmers are not able to access markets especially emerging markets such as supermarkets or processing firms (Varley and Echessah, 2007). Most of the studies have highlighted the potential of the indigenous vegetables and that there production has been decreasing over the years. However, there is little empirical evidence to support the claims of deterioration in production and marketing as well as the factor that affect the probability of producing and marketing indigenous vegetables in Zambia.

1.4 Objectives

1.4.1 General Objective

The main objective of the study was to determine the production level of indigenous vegetables and the access of smallholder indigenous vegetable farmers to markets in Zambia.

1.4.2 Specific Objectives

- To determine the production level of indigenous vegetables in Zambia.
- To determine the number of farmers marketing indigenous vegetables in Zambia.
- To establish the factors that affects the marketing of indigenous vegetables in Zambia.

1.5 Rationale

Participation of small-scale farmers in production and marketing of indigenous vegetables to local markets and supermarkets, increases the competition among indigenous vegetable farmers and encourages the GAP (Good Agricultural Practices) concept that has evolved recently to

balance food production, security, safety and quality (Haantuba, 2003). Knowing the production and marketing levels of the indigenous vegetables in Zambia will improve on information availability as well as bring to light the level of indigenous vegetable production and market participation of smallholder farmers in Zambia. This will help in the production decisions to be made as well as encourage the farmers to diversify into these vegetables. Indigenous vegetables have not featured significantly in the research agendas of many organizations that have often tended to focus on improved exotic varieties. Local varieties had been replaced by improved or exotic varieties and species. However, producing more exotic food crops by themselves is not a panacea to malnutrition problems in Africa. The quality of food and its nutrient content is very crucial. Through greater production and consumption of indigenous vegetables, we can eliminate malnutrition and promote healthy diets in Africa (Ngugi, 2006). Therefore, the significance of this study was to add to the knowledge of farmers and stakeholders on producing and improving the accessibility of Indigenous Leafy Vegetable producers to markets considering the fact that they are cost effective and highly profitable to produce and market.

1.6 Organization of Study

This report begins with chapter one which highlights the introduction and background information about the subject. It covers the problem statement, objectives, scope of study, and rationale of the study. Chapter two focuses on literature review in which the meaning and scope of indigenous vegetable marketing is captured, its methods, previous studies done in Zambia and studies done in other areas and the conceptual framework of the study. Chapter three follows and encompasses the research design, description of the data collection procedure, sampling design and data analysis. Chapter four highlights the findings and interpretation of the findings of the study, while chapter five looks at conclusion and recommendations based on the findings of the study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews the scope of the study and past research projects done on indigenous vegetables and market access. This is to gain an in-depth understanding of the problem in question.

2.2 Definition of Key Terms

Marketing

Marketing is the process by which a product or service originates and is then priced, promoted, and distributed to consumers. Marketing functions precede the manufacture of a product. They involve market research and product development, design, and testing. It concentrates primarily on the buyers, or consumers. After determining the customers' needs and desires, marketers develop strategies that are designed to educate customers about a product's most important features, persuade them to buy it, and then to enhance their satisfaction with the purchase. Markets are therefore places that will satisfy the producer's aim of selling their products with premium prices, earn high income and enhance their livelihood.

Small-holder Farmers

These are farmers that have less than 5 hectares of land growing a variety of crops but mostly maize and a few livestock. They dominate the agricultural sector in Zambia. They are about 1.4 million small-scale farmers in Zambia. (NAP, 2004).

Indigenous Vegetables

Plants that are native or whose leaves have been used for long time and hence become part of the culture & tradition of a community" (Maundu, *1997*).

2.3 Factors attributed to decline in production of African Indigenous plants.

Both urban and rural communities have used indigenous vegetables for a long time. Indigenous Leafy vegetables possess several values such as high micronutrient content, medicinal properties, several agronomic advantages e.g. improve soil fertility by fixing nitrogen in the soil (cowpeas), contribute to food and nutrition security and income generation (Onyango, 2007). But there production in Zambia has been reducing over the years.And according to Adebooye (2004), the factors attributed to the erosion of African indigenous plants include:

1. Erosion of culture and breakdown of traditional systems of plant resources management resulting in loss of traditional varieties.
2. The world market has been tailored to focus on only a few crops, which has resulted to the industrial growth globally to be dependent on continued supply of these few crops at the expense of the traditional varieties.
3. Deforestation, salinization, desert encroachment and erosion lead to land degradation with concomitant loss of the plant genetic resources that the land supports.
4. Natural disasters, including droughts, floods and pests and diseases, which have led to widespread losses of plant diversity from both farmers' fields and natural habitants.
5. Climatic changes, which have posed a threat to diversity as many plants, are unable to adapt to changing temperatures and moisture gradients caused by global warming and the associated climate change.
6. Political instability, civil unrest and insurgence that have led to loss of genetic resources in fields as farmers are flee from war torn areas.
7. The research mandates of most institutions focus on the routinely cultivated species at the expense of the indigenous species. This has resulted in the continued and ever- increasing relevance that the routinely cultivated species are enjoying.
8. African governments are not making adequate investment in the area of conservation of their indigenous heritage.
9. The ever-increasing population, greater competition for natural resources and some interplay of natural resources.

