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Research Article

Contribution of Selected Indigenous Vegetables to Household Income and Food Availability in Wedza District of Zimbabwe

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Abstract

The dependency of African rural households on indigenous vegetables for sustenance has been widely acknowledged in literature. Surprisingly, the production, commercialization and consumption of these vegetables have been historically overlooked by many stakeholders including rural households. Their utilization has mainly been acknowledged as a temporary stop gap measure in times of food inadequacy. As such, this empirical study based in Wedza district seeks to analyse the contribution of selected indigenous vegetables to household income and food availability. The objectives of the study were to evaluate the socio-economic factors that influence intensity of consumption of indigenous vegetables during and after the growing season and to determine the contribution of spider flower, pumpkin leaves and cowpea leaves to household income and food availability. Primary and secondary data were used for the study. The former were collected from 54 farmers using the questionnaire as the main tool. Triangulation was done using Focus Group Discussions and Observations. The latter were collected from extension officers' records. The logit regression model, gross margin and ratio analysis were used to analyse the data. Results revealed that gender and income had a significant ($p < 0.05$) influence on intensity of consumption during the growing season only. Age, education level and market options had a significant ($p < 0.05$) influence during and after growing seasons. Hence, socio- economic factors influence intensity consumption of indigenous vegetables during and after the growing season. Results further show that 3% of the total household income was accounted for by the selected indigenous vegetables. The study cautiously concludes that indigenous vegetables can be a possible source of reliable income. It is recommended that farmers integrate modern technologies and indigenous knowledge to improve production and consumption of indigenous vegetables. Farmer and private sector driven awareness campaigns on the benefits and business potential of indigenous vegetables is essential. The government through the extension officers should spread their services along indigenous vegetables value chain to improve production, processing, post-harvest handling and marketing. There is hope that these efforts should facilitate commercialization of indigenous vegetables for increasing household income and food availability.

Introduction

Background

Indigenous vegetables have their natural habitat in Sub Saharan Africa [1]. Some were introduced over a century ago and due to long and persistent use, have become part of the food culture in Zimbabwe and Africa as a whole [2]. [3] described them as plants whose leaves, roots, or fruits are acceptable and useable as consumable vegetables or for medicinal purposes. They provide nutritional elements such as proteins, Vitamin A, C and iron which are essential for human growth and development [1,4-6]. Indigenous vegetables are characterized by a fast growth rate and are tolerance to adverse ecological conditions. They can also play part as drought mitigation measure in promoting availability of vegetables since they are drought tolerant.

Available data on the more commonly consumed varieties point out that indigenous vegetables contain antioxidants that can also provide significant amounts of beta carotene, iron, calcium and zinc to daily diets [6]. Their promotion interventions should consider the process from advisory, seed propagation, nurseries, production to consumption. Clear, information on production, processing, distribution and marketing, preparation and consumption of vegetable species are vital. So there is need for training and advisory information.

Production and consumption of indigenous vegetables enhance the Sustainable Development Goals (SDGs) such as ending hunger, achieve food security, improved nutrition, and promote sustainable agriculture. Their utilization protects, restore sustainable use of terrestrial ecosystems, sustainably, manage forest, combat desertification, and halt biodiversity loss therefore reverse land degradation [7]. These qualities make them a potentially affordable source of food, income and essential nutrients for most of the population in both rural and urban areas [8].

The dependency of many African rural households on indigenous vegetables for sustenance has been widely acknowledged and Zimbabwe is no exception [1]. Historically, rural households in most Less Developed Countries (LDCs) depended on indigenous vegetables as an integral part of their diet. Presently, women are involved in gathering of these vegetables from the wild or in the fields. Notably, this has contributed to food availability and an income safety net for the rural population in Africa. However, consumption patterns and commercialization of indigenous vegetables has in the past been overlooked by extension agencies, educationists and the civil society due to misconception that they are poor man's crop [9].

There is a growing awareness and increasing emphasis on the need to unlock contribution potential of indigenous vegetables to the livelihood of African societies [3,10]. Despite this, there is also consensus by [11,12] that there is little information available on specific geographical communities where commercialization can be triggered and scaled out.

Their importance in the rural household structures, actual consumption patterns, contribution to household income and food availability in Wedza district of Mashonaland East province in Zimbabwe is not well documented. Indigenous vegetables are increasingly recognized as possible contributors of both micronutrients and bio-active compounds to the diets of populations in the world [13].

The scale of production cannot be theoretically or practically spelt out as compared to other exotic vegetable crops. However, seed multiplication, propagation and germ-plasm conservation can be a possible gateway to high production levels. In addition, advocating for training on agronomy, value addition, processing and product development on the indigenous vegetables can be another road map to build confidence to indigenous vegetables producers. This study aims to fill this gap by analyzing the contribution of indigenous vegetables to household income and food availability in Wedza rural community of Mashonaland East Province of Zimbabwe. Specific attention is made to three selected indigenous vegetables namely pumpkin leaves, cowpea leaves and spider flower.

Problem statement

Rural households are associated with low incomes, limited employment opportunities and food insecurities. A number of researches have been carried out on indigenous vegetables in Zimbab. Muchuweti., *et al.* 2006, [10] However, they have only focused on the multiple uses, occurrence, identification, with little analysis of their economic contribution to household income and food availability. The commercialization of indigenous vegetables has been stalled by inadequate context specific information about their potential contribution to income stability and food availability. The pattern has been that most households see the trade of indigenous vegetables as only a temporary activity whilst they seek or hope for permanent formal employment or other income sources. The study seeks to highlight the potential income and food availability benefits of pumpkin leaves, cowpea leaves and spider weed.

Justification

Initiatives for indigenous vegetables research in the farming systems could enhance new business and market opportunities as well as enhance farm income for resource poor households. This in turn helps in poverty reduction which is one of the action points for the country's development plan. Information generated can therefore be used in the formulation and implementation of relevant strategies to commercialise the vegetables. Local farmers will self-reflect and be incentivised efforts towards cultivation and consumption of indigenous vegetables. Understanding the vegetables' contribution towards rural households can also create awareness and securing effective participation by citizens, thus encouraging them to play an active role in devising of solutions that can be applied to the problems facing agro biodiversity and rural livelihood diversification.

Main Objective

The purpose of the study was to analyse the contribution of selected indigenous vegetables to household income and food availability in rural households during the main growing season and outside the season.

Specific objectives

1. To evaluate social and economic factors that influence the intensity consumption of spider flower, pumpkin leaves and cowpea leaves.
2. To determine the contribution of spider flower, pumpkin leaves and cowpea leaves to household income and food availability.

Research questions

1. What are the socio-economic factors that influence intensity of indigenous vegetables consumption by rural households?
2. Do indigenous vegetables contribute significantly to household income and food availability?

Assumptions

1. Socio-economic factors influence the intensity of consuming indigenous vegetables by rural households.
2. Indigenous vegetables significantly contribute to household income and food availability.

Limitations

Households had challenges in recalling past production and income data, so the available data relied on estimates. They were also not willing to share some of their production data such that they sometimes reported no sales on indigenous vegetables and livestock. This problem was addressed by fully explaining to the household samples the purpose of the study and assuring confidentiality by respecting respondents' privacy rights.

Delimitations

The study was limited to selected respondents from Wedza district. Focus was also on three selected indigenous vegetables namely pumpkin leaves, cowpea leaves and spider weed.

