

# Market linkages: A Way of Sustaining the Production of Amaranth in Manjolo and Sikalenge Wards of Binga District of Matabeleland North, Zimbabwe

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**Abstract** Through a market linkages survey of grain and vegetable amaranth farmers, input suppliers, potential market as well as agricultural extension workers, this paper investigated how grain (*Amaranthus hypochondriacus* L.) and vegetable amaranth (*A. cruentus* L.) farmers in Binga District, Matabeleland North can be linked to the market to ensure the sustainable production of grain and vegetable Amaranth in Manjolo and Sikalenge wards of Binga District. Results from the survey indicate that households have a positive perception towards production and consumption of amaranth. The potential markets that is Bulawayo, Hwange and Victoria Falls are very far and the road connectivity is very poor as indicated by the poor state of the roads Supermarkets need registered companies which is a challenge dealing with the fragmented resource poor farmers, hence there is need to arrange farmers into groups. Also formal markets normally need produce that meets certain standards hence the farmers in the two wards face the challenge in selling their produce to the formal market. The study recommends the popularisation of the vegetable by all stakeholders as well as exploration of value addition and beneficiation to tap into international markets.

**Keywords:** market linkages, potential markets, formal markets, challenges, registered companies, value addition, beneficiation, international markets

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## 1. Introduction

This paper investigated how grain (*Amaranthus hypochondriacus* L.) and vegetable Amaranth (*A. cruentus* L.) farmers in Binga District, Matabeleland North can be linked to the market, input suppliers as well as agricultural extension workers to ensure the sustainable production of grain and vegetable Amaranth in Manjolo and Sikalenge wards of Binga District. The crop was introduced in the two wards in 2020 to increase the diversity of crops that are adapted to climate change. The two Amaranth species were introduced in early March 2020 for their vegetable and grain respectively.

## 2. Contextual Background

The project comprises of 47 women farmers who were initially trained at Manjolo Drop-In Centre and a further

six volunteers who adopted the project from their neighbours. During the baseline survey in March 2020, the farmers indicated the need to be linked to the market, suppliers of inputs as well as agricultural extension workers. This study analyzes the outcomes of the investigation and gives the aspirations of the farmers with regards to linkages to the market, input suppliers and agricultural extension workers. The initial training encouraged the farmers to produce both for household consumption and excess for the market. The crop could be a game changer in terms of income generation for the economically weak families.

Ntengwe for Community Development (NCD) together with the Midlands State University (MSU)'s through the Tugwi Mukosi Multi-Disciplinary Research Institute (TMMRI) embarked on a market survey in Bulawayo, Victoria Falls and Binga to market the vegetable on behalf of the households in Binga. The local District Agricultural Extension Department with whom the team is collaborating currently working in the Red Sorghum project were also consulted in order to clarify viability and their capacity to offer extension services to this project.

## 2.1. Study Aim

To establish the market linkage and households' resilience through Amaranth production in Binga.

## 2.2. Specific Objectives

- To establish local perception and attitudes towards Amaranth.
- To establish potential markets for the Amaranth
- To link the farmers with local and international market in real time.

## 3. Literature Review

Amaranth originated from Central America and was an important food and religious crop among the Aztec civilisation. With time the vegetable was introduced to the rest of America and globally resulting in the crop being grown on a commercial basis. The crop is an easy to grow, nutrient rich and underutilized pseudo-cereal that can play an important role in alleviating hunger and malnutrition in low rainfall areas such as Binga [1]. The crop has been touted as a super climate change adaptive crop owing to its fast maturity, drought tolerance and suitability to arid conditions. The crop was long introduced as a grain and vegetable crop in Africa gaining prominence in countries like Eritrea, Ethiopia, Kenya, Uganda and Tanzania. Its introduction as a grain crop in Zimbabwe is fairly recent.

According to ZIMVAC [2] drier districts in Zimbabwe such as Binga are more vulnerable to droughts leading to 75 % of the population being food insecure. Malnutrition is rampant in the district as well as stunting of children below the age of 5 was 24 % while acute malnutrition was poor 6.15 % in the district. Poor rainfall, high temperatures and predominantly sandy soils (Kalahari sands) characterise Binga leaving most of the population relying on food handouts from government and Non-Governmental Organisations (NGOs) due to poor crop yields. Climate change and climate variability have exacerbated food and nutrition poverty in the area. Its adoption in Zimbabwe has been mixed with market development being a major hindrance to increased adoption.