In terms of marketing, Indigenous leafy vegetables (ILVs) marketing has characterized by inadequate government intervention. And some of the factors that have contributed to poor marketing have been; Lack of reliable market information to both farmers and market advisory service providers, Lack of mechanism to set price. ILVs are sold by farmers mostly on the basis of "cost of living" rather than considering the cost of production, supply and demand conditions. High perishability of ILVs poses major challenges in distribution and marketing. ILVs are mainly abundant during the rainy season. However, poor roads, which are in accessible during the rain seasons hinders timely transportation of ILVs to the market. Low level of ILVs productivity is partly due to inadequate investment in business and insufficient seed production and supply. Inadequate market linkages and handling (sorting, grading and packaging) at the farm gate or village level; as a result of which some vegetables are lost before reaching the market (ICART, 2007).

2.4 Past studies done in Zambia on Indigenous Vegetable Production and Market access.

Several studies have been done on market access for smallholder farmers and the studies have focused on understanding the various ways that will introduce small-scale farmers to markets. Most studies reviewed recommended having farmer organization as the best remedy for increased production and marketing while others gave different remedies. However studies on the production levels have concentrated on the profits obtained from production of the indigenous vegetables.

A case study carried out by the IPGRI (2006), program among three communities of Hoffmeyer, Subcentre and Chikumbi in Nyimba, Siavonga and Chibombo districts determined the priority indigenous vegetables grown, produced and marketed through household survey. The results indicated that most households in the target communities, cultivated both exotic and indigenous vegetables. Across the communities, 33% cultivated indigenous vegetables and 4% cultivated exotic vegetables and 63% cultivated both. This therefore concluded that cultivation of ILV is more common in the surveyed communities making them readily available for marketing. Target communities showed that Subcentre had the highest number of households cultivating only ILV as 42%, followed by Chikumbi with 27%. In Hoffmeyer community 12% of households

cultivated exotic vegetables. About 57% considered ILV as semi-cultivated while 42.5% considered them as cultivated crops. Generally, more land was allocated to ILV than to exotic vegetables.

Considering the aspect of marketing, especially to well developed markets, Hantuba (2003), analyzed the status of supermarket in rural markets and then associated linkages between smallholder farm producers in Zambia. The paper explored the procurement requirements and practices of these supermarkets chains to determine the nature of opportunities or constraints they pose to smallholder farmers in rural areas. The study highlighted that, when markets are developed, they can work for the smallholder farmers. Hence, when market opportunities are available farmers including smallholders adjust their production patterns to tap the market opportunity. But in order to make the trade linkages more effective, farmer's capacity to negotiate, understand contract terms and take remedial measures should be improved. Farmers should for instance compel a contracted party to order supplies from outside when their contracted produce is ready for marketing. This will provide them with more guaranteed markets.

A study by Neven et al, (2006), focused on milk production and marketing in the Southern Province of Zambia. And among the factors that were statistically significant in affecting the probability of marketing included; distance from the farm to the market or milk collection centre, income level, that is; farmers that have a certain income level were more likely to enter a stable marketing channel; ownership of vehicular transport was not necessarily a critical for farmers in modern channel participation but was necessary for farmers in the rural areas.

According to Fresh-mark, (2010), Shoprite Supermarket's vegetable intermediary that sources 80 to 95% of its fresh vegetables from local farmers, there are only 6 small-scale farmers supplying them with indigenous vegetables out of the 150 farmers supplying them with vegetables and the amount supplied had only been 30,278 x 500g of Amaranthus and 14,613 x 700g of African Egg plants (Impawn) from 2004 to early 2010. Generally production and marketing of indigenous vegetables in Zambia has been low.

2.5 Studies done in other Countries on Indigenous Vegetables and Farmer's access to Markets.

Some studies have been done by some researchers in African countries on indigenous vegetables and among them was a study done by Ngugi et al., (2006) which identified how small-scale indigenous vegetable farmers could better be integrated in the emerging and structured markets such as supermarkets. The results of the study revealed that, adhering to private grades and standard demanded by markets as well as making constant deliveries are the key requirements if farmers are to continue supplying the markets. These requirements can only be met if farmers organize themselves in groups in order to have a constant supply of the vegetables throughout. The other strategy was to get connected to some support system such as a development agency or farmer organization that oversees the whole process. Aside all, there was also need to have risk management systems by being well prepared and flexible in supplying other outlets such as wet markets and institutions such as schools, hospitals and hotel.