Literature Review

Introduction

The chapter defines and highlights an overview of indigenous vegetables. It further explores the domestication and roles of indigenous vegetables. Finally the chapter reviews a number of empirical studies that have been done to assess the conceptual model linking production and availability of indigenous vegetables contributing to household income and food availability.

An overview of indigenous vegetables

Indigenous vegetables are those which have their natural habitat in Sub Saharan Africa [1]. Some were introduced over a century ago and due to long and persistent use, have become part of the food culture in Zimbabwe [11]. [3] described them as plants whose leaves, roots, or fruits are acceptable and useable as consumable vegetables or medicinal purposes. Hence, they have been widely defined as vegetables that have their natural habitat in a particular country or ones which were introduced from other regions. [14] noted that indigenous vegetables can be cultivated, semi-cultivated or wild. These can be vegetables whose leaves and fruits are traditionally consumed by the majority of the local populace. In Zimbabwe, examples of these vegetables include black jack, gallant soldier, pig weed, pumpkin leaves, spider weed, and cow pea to mention a few.

Indigenous vegetables are branded as development opportunity crops [15]. They are categorized as minor crops that are already cultivated, but are underutilized regionally or globally given their current relatively low global production and market value [9]. Highlighted that some of the indigenous vegetables species are widely distributed globally but are restricted to a more local production and consumption system. Many of these indigenous vegetables are grown for food, fibre, fodder, oil and as sources of traditional medicine. They therefore play a major role in the subsistence of local communities. Frequently, indigenous vegetables are of special social, cultural and medicinal value. With good adaptation to often marginal lands, they constitute an important part of the local diet of communities providing valuable nutritional components which are often lacking in most staple crops [3,10].

As a result of the Green Revolution, many of those local and indigenous vegetables species and varieties have been replaced by high-yielding exotic cultivars developed by modern breeding programs [16]. He further observed that indigenous vegetables typically do not meet modern standards for uniformity and other characteristics as they have been neglected by breeders from the private and public sectors. In Zimbabwe, this has been shown by extension agencies and educational curricula promoting breeding and cash cropping of exotic vegetables in farming communities. In this regard, indigenous vegetables tend to be less competitive in the market place compared to the more commercial exotic cultivars.

Naturally Zimbabwe has been endowed with a variety of indigenous vegetables that can proliferate diversity to rural households and income sources [11]. Throughout history, these vegetables have been playing a significant role in risk management strategies for rural households. They grow under various conditions such as road side, disturbed agricultural lands, and backyards with minimum to no management. Their food availability potential varies with region, socio economic factors and seasons. [17] observed that many African households have been mainly growing indigenous vegetables in the rural set up chiefly for feeding the family. However [10] reported that in Zimbabwe farmers produce for subsistence and informally trade the within neighborhoods to generate income for the household. Interestingly, there is evidence by

[10,18] that indigenous vegetables have been long commercialized in North Africa. In Southern Africa, Zambia and South Africa have recently established indigenous vegetable seed systems.

This shows that there is a growing interest and awareness throughout the region about the commercial potential of indigenous vegetables.

Domestication of indigenous vegetables

According to this study, domestication is a process of adapting wild plants for human use. Domesticated species are raised for food, medicine and other uses hence they are given maximum care to give satisfying output. Although indigenous vegetables have been utilized for centuries [1], they have not been widely domesticated and are not cultivated on a large scale especially in Zimbabwe [3]. Indigenous vegetables do well in most parts of Zimbabwe and are therefore inexpensive to produce [2]. Domestication varies with agro-ecological regions and this has led to decline in consumption of indigenous vegetables by younger generations. Also there is a current trend of utilization which relies on harvesting without cultivation for most indigenous vegetable species [2]. This is regarded as exploitative and therefore unsustainable in view of the increasing population and could lead to genetic erosion and loss of biodiversity as noted by [19]. A larger number of indigenous vegetables including black jack, gallant soldier and Jew mallow are gathered from the bush during the rainy season. In Zimbabwe few indigenous vegetables species are domesticated with cow pea and pumpkin leaves which are intercropped with sole crops such as maize and partially grown as sole crops on small pieces of lands.

Most of indigenous vegetables are intercropped without a uniform in row and inter row spacing which makes it difficult to calculate plant population. Few households have shown commitment towards growing cowpea as a sole crop. Spider weed is hardly planted but is grown as volunteer crop which is later maintained during the growing season hence multiply on its own through shuttering for the coming season. Households in Zimbabwe grow indigenous vegetables under the traditional systems of agriculture where they appear in crop mixes and no significant inputs are applied. Furthermore, size of land being allocated for indigenous vegetables very small [3].

However, some countries in Africa have become successful in domestication of the indigenous vegetables. [18] indicated that, indigenous vegetables have since become a viable business in Kenya with rural and urban households committing to their production and marketing. However, farmers in rural Zimbabwe are not into intensive domestication of these vegetables. This has been highlighted by availability of indigenous vegetables only in the rain season and become scarce during the off season [3]. Furthermore the policy framework to support domestication and production is still very weak [11]. The current agricultural policy framework does not intensively support the production of indigenous vegetables. Table 1 shows some of the dominant categories of indigenous vegetables.

Category	Origin	Examples of vegetables	Utilization	Cropping system
Cultivated indigenous vegetable	Adopted from other countries have become indigenous due to long use.	a) *Brassica juncea*, Indian mustard. b) *Brassica carinata*, Ethiopian mustard c) *Curcubita maxim,* Pumpkin leaves d) *Abelmoschus esculentus,* Okra e) *Vignia ungucuilata,* Cowpea	Cooked as relish, medicinal, nutritional purposes and source of income.	Intercropped or produced as sole crop under irrigation or rain fed.
Semi cultivated indigenous vegetables	Grown or grow naturally as volunteer crops	a) *Cleome gynandra,* Spider flower b) *Corchorus species*, Young Jew's mallow c) *Amaranthus, Species*, pig weed d)*Solanum nigrum,* Black nightshade	Tender leaves are consumed or boiled and dried for future consumption. Can be a source of income, sold as heaps, bundles or dried vegetables on road sides.	Plants are deliberately left out when weeding or picked from homestead and fallow fields.
Wild indigenous vegetable	Usually not planted are gathered from the wild and consumed in times of food shortages or when other vegetables are not secured.	a). *Bidens spilosa,* Black jack b). *Cleome monophylla*, Spindle weed c). *Galinsoga paviflora*, Gallant soldier	Used for dual purposes .Tender leaves are harvested and consume as relish .Fresh vegetables can be used for medicinal purposes or ailments	They grow naturally in the bush or disturbed lands ,road side or agricultural land

Table 1: Examples of categories of indigenous vegetables in Zimbabwe.

Role of indigenous vegetables

Indigenous vegetables play an integral role in the livelihood strategies of rural households. This section highlights some of these important roles as a possible incentive to their collaborative commercialisation.

Food availability

There is a general gap in availability of exotic vegetables in rural and urban Africa between November and March [16]. This is due to high temperatures which result in low water table therefore affecting plant growth and yield. Indigenous vegetables have always filled this gap. Their characteristics of growing under harsh conditions means they can contribute to food availability [10,16,20-22]. Food availability is when sufficient quantities of food of appropriate quality is supplied through domestic production and distribution throughout the year [10]. Availability of food at household level is determined by increased productivity, stable production and increased incomes. The availability aspect comes from production, accessibility and affordability [23].