Poorly developed markets and value chains have affected the adoption of many crops globally and Zimbabwe in particular. Crops with poorly developed mass markets like cassava have been touted as the panacea to many environmental, food and nutritional security ills in many countries but their adoption has been poor [3]. Similarly, Amaranth despite its nutritional supremacy when compared to cereals like maize, sorghum, millet and wheat had fail to grow in terms of area under production and as a strategic national grain. Its nutritional value is widely accepted by nutritionists and other health staff. Despite being regarded as a balance crop with large amounts of dietary fibre, iron, and calcium, the crop also contains high amounts of lysine, methionine and cysteine [4].

The essential amino acids combined with a fine balance of other amino acids makes it an excellent source of

high quality balanced protein which can be beneficial in reducing stunting and acute malnutrition in Binga. The crop grows vigorously in the rain season with potential to provide more than 30 g per capita of vegetables. To ensure all year round availability of both the grain and the vegetable, capacity on harvesting, post-harvest handling and processing is essential.

Amaranth grain is utilised in many forms from breakfast cereals and flakes, bakery products, gluten-free foods and to make beverages or alcohol. It is blended with maize meal, millet or millet to prepare thick porridge known as *sadza* in Shona or *isitshwala* in isiNdebele in districts such as Insiza, Lupane, Matobo and Tsholotsho where it has been promoted as a climate resilient crop. In bread making, it has often been blended with wheat [5]. Grains are toasted and ground to flour before use and can also be popped like popcorn. The leaves are used to make vegetable meal which tastes like spinach although nutritionally superior in terms of protein content and quality. Amaranth was a valuable crop in the ancient Aztec civilisation in Mexico where it was not only used for food but for medicine. Its medicinal value is obtained from its oil which makes 4.8 to 8.1 % of the grain. The oil though rich in oleic, linoleic and palmitic fatty acids, contains squalene, sterols, tocopherols, and carotenoids, phospholipids that makes skin look healthier and younger. Although the oil content in Amaranth appears low, it contains the highest squalene important in skin hydration whose content is the highest in plants outside whale and shark liver oil. Consumer awareness of all these benefits from Amaranth is essential in building market demand and create value chains.

### 3.1. Research Methodology

This multi-stakeholder and multi-sectoral survey integrated both qualitative and quantitative data. This enabled triangulation, explanation and contextualization of the findings. The approach started with interviewing hotel and large retail managers for fresh produce including the 47 Amaranth farmers as well as 27 residents in the two wards. Data collection was done in three forms that is household questionnaires and interviews with the respondents. These interviews were conducted in Bulawayo, Hwange, Victoria Falls and Binga. The survey sought to solicit the perception of the potential market of the vegetable. Purposive sampling method was used in the selection of respondents. This was done to ensure all potential buyers of the vegetable. A household questionnaire generated information on productivity, farmer capacity, uptake of the crop and knowledge around markets and pricing of the commodity.

Data entry and analysis was primarily done using the Statistical Package for Social Sciences SPSS version 24 for computing frequencies, relationships and correlations between the variables under investigation. Thematic content analysis was used for qualitative data from the key informants.

### 3.2. Key Findings

The following were the results of the market linkages survey;

### 3.3. Land ownership

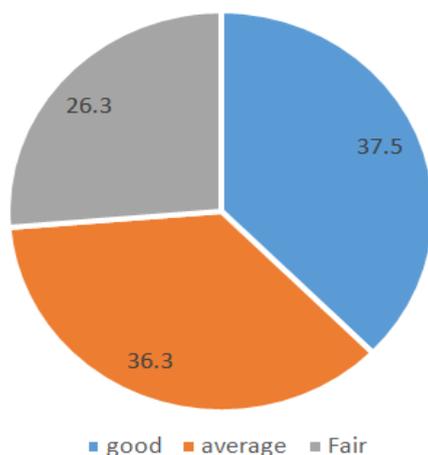
**Table 1. Land owned per household**

| Land owned in Hectares (Ha)   | Percentage (%) |
|-------------------------------|----------------|
| 1-5 Ha                        | 51.3           |
| 16-20                         | 2.5            |
| 21-24                         | 6.3            |
| 25 Ha/ 1 hectare - 5 hectares | 40.0           |
| Total                         | 100            |

All the respondents indicated they owned a piece of land on which they could cultivate the crop and that they had access to manure for the crop. The type of tenure is communal ownership which is not a suitable collateral for bank loans. Most households in the District etch a living on peasant dry cropping, which is vulnerable to climate change and climate variability. Over fifty percent of the households owned from 1 to 5 Ha of land, while 2.5 % owned between 16 and 20 Ha. Over six percent (6.3%) owned between 21 and 24 Ha with the rest (40%) owning 25 Ha or more. The respondents indicated that the greater portion of all the arable land in the two wards was dedicated to the growing of cereals like maize, sorghum and pearl millet with an insignificant portion left to the production of horticultural produce. However, food security is poor due to poor crop harvests caused by a combination of factors chief among them being droughts and poor farm management practices. In the case of cash cropping, incomes are generally low because of poor market linkages as well as proper pricing of their produce. The farmers further indicated that most of the horticultural products are produced in village gardens by irrigation during the greater part of the year.