Another case study was done by Makoka (2009) in Malawi and he took the value chain approach in order to analyze the alternative marketing channels available to the producer. The study was focused on improving the performance of the small farmers' by increasing their production and income from pigeon pea. The results of the study explained that, marketing challenges could be overcome by market institutional innovations, as they will enhance chain coordination. And in the context of poor information, innovations will not only increase efficiency but also enable the realization of potential economies of scale and reduce marketing risk and costs. Innovation will lower transaction costs and foster transparency in market organizations and coordination through providing a facility for bulking, implementation of grades and standards required by the high value markets. The results obtained from the studies reviewed in literature can apply to our study of determining strategies for market access. Farmers could organize themselves in groups and increase on the consistency in supplying the vegetables throughout the year.

However these studies did not go further to look at the total number of farmers producing and marketing indigenous vegetables in the case of Zambia as well as highlight the factor that affect

the probability of marketing the vegetables. Furthermore, the studies done in Zambia did not focus on national wide scenario but was only done certain areas.

2.6 Conceptual Framework

For this research, due to modernization of markets and improved vegetable production programs, we will model the farmer's decision on whether or not to produce and market indigenous vegetables as a standard static adoption decision. This is supported by the input demand function as derived from the farmer's profit function; (Sadoulet and de Janvry, 1995):

$$\text{Market choice} = f(p, r, \sigma, k, z),$$

where p, r, σ, k and z represent output prices, input prices, risk factors, fixed capital and shifters respectively. We hypothesize that there exists a capital vector K* to enter indigenous vegetable production. Farmers with a capital vector $K>K^*$ are expected to enter the indigenous vegetable production, if the incentives such as market reliability are there, while farmers with $K<K^*$ are excluded from the indigenous vegetable production. Group formation and development assistance programs may lower K*, that is, reduce transaction costs and facilitate access to new technologies.

We will also model the factors that affect the marketing of the indigenous vegetables that is whether or not to sell to markets, or consume or farm gate sells, and the effect of this on the overall improvement in the farmer's living standards. Our hypothesis is that the relationship is positive for some factors such as production of indigenous vegetables and negatives for others such as distance.

2.7 Econometric Analysis

For the analysis we used a regression model to assess how farm characteristics determine the participation of the farmer in the indigenous vegetable marketing (Y). Since negative dependent

variables are not possible and assuming non-linear effects of the explanatory variables, we modeled this marketing decision as a Probit model. The model takes on the following form:

$$\text{Prob}\,(Y=1|X) = G\,(\beta o + \beta x),$$

where G is the standard normal cumulative distribution function and where X is a vector consisting of a selection of variables from the five categories of explanatory variables for standard adoption models: prices of inputs and outputs, risk factors, quasi-fixed capital and shift factors (such as location or distance). Prices of inputs and outputs were not directly included as they are implicit in the channel choice and further determined by the size and location of the farm. It was hypothesized that a location closer to the market or some vehicular transport positively affected marketing of indigenous vegetables. The risk factor and fixed capital explanatory variables included here captured risk-sensitivity (size of the farmland), access to financial capital, human capital (age, education, experience, gender, and household size) and physical capital (presence of a vehicle). Each of these explanatory variables is hypothesized to ceteris paribus increase the probability of selling indigenous vegetables to well recognized markets. With regard to gender it is hypothesized that women are more likely to enter the indigenous vegetable market because they are assumed to have better access to the required production factors and men tend to get more involved when the transactions become more formal, sizeable and rewarding (Dolan 2001).

We can therefore state that the implementation model has the following determinant variables based on the above, the (X) variables are:

(a) The age of the head of the household (AGE);

(b) The gender of the head of the household (GENDER);

(c) The number of years of schooling of the head of the farm (EDUCN);

(d) Type of indigenous vegetable produced (TYP_VEGE)

(e) The size of the household (HH_SIZE08);

(f) The distance from the farm to the market (D_MKT);

(g) The presence of equipment/assets (VEHICLE);

(h) The availability of credit (CREDIT).

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methods used in order to achieve the stated objectives. It gives the target population, sample size and method of collecting and analyzing the data.The study was a quantitative study as it intended to determine the level of production and the access of indigenous vegetables farmers to markets. The research was non experimental as it was conducted in a natural and uncontrolled setting of producers.

3.2 Data Sources

The data used in the report was largely secondary. The secondary data was obtained from FSRP (Food Security and Research Project)/CSO (Central Statistics Office) supplemental surveys. The data was collected using the CSO post harvest questionnaire and the survey was conducted in all the 9 provinces of Zambia that is, Lapel, and Copper/belt, central, North Western, Western, Eastern, Southern, Northern and Lusaka provinces. It targeted a sample of farmers from each of the provinces in Zambia.

3.3 Sample used

A sample of 4087 farm households was selected from the total sample of respondents involved in the survey. The data was collected by FSRP and the sampling method used in collecting data was a probability design particularly simple random sampling as each household had an equal and non-zero chance of being selected. A farm household was used as a sampling unit.