Indigenous vegetables can be available throughout the year as dried vegetables or fresh vegetables. According to [11] in rural and urban areas, wild and semi cultivated crops are picked when their growth is stimulated by the first rains for example *Cleome gynandra*, *Amaranth species* and *Corchorus species*. Availability of cultivated indigenous vegetables such as *Vignia ungucuilata*, and *Cucurbita maxima* usually spreads over the rain season. In a survey carried out in Mutare [14] observed that more indigenous vegetables are consumed in remote areas than urban areas. More than 75% of the population in Zimbabwe rely on fresh indigenous vegetables during the rainy season and dried indigenous vegetables during relish lean season. Households in Wedza district reported that they consume fresh indigenous vegetables during summer and dry another portion that is consumed dried during winter. This implies that vegetables such as pumpkin leaves is grown throughout the year and after summer, they grow it in gardens under irrigation.

Since indigenous vegetables can be produced at low cost thereby generating steady incomes, they are considered as socio-economic safety nets for household livelihoods. Qualitative impact assessment by [24] highlighted that indigenous vegetables improve access to a variety of food, even during winter when people consume dried indigenous vegetables. Participating households noted that there is an increase in the availability of food, the wider diversity of their diet and surplus for sale. Thus households in indigenous vegetables production zones are able to reduce the risk of food and income gaps. [25] reported that indigenous vegetables have been given low status by the elite and educated classes. However due to the high incidences of diseases such as cancer, these groups have gradually changed their attitude resulting in growing appreciation of indigenous vegetables.

Nutritional security

Indigenous vegetables are a source of nutrients to communities. Many indigenous vegetables are characterized by a high nutritional value compared with global exotic vegetables [5,19,21]. Indigenous vegetables food sources ranging from legumes, root and tuber, leaf and fruit vegetables have the potential to make a substantial contribution to food and nutrition security [10,12]. Studies have proven that indigenous vegetables are higher in essential nutrients as compared to exotic vegetables. [1,16,26,27] support that indigenous vegetables have high values of proteins, calcium, iron, vitamin A, C, folic acids and phenolic compounds.

WHO (1999) noted that some disease problems are associated with dietary deficiencies. Diseases such as anemia and eye problems which often affect children and geriatrics especially those in lower income groups can be addressed by diversifying diets and incorporating indigenous vegetables in diets. They further highlighted that malnutrition and pandemic diseases such as cancer which are on the increase which are preventable by utilizing abundant diversity in indigenous vegetables.

Economic importance of indigenous vegetables

Despite the consensus that indigenous vegetables constitutes marginally to the economy, they have potential to be highly profitable, provide employment opportunities, generate income and catalyze commercialisation of the rural sector [28]. Zimbabwe import most vegetables from South Africa. Embracing local vegetables implies that the limited foreign exchange which is used to purchase products which could be supplied locally can be saved. Comparatively, exotic vegetables demand high inputs for production and yields are often low and variable [29]. Indigenous vegetables of equal or better nutritional status could perform better under cultivation with relatively low input levels.

Indigenous vegetables have been identified as a potential option for diversification of the economy due to its potential in local markets. They are popular with most rural communities [10]. Many indigenous vegetables can also be stored for long periods, transported easily and are less prone to contamination during preparation or storage as compared to exotic vegetables [30]. The market for indigenous vegetables is developing in big villages and towns due to the emergency of pandemic diseases. Currently, supply of local vegetables does not meet local demand and the marketing is still disorganized [3,15]. This exploitation of indigenous vegetables resources is an important source of income, especially for the rural poor, who are also under employed.

Shackleton., *et al*. [19] also highlighted the economic importance of indigenous vegetables for income generation and livelihoods diversity. In a comparative analysis of indigenous vegetable from home gardens, fields, and arable lands, it was found that indigenous vegetables contributed 31% of the value of all plants grown by a household [10,19]. These studies indicated that the values of domesticated indigenous vegetables, wild or grown in rural household were comparable to, or even better than, the mean wage paid to agricultural labourers in the vicinity. In addition, although the most trade was within the village/region, a growing supply and trade to larger regional centers was observed [2].

In Tanzania, in a study examining production and commercialization aspects, 13% of household income of farmers was from indigenous vegetables [13]. In Kiambu district in Kenya [18] showed that farmer groups successfully penetrated the high value market segments for leaf indigenous vegetables through collective action and collaboration with support systems. Studies by [19] indicated that indigenous are being marketed than serving as subsistence vegetables only. Small farmers in linking to high value markets for example supermarkets have managed to by-pass brokers, guaranteeing markets for their produce all year round and maximizing profits. Farmers organized in groups were able to realize higher profits by 35 to 72% compared to unorganized farmers. In Zimbabwe, [14] also reported a similar patterns among rural farmers and vendors in Mutare.

Value addition by applying appropriate production and post-harvest techniques ensures that high quality produce reaches the market and satisfies consumer expectations. Consumer studies with regard to the purchase and consumption of pig weed (*Amaranthus spinosis*) in Nairobi revealed that urban consumers care most for nutritional, sensory and safety attributes of the produce [26]. In Eastern Africa and Southeast Asia selected indigenous vegetables were becoming increasingly attractive food groups for the wealthier segments of the population and are slowly moving out of the underutilized category into the commercial mainstream. Attracted by the strong market demand, seed companies are beginning to explore and develop these popular crops, thus strengthening the formal seed sector.

Highlighting the importance along the supply chain in wholesaling and marketing [30] investigated the importance of indigenous vegetables for urban and peril urban households. Employment creation along strategic value chains is shown in figure 1.

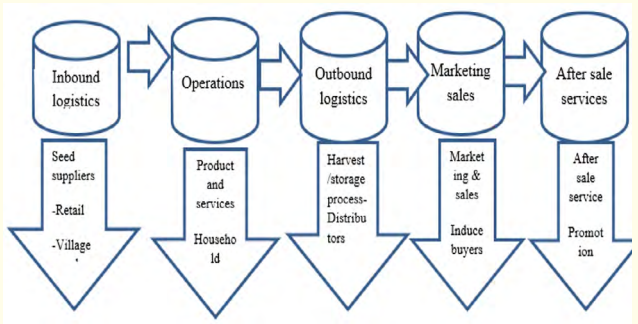

Figure 1: Value chain of indigenous vegetables.

They found a high level of participation by women in indigenous vegetable marketing since little start-up capital is required for entry, allowing even the poorest household to participate. Hence indigenous vegetables have evidently indicated the contribution to household income.

Strengthening institutional and cultural systems

Since the ancient past many indigenous vegetables have been used in meeting food, medicine, and cultural needs [19]. The traditional people believed and based their health-care and medicinal needs on plants (as well as insects; animals) found in their environment to cure specific ailments, enhance beauty, health, improve health, nutrition and for religious and spiritual purposes. The integral role that plants had then and continues to play in many societies and do not differentiate foods from medicine [31]. Given these benefits, caliber of the growing generation has changed due to globalization. They are more focused on exotic vegetables such as cabbage, rape and covo. Globalization has also increased the desire by current farmers to concentrate on cash crops maize, tobacco and Zimbabwe is no exception.