### 3.4. Availability of Inputs

All the respondents indicated that agricultural input were not easily accessible particularly the vegetable seed. The initial seed was provided by the Tugwi Mukosi Multidisciplinary Research Institute (TMMRI). The first crop was dedicated to the production of seed by the farmers for distribution to needy farmers in the area. Fertilisers and pesticides were a challenge to farmers although AGRITEX officials and suppliers of these inputs categorised these inputs as good, average and fair respectively.



**Figure 1. Price of inputs**

More than thirty-seven percent (37,5%) of the input suppliers said the current prices of \$US30 per 50kg bag of Compound D fertiliser and US\$10 per 500 grams of pesticide are good considering that these items are imported. They indicated that if these inputs were sold at prices lower than the current prices it would be not viable to continue operating and would be forced out of business About 28.7% of them said the prices were average considering the prices for them same products in neighbouring countries while the rest (26.3%) regarded the prices as fair. However, all the farmers indicated that they could not afford these prices as all of them were not gainfully employed and depended on inputs from the government or non-governmental organisations. Use of natural fertilizers was recommended under the guidance of crop specialists in government and from The Tugwi Mukosi Multidisciplinary Research Institute.

### 3.5. Types of Horticultural Produce Consumed in the Two Wards

**Table 2. Horticultural produce consumed in the two wards**

| Type of produce   | Percentage (%) |
|---|----------------|
| Exotic leafy vegetables like Covo ( <i>Brassica oleracea var acephala</i> ) rape <i>Brassica napus</i> , variety <i>napus</i> tomatoes ( <i>Solanum lycopersicum</i> ) beans ( <i>Phaseolus</i> ), cabbages ( <i>Brassica oleracea var. capitata</i> ), <i>vulgaris</i> ) etc | 96.9           |
| Indigenous leafy vegetables- pumpkin leaves ( <i>Cucurbita pepo</i> ), <i>derere</i> ( <i>okra -Abelmoschus esculentus</i> ), grain and vegetable Amaranth ( <i>Amaranthus hybridus</i> ) etc   | 3.1            |
| <b>Total</b>  | <b>100</b>     |

More than 96% of households consume exotic leafy vegetables like covo cabbages, rape and so on. These exotic cultivars contain less micro-nutrients and proteins than indigenous vegetables. This one of the reasons why it became necessary to introduce the micro nutrient rich and easy to grow Amaranth in the District. Only 3.1% of the respondents indicated that they, apart from the exotic vegetables, they also consumed indigenous leafy vegetables like pumpkin and cassava leaves as well as Amaranth from a wide range of the local varieties. The households indicated that most of the indigenous vegetable grew naturally. Their nutritional value is still unknown to the local communities who still perceive them negatively as compared to exotic vegetable types.

### 3.6. Amount of Vegetables Required Per Household Per Day

**Table 3. Quantity consumed per day**

| Amount consumed per day | Percentage (%) |
|-------------------------|----------------|
| One bundle              | 95             |
| 2 bundles               | 2.4            |
| 3 bundles               | 1.3            |
| 5 bundles               | 1.3            |
| Total                   | 100            |

Table 3 shows quantities of exotic leaf vegetables consumed per day by an average household of five people.

Households said they produced enough vegetables for family consumption. Ninety-five percent (95%) of them indicated that they required one bundle of leaf vegetables, usually rape or covo or half a head of a cabbage per day. The respondents said the same uptake applied to indigenous vegetables. This scenario shows that local demand for both exotic and indigenous vegetables is too low hence the need to create demand locally by educating the people of the nutritional value of these vegetables or for the farmers to be linked to outside markets.

### 3.7. Other Sources of Protein and Vitamins

Table 4. Sources of protein and vitamins

| Meat   | Percentage (%) |
|--|----------------|
| a) Beans, beef from game and domesticated animals and fish | 65.5           |
| b) Vegetables (exotic & indigenous)                        | 34.5           |
| <b>a+b</b>   | 100.0          |
| <b>Total</b>   | <b>100</b>     |

Over sixty-five percent (65.5%) indicated that their main source of protein was meat from beans game and their livestock while 24.5% indicated that exotic and indigenous vegetables were their major sources of vitamins. All the respondents (a+b=100 %) said they got proteins and vitamins from both sources. Households access part of their fish from the local rivers on their way to the Zambezi River while a larger portion is got from fishermen. The majority of the respondents preferred bream fish which is usually preserved by drying or smoking.