3.4 Data Analysis

The data collected was analyzed using the Statistical Program for Social Sciences (SPSS) and STATA. The data was tested for heteroskedasticity, omission of variables, autocorrelation and multicollinearity. Heteroskedasticity test was done to find out if the error terms had equal

variances so as to improve efficiency. Omission of variable test was done to find out if relevant variables were omitted from the model or to find out if the variables included were irrelevant. Autocorrelation test was done to find out if the variables in the model were serially correlated and the multicollinearity test was done to examine if one variable was affected by other variables in the model. The results showed that the model was heteroskedastic and this was corrected for. The other tests did not show any anomalies.

CHAPTER FOUR
STUDY FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the descriptive study findings of the research. It begins with a presentation and discussion of the demographic characteristics of the farmers. The Probit regression estimates with a discussion of the results estimate will be stated later.

4.2 Demographic characteristics

With reference to the data set collected from supplemental surveys carried out by CSO/FSRP/MSU, 82% of the respondents were males while 18% were females. It basically contradicts the hypothesis of having more females in indigenous vegetable production. The reason for having more males dealing with vegetable production could be that vegetable production was more sizable and formal. The age distribution of the respondents on the other hand was normally distributed as can be seen in Table 1 below.

Table 1: Distribution of Farmers by Age

Age Category	Number	Percent
0 - 20	14	.3
21 – 30	361	8.8
31 – 40	1122	27.5
41 – 50	1096	26.8
51 <	1494	36.6
Total	4087	100.0

Source: 2008 CSO/FSRP/MSU supplemental surveys. Computed by author

The age distribution of farmers that was common among the respondents was that of the farmers above the age of 50 years, followed by those between the ages of 31-40 years of age. Only 0.3% of the respondents were below 20 years old. However the average age was 47 years with the maximum age of 103 and a minimum age of 16 years. Considering the fact that the minimum age of the respondent was 16 years one would expect that most respondents would have gone beyond grade nine in their education level, but this was not the case as can be seen in Table 2 below.

Table 2: Highest years of Education attained in Households in relation to Gender

Gender of household head	No Formal Education	Primary	Junior Secondary	Senior Secondary	College/ University	Missing	Total
Male	50	1675	891	598	136	1	3351
%	1.49	49.99	26.59	17.85	4.06	0.03	100
Female	61	410	144	103	18	0	736
%	8.29	55.71	19.57	13.99	2.45	0.00	100
Total	111	2085	1035	701	154	1	4087
%	2.72	51.02	25.32	17.15	3.77	0.02	100

Source: 2008 CSO/FSRP/MSU supplemental surveys, Computed by author.

The education level of most Zambian farmers was very low as seen above. There were more illiterate female household heads compared to the males from the respondents and the majority of the farmers went as far as primary education with more males having attended primary education than the females. Only 4.06% of the males and 2.5% of the females had attended college and/or university education. Considering that the majority of the farmers only achieved primary education that is; 49.99% amongst males and 55.71% amongst the females, could most likely contribute to the low level of vegetable marketing. As most of these farmers tended to produce products which they considered common without putting into consideration the aspect of market competition and the forces of supply and demand on marketing.

4.3 Factors that contribute to Marketing of Farm Products

Rural farmers in Zambia are usually faced with many challenges in production and marketing their farm products. Farmers face challenges in terms of transporting their products to the market, having access to credit, fluctuating product prices and many more. Based on the survey data collected, agricultural credit was available to some and not all farmers. Farmers were usually seeking for credit to complement the low income and capital for farm production. This actually agreed with the hypothesis that low income farmers acquired more credit. However, credit acquisition varies with location. The Eastern Province of Zambia farmers acquire more credit in comparison to the farmers in other provinces and they had the lowest income. Farmers on the Copper-belt on the other hand had the highest income and Northwestern province was the lowest in credit acquisition. Most of the farmers sampled did not have access to credit. Only

14.5% of them were able to get credit from different banks and stakeholders while the 85.5% did not have access to external credit.

Another factor that affects the probability of marketing indigenous vegetables is the distance from the farm to the market. It was hypothesized that the shorter the distance to the market the larger the probability of marketing the vegetables. Based on the survey carried out, majority of the farmers were within the distance of 0 – 10km from the farm to the market. About 87% of the farmers were within this range and 2.7% were in the distance above 40km. But despite this fact most farmers did not sell their indigenous vegetables but sold more of the exotic as will be seen later in the report. However, the average distance computed was 5.38Km with the maximum being 150Km and minimum of 0 as the farmers sold their vegetables on their farms. Table 3 summaries the distances and the number of respondents in each range.

Table 3: Distance from Farm to Market

Distance Km	Number	Percentage
0 – 10km	3559	87.0
11 – 20km	331	8.0
21 – 30km	47	1.1
31 – 40km	36	.9
41 <	110	2.7
Missing	4	.1
Total	4087	100.00

Source: 2008 CSO/FSRP/MSU supplemental surveys, Computed by author.