Furthermore, the rate of growing indigenous vegetables has deteriorated due to institutions and a policy framework which does not fully support indigenous vegetables. According to [19], Sub Saharan Africa's agricultural education in both commercial and communal areas is primarily aimed at cash crop production. This type of farming promotes monoculture and emphasized the eradication of any other plant species from the field as weeds. Zimbabwe has been unsupportive to indigenous vegetables for long. This has been highlighted by, supporting cash cropping of tobacco and implementation of fully funded programmes which supports grain production through provision of inputs as an incentive to the farmers.

Herbicides which destroy wild and semi cultivated indigenous vegetables are also provided thereby eroding biodiversity. This same attitude still prevails among extension agents and researchers who advise farmers to remove semi cultivated and wild indigenous vegetables from their fields as weeds. Such behavior will result in loss of indigenous knowledge and biodiversity.

According to [32-34] countries such as Uganda, Ghana, Kenya, Tanzania, Nigeria and Cameroon have advocated for policy frameworks at all levels that support conservation, production and marketing of indigenous vegetables. This policy has been implemented in these countries and has proved to work and produce results in both rural and urban households.

Factors influencing intensive consumption of indigenous vegetables

Consumption of indigenous vegetables is affected by perceptions held by many households [4]. In light of this, the frequency of consumption of indigenous vegetables has decreased over the years. It is noted that the situation emanated from the perception that indigenous vegetables are considered inferior in their taste as compared to exotic vegetables. [31] argued that the low intake of indigenous vegetables is associated with poverty and primitive practices. According to [31] the consumption of indigenous vegetables is coming under increasing pressure since these are linked with concept of social backwardness and poverty.

Vorster., *et al*. [4] point out that the general impression of these indigenous vegetables as poverty food or backward explain why young household members shun indigenous vegetables. Most indigenous vegetables have a unique taste associated with bitterness. Tavassoli and Baron-Cohen [35] propound that youngsters have active taste buds that are replaced each time of growth hence they shun to consume bitter taste foods as compared to adults whose taste buds don't get replaced each time they grow. Therefore older people tend to consume more of indigenous vegetables than young people. Research has also revealed that young people lack interest in consuming indigenous vegetables as they consider them as backwardness and outdated. The limited methods of preparation like boiling as the most common practice makes the young less likely to prefer indigenous vegetables.

Intensity of consuming indigenous vegetables is influenced by many other socio economic factors, such as gender, education and age of household head, market options and household monthly income. For instance, Vorster., *et al*. [4] highlighted that men have less preference for consumption of indigenous vegetables than women. However, Kimiywe., *et al*. [31] revealed that preference of indigenous vegetable species varies with geographical location and cultural norms. Cash cropping activities in crops like tobacco has resulted in loss of diversity, hence factors such as livelihood source and availability of indigenous vegetables in the local area has negatively influenced the intensive consumption of indigenous vegetables. The vegetables have naturally been pushed out of land allocation decisions and hence from the consumers' table.

The consumption pattern and preferences of indigenous vegetables vary by structure of households. A study carried out by Danisile [36] in Cape Town indicated that livelihood sources is one of the factors which determine choice and consumption of vegetables. More casual labourers and non-employed people have been found to consume more vegetables that employed personnel [31]. The author noted that livelihood source determines time one has for buying, preparation and cooking indigenous vegetables. Monthly household income was seen to affect the consumption rates of indigenous vegetables [37]. The low income groups were seen to consume more than their high income counterparts [4]. There is evidence from a study by Mpala., *et al*. [38] who further propound that availability and accessibility of indigenous vegetables affect their consumption patterns. They noted that consumption of indigenous vegetables was limited during periods of food shortages and was used as supplements to major foods.

Summary

Chapter 2 has highlighted a vast of literature in indigenous vegetables. Firstly, the definition and the overview of indigenous vegetables were discussed. The domestication of indigenous vegetables was also explored. Different roles of indigenous vegetables were highlighted. Finally, the factors influencing intensive consumption of indigenous vegetables were explored.

Methodology

Introduction

This chapter develops the methodological framework that was used to test the assumptions that are suggested in chapter one. The chapter first lays out the conceptual framework. Consideration is taken of the data requirements and the analytical framework. The chapter then further discusses the logit model that was used to determine the socio economic factors that affect the intensity of consumption of indigenous vegetables. In addition, gross margin budget and gross margin ratio analysis were used to determine the contribution of indigenous vegetables to household income and food availability.

Conceptual framework

The concept adapted in this study is built on the production and availability of indigenous vegetables since they do not require high technical management, they are low inputs vegetables, and drought tolerant hence the success is high.

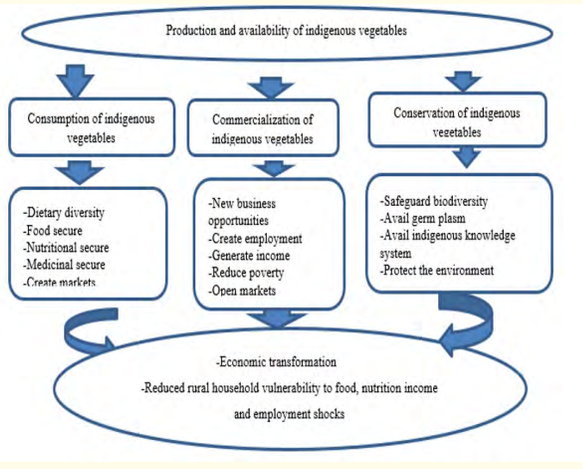

Figure 2: Conceptual framework for production and availability result in consumption, commercialisation, and conservation contribution of selected indigenous vegetables.

Source: Adapted from (Mavengahama., et al., 2013)

Consumption of indigenous vegetables yield some benefits such as dietary diversity, food and nutritional security, medicinal value and create market for participants in indigenous vegetables production sector.

Whereas commercialization open new business opportunities, create employment, generate income for households, reduce poverty and open markets for indigenous vegetables. It is believed that indigenous vegetables are low capital enterprises hence households that engage in such businesses have more profits, more food secure and are better endowed. Thus, the profitability of indigenous vegetables is influenced by demand, output level, the price on the market and to a lesser extent cost of production although it is less. Conservation of indigenous vegetables through use will avail germ plasma, indigenous knowledge to the society and new generations. Thus, biodiversity is safeguarded and the environment is protected as a whole.

Location of Wedza district

The study was conducted in Wedza district. It is one of the nine districts in Mashonaland East Province. The area lays in region 2b of the agro ecological zones of Zimbabwe and lies about 50 km south of Marondera town and 127 km south of Harare. Rainfall pattern in this district is diverse and it ranges from less than an annual average of 600 mm to 800 mm. This sometimes limits dry land agricultural production. The district has 15 wards. Ward 3, 5, 6 were selected for the purpose of study. The three wards were opted because they are well known of intensive cropping activities. These wards have an average population of 1451 households with an average of 38 households per village.

Figure 3: Study site.

Source: Wikipedia

Research design

The study employed the survey research design because it is regarded as the best method to collect original data for the aim of describing a situation which is too large to observe [39]. The population of communal area in Wedza is 70 604 people of which resource poor farmer constitute the majority. The survey design enabled the researcher to complete the study in a short time by choosing a manageable number to represent a population. To survey basically means to see over things in their natural setting in order to derive meaning, [39]. Furthermore, Wayne and Manijeh, (2010) explains, the survey design as the most suitable method to gather and obtain information where little is known about a phenomenon. The aim was to analyse the contribution of indigenous vegetables to household income and food availability in Wedza district. The survey research was therefore the best since it entails gathering of raw information from a representative sample of a communal household in Wedza. Cohen and Manion [10] thus conclude that the survey design is good for generating original data.