### 3.8. Storage for the Produce

All the respondents indicated that storing their horticultural produce was a big problem hence a lot of loss through rotting. The traditional methods of preserving meat and vegetables were drying and smoking in the most cases. In the case of grains such as maize, sorghum and pearl millet so on were first dried and then stored in granaries. As a result of these methods post-harvest losses were quite phenomenal due to weevils since pesticides were not affordable to the majority of the households.

### 3.9. Access to Information by the Farmers

The two wards are served by a pot-holed tarred road off the Bulawayo-Victoria Falls Road at Cross Dete to Binga Centre about 150 kilometres away on the shores of Kariba Dam on the Zambezi River. There are dusty roads which link the two wards with the rest of Binga which are impassable during the rainy season. Public transport operators are not very keen to commit their fleets to Binga hence transport problems in the area. Mobile cell phone reception in the wards is very poor due to a few baseline stations that were established in the area. However, despite that problem the majority of the respondents had cell phones and a few did not have. Of those few having cell phones, only 10% had the android type and most of them have basic cell phones.

Table 5. Amount of money spend on airtime per day per household

| Money spend on airtime | Percentage (%) |
|------------------------|----------------|
| \$0-10                 | 97.5           |
| \$21-50                | 1.3            |
| Above \$51             | 1.3            |
| <b>Total</b>           | <b>100</b>     |

Most (97.5) of the respondents with cell phones spend \$0 to \$10 per day on airtime. The cell phone rates are too high and out of reach of the farmers who are not gainfully employed. The farmers indicated that they rarely use their cell phones due to the prohibitive rates. They said they only used cell phones to receive calls or when there was an emergency.

### 3.10. Transporting Produce to the Market

All the respondents indicated they did not have transport to take their produce to the market. They carry their produce on their own to their homes or to the local market. The farmers indicated the need for specialised transport so that their produce gets to the markets whilst fresh. The use of public transport like buses which ply the Binga-Bulawayo and Binga-Victoria Falls routes is another option.

### 3.11. Linkages to the Markets

From the market linkages survey carried on large-scale retailers, lodges and hotels in Bulawayo, Hwange and Victoria Falls a few retailers indicated ignorance of the vegetable while some hotels in Victoria Falls said they knew about the vegetable. Supermarkets indicated they traded with registered companies which is a challenge when it comes to the fragmented resource poor Binga farmers, hence the need to organise these farmers and register them. Also formal markets normally need produce that meets certain standards hence the farmers in the two wards face the challenge in selling their produce to the formal market.

The hotels in Victoria Falls said that they offered the Amaranth dish to foreign tourists and indicated that the Amaranth vegetable they serve was imported from South Africa. Those hotels and lodges who did not know the vegetable indicated their willingness to try it on their shelves or menus. They asked if it was possible to get some samples they could use to gauge the demand for the vegetable by their clients.

## 4. Conclusions

From the above findings the following conclusions can be made;

- Households have a positive perception towards production and consumption of Amaranth. This can be exploited by the farmers to create demand for the vegetable locally and beyond. There is a limited diversity of crops and sources of income for the farmers in the two wards. Diversity of crops gives nutritional resilience while wider income sources build resilience to extreme weather conditions such as droughts.

- The potential markets that is Bulawayo, Hwange and Victoria Falls are very far and the road connectivity is very poor as indicated by the poor state of the roads. This might result in the produce getting to the market stale thereby fetching lower prices.
- Supermarkets need registered companies which is a challenge dealing with the fragmented resource poor farmers, hence there is need to arrange farmers into groups. Also formal markets normally need produce that meets certain standards hence the farmers in the two wards face the challenge in selling their produce to the formal market.
- Since it is a new crop uptake might be low and production might also be low to meet the demand that may arise from the markets. However Amaranth has great potential to mitigate against climate change in
- The government through the Ministry of Health and Child Care's Nutrition Department, be engaged as an advocacy partner to popularize the nutritional value of the vegetable among local communities, supermarkets and lodges.
- Given the perishable nature of the vegetable, local demand needs to be generated first while in the long run, possibilities of value addition and beneficiation are explored to tap into international markets.

## 5. Recommendations

From the findings and recommendations above the study recommend the following;

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