Markets too contribute to the probability of marketing the vegetables. Most of these vegetables are sold to traders who later sell to the consumers and a little are sold to other households. Most Indigenous vegetables have been left out of the supply chain to supermarkets and other markets. Hence the probability of selling to supermarkets is small as supermarkets are characterized with high grading systems in terms of quality which very few of the small scale can manage to maintain. As can be seen from Table 4, majority of the farmers did not sell their products to trader. Only 22.5% of the respondents were able to sell their vegetables to traders and 11.5% of them sold to other households. 2,697 of the farmers neither sold to traders nor to other households. The farmers that sold to traders were faced with the challenge of pricing their products as they sold to trader because the market was crowded with agents who sold the

products on behalf of the farmers at some commission. This actually reduced on the revenue the farmer obtained from the vegetables sales. From an observation study made at Soweto market, the agents made more money out of selling the farmers products to traders than the farmers actually did. And pricing was usually done by the agents who set a price at which they were assured of getting a high commission.

Table 4: Cross Tabulation of Farmers that Sold through Traders and those that sold to Other Households.

	Sold through traders	
Sold to other households	**No**	**Yes**
No	2,697	918
%	88.5%	22.5%
Yes	472	0
%	11.5%	77.5%
Total/%	**3,169 (100%)**	**918 (100%)**

Source: CSO/FSRP/MSU supplemental survey (2008), Computed by author.

Farmers do not only produce indigenous vegetable but exotic vegetables. Hence the survey went further to look at the quantities of some common exotic vegetables produced and sold at the local markets and these included Cabbage, Rape and Chinese cabbage. The quantities of these vegetables, including those of the indigenous vegetables were computed and are show in Table 5 below.

Table 5: Average Quantities of Exotic and Indigenous vegetables produced in each Province (Kg)

PROV	Cabbage	Rape	Chinese cabbage	Sweet potato leaves	Cassava leaves	Pumpkin leaves	Beans leaves	African eggplant
Central	334	429	52	130	0	12	0	132
Copper belt	554	301	195	0.3	0.10	15	0	25
Eastern	46	75	9	3	1	162	0.5	0.07
Luapula	4	11	8	19	76	6	2	0.06
Lusaka	46	934	64	1.2	0	8	0	26
Northern	90	104	50	0.4	2.3	5	4	12
N/ Western	73	38	13	2.1	23	7	0.1	15
Southern	219	198	15	0.28	0	2	0	2
Western	190	190	57	0	4	0	0	0
Total	**103**	**108**	**27**	**15**	**30**	**42**	**1**	**10**

Source: CSO/FSRP/MSU supplemental survey (2008), Computed by author.

Exotic vegetables were the most produced vegetables in Zambia with a total average of 238Kg compared to an average total of 98Kg of the indigenous vegetables. Pumpkin leaves were the most produced vegetables in eastern province with an average of 162Kg followed by African eggplant and sweet potato leaves in central province with quantities of 132Kg and 130Kg respectively. The other quantities of the other vegetables are shown in the Table 5. The analysis went further to determine the number of farmers that were able to market these vegetables. This was shown in Table 6 below.

From the statistics, the indigenous vegetables were the least sold vegetables in Zambia. Most of the farmers concentrated more on marketing the exotic vegetables such as cabbage (cab), rape (rap) and Chinese cabbage (cc). Selling of indigenous vegetables had been very minimal with the highest number of farmers selling pumpkin leaves in Eastern province.

Table 6: Number of Farmers who sold Exotic and Indigenous Vegetables in each Province.

PROV	Sell Cabbage	Sell Rape	Sell Chinese cabbage	Sell Sweet potato leaves	Sell Cassava leaves	Sell Pumpkin leaves	Sell Beans leaves	Sell African eggplant
Central	34	91	14	9	0	4	0	15
Copper belt	56	101	40	0	0	2	0	13
Eastern	52	192	20	3	0	29	0	2
Luapula	8	31	17	7	14	7	2	7
Lusaka	5	23	3	1	0	1	0	2
Northern	23	64	30	0	0	8	19	4
N/ Western	14	24	11	5	6	5	0	4
Southern	86	265	11	0	0	1	0	5
Western	19	38	9	0	0	0	0	0
Total	**297**	**829**	**155**	**25**	**20**	**57**	**21**	**52**

Source: CSO/FSRP/MSU supplemental survey (2008), computed by author.

A total of 1281 of the household respondents produced and sold the three exotic vegetables considered in the study and these included Cabbage, Rape and Chinese cabbage and only 175 of the household respondents sold the indigenous vegetables considered in the study. Based on the summary statistics, one can be right to say that most of the small scale farmers were into exotic vegetable production and marketing. The reason could be that there has been little extension

work to educate the farmers on the productivity of the indigenous vegetables, their high income levels, low production costs and the high nutritive value that these vegetables have.