Simultaneously, the survey design was strong in that it did not influence the research respondents (Wayne and Manijeh, 2010). This means that it did not directly control the respondents' responses. Instead, it observes and describes the opinions and perceptions of the defined group. The results from the sample were generalized to the entire population. Therefore, the research de-

sign was cheap and information was collected from a large population in a short period.

Sampling strategies

For the study, a large sample was ideal but not sufficient in itself and as such the principles underlying the selection of the participants were equally important. Probability and non-probability methods were used to delineate the sample. Cohen., *et al*. [40] define probability sampling as a method in which all members of the population have an equal chance of being chosen. Multi stage sampling was used. Initially Wedza district was purposively selected due to its convenience to the researcher and the presence of indigenous vegetables producing communal farmers in the area. A purposive sampling of three wards was done in localities that practice diverse and intensive cropping activities.

Three villages were randomly selected in each ward and snowball technique which involves identifying one or more indigenous vegetable farmers, who in turn helps to identify other respondents until the sample size is reached was used. Structured questionnaires were self-administered to 54 households in the nine villages. However, the final choice of the study depended on guidance and advice from the District Agricultural Extension Officer who assisted in identifying villages they knew that there is production of indigenous vegetables.

Data collection

A structured questionnaire and Focus Group Discussion (FDG) guide were used to collect data through face to face interactions. A questionnaire is a document consisting of items to solicit information from a participant that is suitable for research analysis [39]. Questionnaires are useful in that vital information can be obtained from many participants within a short time frame [40]. Data were directly collected from the unit of analysis hence responses were assured. In addition, the questionnaire guarantees participant anonymity, hence the respondent was free to give responses. The questionnaire has an advantage of being filed therefore provide a permanent and verifiable record of the collected data (Wayne and Manijeh, 2010).

After completing data collection on questionnaires, FDGs composed of six members were conducted to validate some data collected from farmers. FDGs also aided in obtaining insights into target audience perceptions, needs, available knowledge, problems, beliefs and reasons for certain practices. The FGDs were organized by the extension officer and the households since the researcher had a difficulty in bringing people together to a meeting.

Objectives	Research questions	Research assumptions	Data requirements	Testing procedure
-To evaluate socio-economic factors that influences the intensity consumption of indigenous vegetables.	-What are the socio-economic factors that influence the intensity consumption of indigenous vegetables?	-Socio-economic factors that influences the intensity consumption of indigenous vegetables.	Primary data -Age -Household size -Household land size. -Monthly income -Marital status -Educational level -Upbringing -Gender of household head -Livelihood source	SPSS 22 and STATA 13 -Descriptive statistics -Logit regression model
-To determine the contribution of indigenous vegetables to household income and food availability.	-What is the contribution of indigenous vegetables to household income and food availability?	-Indigenous vegetables contribute to household income and food availability.	Primary data -Enterprises on farm -Field crops -Gardening -Livestock -Indigenous vegetables -Off-farm income sources	Gross margin and ratio analysis

Table 2: Analytical framework.

Data analysis

The collected data was used to validate the research questions and objectives. The validation process entails the confirmation and disconfirmation of the two research questions and objectives as portrayed by the results. Data were manipulated using SPSS 22 and STATA 13 with gross margin and logit based analyses.

Logit regression modeling

In the context of this study intensity of consumption was defined as the frequency of consuming any of the three selected indigenous vegetables in a week. A censoring point of 50% was established with households consuming the vegetables for times below the threshold being defined as non-intensive consumers. This definition created a binary dependent variable since any household would either be an intensive or non-intensive consumer. The specification of the logit model (derived from the logistic regression function) allowed for the determination of the determinants of the intensity of consumption decision [41]. The likelihood of observing the dependent variable ( ) was tested as a function of variables which include age, training and gender of household head. Therefore:

$$P_i = \Pr\left(Y_i = 1\right) = \frac{\exp\left(Z\right)}{1+\exp\left(Z\right)} \quad \text{..... (1)}$$

The natural log transformation of (1) results in (2):

$$\ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum_i^n \beta_i X_i + \mu_i \quad \text{..... (2)}$$

$$Z_i = \beta_0 + \sum_i^n \beta_i X_i, + \mu_i \quad \text{..... (3)}$$

Where:

- P_i is the probability that the i^{th} farmer is an intensive consumer ($Yi = 1$)
- β_0 is the intercept
- β_i's are the slope parameters, and
- X_i's the independent variables.

Gross margin and ratio analysis

Objective two was analysed using the gross margin analysis and ratio analysis to determine the contribution of indigenous vegetables to household income and food availability. Communal households are involved in various livelihood activities. These activities contribute to household income and food availability status of a household. Gross margin analyses for spider weed, cowpea leaves and pumpkin leaves was carried out to test the hypothesis that indigenous vegetables contribute to household income.

Gross margin = Gross income net of direct variable costs [42].

$GM_i = R_i - VC_i$ .....(4)

Where = Revenue from the i^{th} activity.

VC_i = Variable cost from the i^{th} activity.

The study sought to quantify the proportion of household income accounted for by the selected indigenous vegetables. To attain this, the gross margin approach was adopted as:

$$Contribution\ of\ Indigenous\ vegetables = \frac{income\ from\ indigenous\ vegetables}{total\ household\ income} \quad \text{.... (5)}$$

Summary

This chapter has highlighted the research approaches used. The conceptual framework, the survey research methodology has been elaborated and justified. The selection of target population and the sample size have been explained. Various research instruments, which are the self-administered questionnaires and Focus Group Discussion, have been explained with their relevance and strength. Data analytical tools are also discussed.

Results and Discussion

Introduction

This chapter presents results and discussions from the survey that was conducted in Wedza district of Mashonaland East Province in Zimbabwe. Firstly there is a summary description of the general socio-economic attributes of the respondents and the characterization of indigenous vegetables under study. Socio-economic factors which affect the intensity of consumption of indigenous vegetables are highlighted. Secondly, as summary of the contribution of indigenous vegetables to household income is also presented.

General household characteristics

The socio-economic characteristics of respondents are shown in table 3 and 4.

Characteristic	Mean	Standard Error
Age	47	1.4814
Household size	5	0.2665
Household land size	3	0.1712
Household monthly income	63	3.8670

Table 3: Quantitative characteristics of households.

Items	Percentage (%)
Upbringing	
Rural	75.9
Urban	3.7
Both	20.4
Sex of Household Head	
Male	74.1
Female	25.9
Marital status of Household Head	
Single	5.6
Married	74.0
Widowed	20.4
Highest level of education of Household Head	
No formal education	10.8
Primary school	29.9
Secondary school	55.6
College	9.3
University	3.7
None	1.9
Livelihood source	
Casual labour	9.2
Farming	77.7
Self employed	5.6
Formally employed	5.6
Pension	1.9

Table 4: Qualitative characteristics of households.

Results revealed that the respondents have a mean age of 47 years. This indicates that they are still in the productive age zones and are expected to actively participate in livelihood activities including farming activities. This is similarly to a study conducted in Tanzania by [43,44] who indicated that young age participate in farming activities for their livelihoods. The average land holdings are reasonable given the nature of the settlement. If efficiently utilized, there is scope for attaining welfare benefits from on farm activities. It is also noted that given the average household size in the study area, there are higher chances of having a reliable supply of household labour. The mean household monthly income was $63. This implies that the households' income for households is a collective of many livelihood sources besides farming.