4.4 Probit Regression Results.

A Probit regression was used to analyze the data collected for the survey. A Probit model was run for each of the vegetables and tabulated using outreg2 which displays the coefficients, standard error and p-values respectively. Before the model was run for the various vegetables, it was tested for heteroskedasticity, multi-collinearity and missing variables. A Breusch Pagan test was used to test for heteroskedasticity, while the VIF test was used to test for multicollinearity and the Ramsey Reset Test was used to test for model mis-specification (omission of variables). All tests were negative except for the heteroskedasticity that showed that the model was not homoskedastic and was corrected for.

The model included the following variables: Age, Gender, Educn (Education), hhsize08 (Household size), Credit, Distance, prodasst08 (Production asset) and the production of each of the vegetables with the labels; prodbl (Production of Bean leaves), prodpl (Production of Pumpkin leaves), prodcsl (Production of Cassava leaves), prodspl (Production Sweet potato leaves) and prodimpw (Production of African eggplant). A Probit model was also run for each of the exotic vegetables. This was done to complement the findings through a comparison considering the fact that the world is diverse hence the need to look at those exotic vegetables commonly produced and marketed by the smallholder farmers. These were labels as; prodcc (Production of Chinese cabbage), prodrap (Production of Rape) and prodcab (Production of Cabbage). The exotic and indigenous vegetables were presented in tables using outreg2 as will be seen in Tables 7 and 8. The tables show three values of marginal effect, standard errors and p-values respectively.

Table 7: Regression results of Indigenous Vegetable showing the Coefficients, Standard error and P-values respectively

VARIABLES	Sell African eggplant	Sell Sweet potato leaves	Sell Cassava leaves	Sell Pumpkin leaves	Sell Bean leaves
age	0.000130**	3.92e-05	-1.97e-07	-0.000145	-6.38e-08
	(5.53e-05)	(6.02e-05)	(9.53e-07)	(0.000122)	(4.57e-07)
	0.0183	0.515	0.836	0.235	0.889
gender	-0.00354	0.00391*	7.59e-05**	0.00110	-1.39e-05
	(0.00399)	(0.00202)	(3.66e-05)	(0.00470)	(1.99e-05)
	0.375	0.0524	0.0381	0.815	0.486
educn	2.14e-05	0.000248	-3.39e-06	-0.000260	-6.01e-06**
	(0.000312)	(0.000258)	(5.70e-06)	(0.000515)	(2.45e-06)
	0.945	0.336	0.553	0.614	0.0140
hhsize08	0.000365	-0.000114	8.79e-06	-0.000203	4.83e-06***
	(0.000250)	(0.000326)	(7.45e-06)	(0.000596)	(1.75e-06)
	0.145	0.728	0.238	0.733	0.00582
distance	-6.37e-05	1.70e-05	-5.23e-06**	0.000101	1.04e-06***
	(5.70e-05)	(6.00e-05)	(2.45e-06)	(9.71e-05)	(1.65e-07)
	0.264	0.777	0.0329	0.299	2.74e-10
prodasst08	-2.34e-10	0	8.74e-11**	0	0***
	(1.69e-10)	(6.28e-11)	(0)	(1.41e-10)	(0)
	0.167	0.853	0.0104	0.750	0.00819
prodbl					1.25e-06***
					(4.38e-07)
					0.00426
credit	-0.000750	0.00170		0.00385	
	(0.00279)	(0.00267)		(0.00472)	
	0.788	0.523		0.415	
prodpl				1.67e-05***	
				(5.42e-06)	
				0.00204	
prodcsl			6.89e-09*		
			(3.72e-09)		
			0.0640		
prodspl		2.18e-05***			
		(5.02e-06)			
		1.40e-05			
prodimpw	0.000153***				
	(3.74e-05)				
	4.37e-05				
Observations	4,086	4,086	3,494	4,086	3,494

Note: *=significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level. Source: 2008 CSO/FSRP/MSU supplemental surveys, computed by author.

4.4.1 Determinants of Indigenous Vegetable Marketing by Small-holder Farmers.

Probit regression results highlighted the factors that affected the probability of marketing the indigenous vegetables. The results were tabulated showing the values of the marginal effect, standard errors and the P-values respectively as stated earlier, at three statistical significance levels of 1%, 5% and 10%. Based on Maximum Likelihood Estimation (MLE), the table presented the Probit estimators (β_i) of the model presented in the econometric equation.

From Table 7 it was observed that some of the results were not as hypothesized in some vegetables. Variables that could have a greater effect on marketing the vegetables, such as distance to the market were not statistically significant for vegetables like African eggplant, Sweet potatoes and Pumpkin leaves. This implies that distance to the market was not necessarily critical for marketing for some vegetables. Variables, that were however statistically significant at any one of the significance levels for some vegetables were age, gender, education, household size, distance, production equipment assets and vehicular transport, and the production of the specific vegetables to be marketed. Therefore different vegetable had different factors that determined there marketing and of course production which was common among all the vegetables including the exotic vegetables.

The age variable was statistically significant at 5% in selling of African eggplant showing a positive relationship, while the other variables were not significant. The marginal effect of age was 0.00013 meaning that a year increase in age would increase the probability of marketing African eggplant. Gender, however was significant at 10% in selling sweet potato leaves and at 5% in selling of cassava leaves and their marginal effects were 0.0039 and 0.000075 respectively. Meaning that being female increased the probability of marketing sweet potato leaves by 0.3 percent and cassava leaves by 0.0075 percent.

Education and household size had negative and positive marginal effects respectively, on the marketing of Bean leaves. Education was statistically significant at 5% while household size at 1% and both had a minimal marginal effect. Hence having a large household size increased the probability of marketing while increasing household head's education by one year reduced the

probability of marketing bean leaves by a minimal value of $6.01x10^{-4}$ percent. The reduction could have been due to the famers focusing more on marketing the pulse than the vegetables. Hence education had a negative effect on participation in terms of bean leaves.

Production equipment assets and distance to market were both statistically significant at 5% in marketing cassava leaves and production asset (Vehicular transport) was also statistically significant at 1% in marketing of beans leaves. Both had a positive relationship to marketing. Hence, having production equipment asset increased the probability of marketing both beans and cassava and increasing the distance from the farm to the market by 1Km reduced the probability of marketing cassava leaves. The positive relationship of production equipment assets to marketing the cassava and beans is attributed to the fact that availability of vehicular transport would increase the incentive to market not only the pulse and the tubers but also the vegetables. However most farmers preferred to sell the tuber and the pulse rather than the vegetables as they considered the tubers and pulse to be more profitable to sell considering that they have readily available transport. Vegetables were considered only for consumption purposes.

Production of the different indigenous vegetables increased the probability of marketing them. With every unit increase in the production level of the vegetables, the probability of marketing these vegetables increased by their marginal effect. Credit however, was not statistically significant in selling of any of the vegetables. This showed that most of the indigenous vegetables had low production cost and did not require external sources of income to produce them.

4.4.2 Determinants of Exotic Vegetable Marketing by Small-scale Farmers.

Exotic vegetable are the most marketed vegetables in Zambia but they too have factor that affect the probability of marketing these vegetables. Variables that were statistically significant in the different vegetables at the three significance levels were; age, gender, education, credit, production equipment asset and production of the respective vegetables. These were clearly shown in Table 8.

Table 8: Probit Regression results for Exotic Vegetables showing Coefficients, Standard errors and P-values respectively.

VARIABLES	Sell Cabbage	Sell Rape	Sell Chinese cabbage
age	-0.000691	0.00161***	-0.000141
	-0.000889	-0.00056	-0.000213
	0.437	0.004	0.508
gender	-0.0462	-0.0449**	-0.0123
	-0.0383	-0.0217	-0.00948
	0.228	0.0384	0.196
educn	-0.00302	0.000509	0.00201**
	-0.0041	-0.00246	-0.000848
	0.46	0.836	0.0176
hhsize08	-0.00328	0.00331	0.000437
	-0.00446	-0.0027	-0.00104
	0.463	0.221	0.674
credit	-0.0347	0.0810***	0.00947
	-0.0342	-0.0217	-0.00826
	0.31	0.000186	0.251
distance	-0.000662	-0.000154	0.000131
	-0.00117	-0.000636	-0.000216
	0.57	0.809	0.545
prodasst08	1.01E-09	1.24e-09**	-3.25E-10
	-7.19E-10	-6.09E-10	-3.63E-10
	0.16	0.041	0.371
prodcc			0.000564***
			-3.10E-05
			0
prodrap		0.00108***	
		-3.78E-05	
		0	
prodcab	0.00232***		
	-0.000126		
	0		
Observations	4,086	4,086	4,086

Note: *=significant at the 10% level, ** = significant at the 5% level, *** significant at the 1% level. Source: 2008 CSO/FSRP/MSU supplemental survey, computed by author.

The age variable was statistically significant at 1% significance under selling rape and was not significant with the other two crops. This therefore implies that as one gets older, the probability of marketing rape reduced by 0.16 percent. Gender was also statistically significant at 5% in the case of selling rape and had a negative marginal effect. Hence, being female reduced the probability of marketing rape by 4.5 percent.

Education level was statistically significant at 5% in selling of Chinese cabbage. Therefore, the more educated one was, it increased the probability of selling the Chinese cabbage by 0.2 percent. Credit had a positive statistical significance at 1% in rape. Hence having access to credit increased the probability of marketing by 8.1percent. This was because increased credit allowed the farmer to increase their production and eventually increase their probability of marketing. Production equipment asset too was statistically significant at 5% significance level. Hence having production equipment increased the probability of marketing rape by a minimal value. Production of the various vegetables, that is Cabbage, Rape and Chinese cabbage were statistically significant at 1%. Therefore, increasing production by one unit increased the probability of marketing by 0.2 percent, 0.1 percent and 0.05 percent respectively.