The results in Table 4 point towards a higher percentage of married population in the study area. A significant component of sampled household heads had a rural upbringing. This might have a bearing on their inclination towards indigenous vegetables. The study also reports an educated community with over 75% attaining at least a secondary level education. The study also indicated 77.7% of the households depend on farming as a source of livelihood.

Description of selected indigenous vegetables

Table 5 below indicates indigenous vegetables that were isolated for the study. The three were intercropped in maize and other sole crop fields except after growing season when households grow pumpkin leaves in gardens. Spider flower was hardly planted it grow in the fields as a volunteer crop. This has been highlighted in a study conducted by [44] that spider weed has a high seed dormancy hence difficult for farmers to propagate it. During the FGDs, households also mentioned other peripheral indigenous vegetables which they consume but are not captured by the current research effort. The most common ones were jute mallow (gushe) and pigweed (mow).

Scientific name	Common name	Vernacular name	Average area grown (%)
(Cucurbita maxima)	Pumpkin leaves	Muboora/ Mutikiti	46
(Cleome gynandra)	Spider plant	Nyevhe/Runi	19
(Vignia ungucuilata)	Cowpea leaves	Munyemba	35

Table 5: Selected indigenous vegetables.

Reliance on rain fed and mixed or intercropping production of indigenous vegetables has been a major limitation in expanding production in Wedza District of Mashonaland East Province of Zimbabwe. During the growing season, indigenous vegetables are purely produced under rain fed systems. This makes their supply unreliable during the dry spells or drought years. The study reports that the indigenous vegetables are mostly abundant during rainy season and are in short supply during winter. Limited number of households indicated that they buy seeds, most of them borrowed from their neighbours.

Manure was commonly applied, with use of inorganic nutrients and other synthetic chemicals being limited. Households used different types of manure but preferably cattle and goat because they were easily accessible. The practice is similar to the results of the study carried out in Juru district of Mashonaland East Province of Zimbabwe by [23] who indicated that indigenous vegetables are

organically farmed. They further highlighted some reasons with regards to limited production as lack of technical knowledge, inputs, market, government support and lack of processing infrastructure as the major limitation.

Determinants of intensive consumption of indigenous vegetables

Table 6 show results for intensity of consumption of indigenous vegetables during growing season of indigenous vegetables (November to March) and after growing season (April to October).

Variables	Regression Coefficient	
	During growing season	After growing season
Age of household head	0.024** (0.034)	0.011** (0.057)
Upbringing	-0.266 (0.752)	-0.345 (0.168)
Education level of head	0.255** (0.365)	0.197*** (0.477)
Gender of household head	1.446** (0.811)	
Household size	0.177 (0.183)	0.217 (0.263)
Livelihood source	-0.207 (0.793)	0.561 (1.321)
Monthly income	-0.006** (0.004)	-0.005 (0.007)
Landholding size	-0.024 (0.278)	-0.306* (0.465)
Market options	0.894** (0.698)	1.606 (1.240)
Constant	-3.823 (3.430)	-4.248 (4.905)

Table 6: Logit regression model results

Source: Generated by authors from 2017 survey data using STATA.

Notes: -*; ** and *** indicate p-values significant at 1 %, 5 % and 10 % levels respectively.

-Standard error for each estimate is placed in parenthesis.

The operational models for intensity of consumption are:

During growing season

$$-3.823 + 0.024\,age - 0.027\,upbringing + 0.255\,education + 1.446\,gender + 0.177\,household\ size - 0.207\,livelihood - 0.006\,income - 0.024\,landsize + 0.894\,market$$

After growing season

$$-4.248 + 0.011\,age - 0.345\,upbringing + 0.197\,education + 0.217\,household\ size + 0.561\,livelihood - 0.005\,income - 0.306\,landsize + 0.606\,market$$

Out of nine factors that were hypothesized to have an influence on intensity consumption of indigenous vegetables during the growing season, five were found to be significant ($p < 0.05$). Results in Table 6 indicate that out of nine factors hypothesized to have an influence on intensity of consumption after growing season three were found to be significant.

Age is one of the factors which were found to have a positive and significant influence on intensity of consumption both during and after growing season. This is explained by the fact that, age affects efficiency of carrying out farm activities and is also associated with experiences in farming practices over time. In a study conducted in Oyo State in Nigeria, [45] indicated that, the age variable is critical for enhancing agricultural production. Although experience comes with years of practice is important, young decision makers can also make more informed decisions since they are more networked. More food and nutritional security oriented production activities could be engaged by the younger respondents' hence higher productivity.

However, in some studies carried out in South Africa [46-48] the younger age was said to be influenced by modernization and globalization. There is likelihood that they would therefore shun indigenous vegetables and prefer exotic vegetables. Tavassoli and Baron-Cohen [35] also argued that age has an impact on food choices and preferences as guided by taste perceptions. Therefore in light of this; we observe that older people tend to consume more of indigenous vegetables than the younger counterparts.

Education level of the farmer was also significant hence, was seen to contribute to the decision to consume indigenous vegetables both during the growing and after the growing season. This was similar to a study that was conducted in Nigeria [45] which revealed that those who attained higher education status tend to consume and produce more indigenous vegetables. This, they attributed to their human capital status hence the ability to acquire and process knowledge on several aspects of indigenous vegetables such as agronomy, nutritive value, marketing strategies before embarking on production.

Gender of household head was positive and significant, which is strong relationship during the growing season of indigenous vegetables but was it insignificant after the growing season of indigenous vegetables. During the growing season of indigenous vegetables, it is explained by the fact that, due to the patriarchal nature of the culture, gender of household head is very important in deciding types of crops to be grown and dishes consumed by a household. Studies revealed that in African society's males are dominant in decisions regarding agricultural activities as compared to female [18]. The latter sex are not entirely left out and they serve as helping hands in harvesting and processing of produce [10]. However,

after the growing season gender was found to be insignificant and this is explained by the fact that during this period food options are limited. Therefore, most households will be consuming previously dried vegetables since they will be out of season hence the decision to cook is normally made by women.

Household monthly income was another economic factor that was negative and significant during the growing season of indigenous vegetables but insignificant after growing season. The variable can determine decisions including dishes that household frequently consume [8,23]. According to [18,43], in the study conducted in Kenya low income households and household who work as farm workers consume indigenous vegetables due to limited food options. This observation contradicts with [32] who revealed that high income status people where seen to be potential buyers and consumers of indigenous vegetables in Kenya.

This is explained by the fact that although higher income earners are associated with diversifying their diets, they are not much aware about indigenous knowledge on healthy diets hence they consume less of indigenous vegetables. Therefore, low income earners have been seen consuming more indigenous vegetables in this study. However, after the growing season the household income was both negative and insignificant. This was explained by the fact that since the households do post-harvest technology of drying indigenous vegetables during the growing season and very limited families grew indigenous vegetables after growing. This reflects shortages of indigenous vegetables after the main growing season. However, [43] revealed that low income people consume more indigenous vegetables both during and after the growing season. As such, monthly income of a household became irrelevant in decisions of a household to consume indigenous vegetables.