Based on the results some variables were statistically significant for both exotic and indigenous vegetables and these included; age, gender, education, production assets and the production level of the various exotic vegetables. Credit was only statistically significant under selling of Rape an exotic vegetable. This implied that there is need for an external source of income to sustain its production. The other marginal effects for the vegetables have been present in Table 8 above.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter gives the conclusion and recommendation based on the study findings and interpretation.

5.2 Conclusion

Based on the study findings presented above, it was concluded that Indigenous vegetable production and marketing among Zambian small scale farmers was very low. This actually agreed with the study that was done on indigenous vegetables and stated that indigenous vegetables were going into extinction. The study findings showed that only 175 households produced and marketed indigenous vegetables out of the sample size of 4087 and 1281 of the households produced and marketed all of the three exotic vegetables considered in the study. The remaining 631 respondents included the households that either produced or did not sell or those that did not produce any of the vegetables.

The average quantity of indigenous vegetables that was produced among the respondents was 98Kg with Pumpkin leaves having the highest average quantity of 162Kg in Eastern province, followed by the African egg plant and Sweet potato leaves with quantities of 132Kg and 130Kg in Central province. The total number of farmers that sold their indigenous vegetables was 175 of which 22.5% of the respondents sold to traders while 11.5% sold them to other households and the rest sold to other open markets. However, several factors were identified to be significant in affecting the probability of marketing the indigenous vegetables. The factors that were identified therefore, varied depending on the vegetable in question and they included; age of the farmer ($p = 0.0183$), in selling of African eggplant; gender of household head ($p = 0.0524$) and ($p = 0.0381$) in selling of Sweet Potatoes and Cassava respectively; education ($p = 0.0140$), household size ($p = 0.0058$), distance ($p = 2.74e\text{-}10$) and production assets/vehicular transport ($p = 0.0082$) were statistically significant in selling of Beans leaves. The factors that were common

amongst the vegetables were gender, distance, production assets (vehicular transport) and the production of the vegetables.

The age of the household head for instance only affected the sale of African eggplant. The nature of being either male or female also affected the probability of marketing sweet potato leaves and cassava leaves. Male household heads only got involved in vegetable marketing when marketing became more formal and earned high income. The household heads that were more educated and were into vegetable or produced crops that had vegetables as by-products concentrated more on marketing the main output of the crop such as the pulse (beans) in terms of beans production rather than the vegetables. The household size too affected the marketing of the indigenous vegetables. Large households meant increased labor availability and hence increased production which further gave an incentive to market the indigenous vegetables in order to earn more household income to support the large family. The distance from the farm to the market affected the marketing of the indigenous vegetables. Households that were closer to the market were able to market their vegetables. However, marketing of beans was not affected by the distance; instead increased distance from the farm to the market increased the probability of marketing the vegetables. Northern Province recorded the most sells of beans and marketing was done far from the farm because most of the households in the province were growing beans and probably consuming and marketing more of the bean leaves or did not consider the vegetables. The production of indigenous vegetables is not affected by the access to credit. Credit was not statistically significant in any of the indigenous vegetables. This proved the hypothesis that indigenous vegetable production requires minimum cost to produce and market.

5.3 Recommendation

The recommendations were based on the research findings and it was noted that in order to fulfill the recommendations, there was need for government intervention. Unlike other vegetables indigenous vegetables were not considered in most extension works. Extension had been focusing on cereals and other cash crops; hence more extension work has to be done in order to educate the farmers on growing, preserving and marketing of indigenous vegetables throughout

the country as has been done by Sylva Catering that is educating farmers in indigenous vegetables production, storage and marketing.

The poor road network in our country has had a deteriorating effect on the production and marketing of indigenous vegetables considering the fact that most of these vegetables are grown in the rain season and the roads become deplorable in this season. This has affected the marketing of the vegetables. And so, there is need to improve infrastructure in our country in order to encourage their marketing.

In order to ensure that there is continuous supply of these vegetables on the market; farmers have to work in groups. This reduces on the transportation costs that are usually hiked in the rainy season and will increase the accessibility to new technologies that will increase productivity of these vegetables. This will not only increase access to open markets but also to markets such as supermarkets that are recognized with high grades and standards. They can also form partnership with transporters and share the profits they gain from their vegetable markets and later on purchase their own vehicle and have control over their transport.

Based on the observation study done to complement the research, it was discovered that pricing mechanism of vegetables is very poor. Hence there is need to develop some pricing mechanism in order to reduce the exploitation of the farmer by the trade agents that market the farmer's products at the market

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