The estimated coefficient for household land holding size was negative and insignificant during the growing season of indigenous vegetables and negative but significant after the growing season. This is explained by the fact that in this study land was not an important factor during the growing season of indigenous vegetables since indigenous vegetables were cropped in mixed cropping or intercropping. After the growing season, what is observed to be explained by the fact that after growing season, production of indigenous vegetables is carried out in protected areas which are near water sources for irrigation hence land was significant after growing season of indigenous vegetables.

In this regard, as also reported by [25] who noted that landholding size influences intensity consumption of indigenous vegetables. This is similar to [7] who revealed that household land holding size is critical to agricultural production. In their study conducted in Nigeria, they reported that households with access to land may be able to augment income from a number of small scale farming activities with income from alternative sources. Similarly [49], revealed that households with larger pieces of land can produce indigenous vegetables both for consumption and for sale.

Market options are highly significant during growing season of indigenous vegetables. This is explained by the fact that market options such as roadside, local growth point/shops and neighbours are convenient to the consumer hence intensity of consumption is high. Distance and other transaction costs associated with accessing the vegetables will be also reduced thereby incentivizing intensive consumption. This is similar to study carried out by [28] in Limpopo province who indicated that sell of indigenous vegetables was highly among roadside, local shops/growth points and neighbours.

Contribution of indigenous vegetables to household income

Table 7 below summarizes the yield, production costs and gross margins of three major indigenous vegetables as observed in the study area. The table below summarizes the yield, production costs and gross margin per hectare of indigenous vegetable in the field. In these calculations farm level profits per hectare were computed using farmed acreage instead of total hectares. Gross margin are calculated by deducting costs incurred during production (seed, labour and manure) from the total production for each farmer and then averages are taken for each variable

Variable	Indigenous vegetable		
	Cowpea leaves	***Pumpkin leaves***	***Spider weed***
Area grown(ha)	0.11	0.14	0.06
Total yield(kg)	200	200	300
Average price (US$/kg)	0.50	0.50	0.50
Gross income (US$/ha)	100	100	150
Total variable production costs (US$)	20	33	75.79
Observed gross margin (US$)	80	67	74.27
Standardized gross margin (US$/ha)	727	478	1237
% Gross margin	2.1	1.3	1.2
Return/$ invested	11.3	1.8	3.5
Net margin	0.8	0.67	0.49

Table 7: Summary of gross margin analysis of selected indigenous vegetables in Wedza District of Mashonaland east Province of Zimbabwe.

All the indigenous vegetables analysed above had positive margins. Gross margin is a function of market producer price, yield and effective area under cultivation [23] Cowpea leaves had the highest margin as well as highest return per dollar spent. The fact that cowpea leaves, especially in their dried form has got high demand on the market can explain this. Moreover, its growth habit of intensive running when frequently harvested results in higher yield hence more income potential. With pumpkin leaves, as the plant reaches the bearing stages tender palatable leaf growth start to decline and the running growth habit also starts to be reduced. Similarly, with spider weed, the plant has got very short life cycle as compared to cowpea plant and pumpkin plant hence lower effective yield. As it reaches the bearing stage tender leaves ideal for consumption are stunted. This means that the plant growth became more concentrated on bearing than leaf development.

Results show that in Wedza, currently the effective land towards indigenous vegetables is low [29] indicated that the area under cultivation is a factor of production that can contribute to profitability of an enterprise. Therefore, is need for potential scope of re-aligning land allocation decisions by incorporating indigenous vegetables in crop production mixes.

The average price of indigenous vegetables above is almost constant, this is due to lack of pricing strategies influenced by the dollarization of the economy which result in difficulties in accessing coins some time back hence the markup was the same across all indigenous vegetables. Prices of indigenous vegetable dishes in the formal and informal food industry are very expensive in Zimbabwe [25], this shows that people attach significant value to indigenous vegetables due to their characteristics of being medicinal and nutritious, hence if prices are strategically researched indigenous vegetables will fetch higher markup than $ 0.50. This is similarly to a study conducted by [34] in Sub Saharan Africa which revealed that value can attach price in agricultural commodity marketing.

Yield tends to be lower as compared to the standardized outputs. According to [13] per hectare of indigenous vegetables can yield up to 5000 kg. Lower yields are being affected by input use patterns and agronomic practices. In the present study context, farmers indicated that they do not commit to directly applying artificial fertilizers or chemicals for indigenous vegetables except cattle or goat manure. They also do not grow these vegetables as sole crops. The vegetables are intercropped in field crops or in exotic vegetable gardens hence they utilise fertilizers applied for the sole crop. Spider weed is hardly sown and it grows as a volunteer crop in the fields and then managed by farmers.

In this regard, there is scope for designing indigenous vegetables and livestock integration systems. These sustainable intensification efforts should increase yield therefore generating higher gross margins. Indigenous vegetables can therefore be used as a potential gateway for diversification and risk hedging by resource poor farmers. Presently, indigenous vegetable producers in [43]. Wedza district of Zimbabwe are participating in the local markets. There is consensus in literature suggesting that the vegetables are relatively easier to produce. Since production is mainly by traditional methods, there is limited financial burden which could have been a disincentive for the resource constrained farmers [10].

The study also analysed the contribution of indigenous vegetables to total household income as in table 8. Indigenous vegetables seemed to be a potential livelihood activity in the area.

	Field crops	**Vegetables**		**Livestock**			**Other**		
		Exotic	*Indigenous*	*Poultry*	*Goats*	*Cattle*	*Petty*	*Labour*	*Pension*
$	1229	475	65	11	27	276	17	31	16
%	55	24	3	1	1	13	1	1	1
Rank	1	2	4	8	6	3	7	5	9

Table 8: Summary of average total household income.

$$Contribution = \frac{Income\ from\ indigenous\ vegetables}{Total\ household\ income}.$$

$$= \frac{65.36}{2147.73}$$

$$= 3\%$$

On average, indigenous vegetables are contributing 3% of the total household incomes. Field crops constitute the highest percentage (55%) followed by exotic vegetables which constitutes (24%). These results support [16] who indicated that, indigenous vegetables have been replaced by high exotic yielding cultivars developed by modern breeding programs. In Zimbabwe, this has

been supported by extension agencies and educational curricula promoting breeding and cash cropping of exotic vegetables in farming communities [3]. Hence indigenous vegetables tend to be less competitive in the market place compared with commercial exotic cultivars. However, a study conducted in Kenya [18] indicated that indigenous vegetables have become an important strategic commercial crop. Indigenous vegetables contributed on average 36.29% of the total crop income of the 83 farmers sampled. This was similar to [50] who indicated that in the same area of study, indigenous vegetables were an important contributor to the household income. A study conducted in Nigeria by [45] revealed that indigenous vegetables was the major source of income [51].

In a comparative analysis of indigenous vegetable from home gardens, fields, and arable lands conducted in South Africa, it was found that indigenous vegetables contributed 31 per cent of the value of all plants grown by a household [10,19]. These studies indicated that the values of domesticated indigenous vegetables, wild or grown in rural household were comparable to, or even better than, the mean wage paid to agricultural laborers in the vicinity. In Tanzania, in a study examining production and commercialization aspects, 13 per cent of household income of farmers was from indigenous vegetables [13].

The relatively low figure observed in Wedza district of Zimbabwe can be explained by missing links in markets and marketing. This can also be compounded by limited support from policy and institutions. In Kiambu District of Kenya [18] showed that farmer groups successfully penetrated the high-value segments of markets for leaf indigenous vegetables through collective action and collaboration with support systems. Shackleton., *et al*. [19] argue that the success of indigenous vegetables value chains is hinged on them being commercialized and marketed than locking them in the subsistence domain. It therefore implies the need to facilitate linking small farmers to high value markets for example supermarkets, by pass brokers. This guarantees markets for their produce all year round and maximizing profits.

Consumption of indigenous vegetables during and after growing season

Figure 4 below shows the percentage consumption of indigenous vegetables during and after growing season in the study area. All the sampled households indicated the availability of indigenous vegetables during the growing season hence high consumption and food secure. The variation in intensity consumption and availability was due to differences in the type they prefer. This implies that they are different species of indigenous vegetables which household prefer most and expected to make them food secure. This findings confirms with studies carried out in South Africa by [10] that availability and consumption of indigenous vegetables offer great promise for household producers in the informal economy.

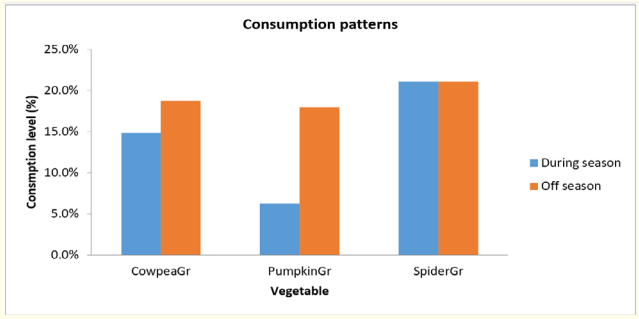

Figure 4: Consumption of indigenous vegetables during and after growing season in Wedza District of Zimbabwe.

Source: Wikipedia

Ebert [21] reported that native African vegetables are not well researched and documented. The three isolated in this study proved to have potential food and economic benefits. In Kenya and Nigeria there is promotion of local cultivation, conservation of many indigenous vegetable species, especially those facing genetic erosion. Borrowing from successful experiences in other parts of Africa, the levels of consumption in Wedza district of Mashonaland East Province in Zimbabwe can be increased if indigenous vegetables are commercialized to enhance household food availability during and after the growing seasons.

Summary

The chapter analysed the major socio-economic factors that influence intensity consumption of indigenous vegetables using descriptive statistics and frequencies. The chapter further analysed these socio-economic factors using the logit regression model. Five factors out of nine were found to be significant in intensity of consumption during and after the growing season of indigenous vegetables. Results further shows that 3% of the total household income was accounted by the selected indigenous vegetables.

Summary, Conclusions and Recommendations

Summary

The chapter summarizes the main findings of the study and concludes on the basis of the results. It also gives recommendations on how the potential of indigenous vegetables can be exploited. The

aim of the research was to analyse the contribution of pumpkin leaves, cowpea leaves and spider flower to household income and food availability in Wedza district. The study focused on two specific objectives which were to:

1. Evaluate social and economic factors that influence intensity of consuming indigenous vegetables by rural households.
2. Determine the contribution of indigenous vegetables to household income and food availability.

The study used two analytic techniques which were the logit regression model and the gross margin (and ratio) analysis. Results of the study indicated that socio-economic factors such as age and education level had positive and significant contribution to the decision to intensively consume indigenous vegetables during the growing season and after the growing season. Gender of household head, household monthly income and market options were found to be positive and significant during the growing season of indigenous vegetables only. Household land holding size was positive and insignificant after growing season of indigenous vegetables.

Results of the study indicated that households diversify their income sources. Of the nine (9) sources identified 3% of the total income was obtained from indigenous vegetables.

Conclusions

From the study, a conclusion that several socio-economic factors influence intensity of consumption during and after the growing season can be made. During and after the growing season, these are age and education level during the growing season and after the growing season. Gender and income and market options had an influence during the season only. The aprior hypothesis made was therefore not rejected in this case. The second hypothesis stated that indigenous vegetables contribute significantly to household income and food availability. Three percent of total household income was accounted for by the selected indigenous vegetables. The study there cautiously concludes that indigenous vegetables can be a possible source reliable of income.

Although food availability varies among region, it is one of the three pillars of food security. This context indicated that there was availability of indigenous vegetables both during and after growing season but more abundant during growing season. Therefore, high consumption rate in summer resulting in households being food, nutrition and food secure. However, unreliable markets, information asymmetries are an impediment for commercialisation of indigenous vegetables. The market uncertainties' results in small area committed to indigenous vegetables therefore only 3% was accounted for in Wedza district of Zimbabwe as compared other countries like Kenya.

Households have acknowledged the impact of consuming indigenous vegetables on the nutrition and health as such, agricultural, education, health and food industry should join hands together to come up with strategies to promote indigenous vegetables.

Recommendations

Based on the study findings, the research output recommends the following:

- Integration of modern technologies and indigenous knowledge to improve production and consumption of indigenous vegetables. The integration of modern technologies and indigenous knowledge will allow improvement of consumption of indigenous vegetables hence will enhance market and participation by young people in the main stream.
- Awareness campaigns on the benefits and business potential of indigenous vegetables to both rural and urban households is essential. The main focus of campaign should incorporate recruitment of youth to agriculture and further incorporate indigenous vegetables in the agriculture school curricula. This will facilitate a change to negative perception of young people towards indigenous vegetables hence they can frequently consume indigenous vegetables. In addition, this will raise market demand simultaneously initiating indigenous vegetables to enter into the food systems.
- Older household head aging from thirty five and above has shown that they are well versed with indigenous vegetables in terms of nutritive value, medicinal, food source, income source and agronomic advantage. However, handling, marketing, modern post- harvest equipment and technology have been a challenge to them. To incorporate enthusiasm and confidence, the government through the extension officers should spread their services to indigenous vegetables producers in improving indigenous vegetables production, processing techniques, post-harvest techniques and marketing since extension officers do subsequent visits and understand better the local environment.
- There is need to encourage the formation of a well local oriented formal institutions that will also discuss issues associated with indigenous vegetables and promote the spirit of entrepreneurship among households. This will organise households into groups and treat their farming of indigenous vegetables as a business so as to make profit and to create employment.

- A number of stakeholders need to be involved in the development stage of awareness of these vegetables. Micro finance institutions can be involved and can come with some initiative of lending some funds to buy postharvest equipment for households. Food industry should also be involved so that they will come up with different recipes of preparing indigenous vegetables and this will assist to introduce an appealing product into the market, the product that will be highly demanded rather than be forcing a product into customers. Further research should be done on other alternative uses.
- There is need to carry out market analysis of indigenous vegetables so that farmers can plan their cropping programmes effectively thus market information asymmetries can be avoided. Furthermore, it would be necessary to look for opportunities for exploring other markets behind borders as well as value addition of the product before venturing into the markets.
- An increase in area under cultivation might be necessary since indigenous vegetables have proved to be low input crops.

These efforts should facilitate commercialization of indigenous vegetables since the study shows that they have contributed significantly to household income. Indigenous vegetables have a great business potential and proved adding value to the lives of households. They alleviate households from financial burdens, unemployment and address nutrition and health issues.

Dedication

This thesis is dedicated to my husband and children for their devotion to my education and their commitment to giving me their best support.

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