



Full Length Research Article

THE IMPACT OF WINTER PRODUCTION OF TRADITIONAL VEGETABLES ON HOUSEHOLD FOOD SECURITY: A CASE STUDY OF RIVER BED ALLUVIAL DEPOSITS TRADITIONAL GARDENS IN HWANGE DISTRICT, MATABELELAND NORTH PROVINCE

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ABSTRACT

Traditional vegetables have been consumed by many rural communities for centuries and have a potential to contribute to household food security by providing direct access to readily accessible nutritious food and income. The availability of fresh vegetables is however seasonal but local communities in Hwange have made it an all year round activity. To assess the production and availability of the traditional vegetables, a survey was conducted in July to November 2013 in Nekatambe Ward of Hwange District. The study was aimed at identifying and assessing the indigenous production systems, consumption and the role of traditional vegetables in income generation, food security and livelihoods of the households. Data was collected through focus group discussions, field observations and questionnaire surveys on forty households. Results showed that traditional vegetables were produced in abundance in winter so that households had vegetables all year round. The winter vegetables are cultivated in the alluvial deposits in river beds. The traditional vegetables are produced organically using manure, organic pest control and intercropping with no inorganic fertilisers. Basin irrigation is used for watering. 47% of the respondents make over US\$150 per month from the sale of vegetables. Marketing is informal and some vegetables are sold through barter and trade. Income generated is used to buy non food items and invested in small livestock. Information on agronomy, nutritive value and methods of preparation that minimise nutrient leaching is scarce among the communities

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INTRODUCTION

Africans have for centuries relied on indigenous vegetables not only for food security, but also for medicinal, social, cultural and income generating purposes. However, there has been a general decline in the consumption of these vegetables over the years, a factor attributed to unavailability and disappearing knowledge particularly among the younger generations. According to FAO (1988), traditional vegetables are all categories of plants whose leaves, fruits or roots are acceptable and used as vegetables by rural and urban communities through custom, habit and tradition. Before the introduction of exotic species, they were widely consumed, particularly during famines or natural disasters. While most of them are gathered when in season or are grown in home gardens as intercrops with staples, they may find their way to

urban markets (Mnzava, 1999). Traditional vegetables are a valuable source of nutrition in rural areas where exotic species are not available, and contribute substantially to protein, mineral and vitamin intake. They are compatible in use with starchy staples and represent a cheap but quality nutrition to the poor sector of the population in both urban and rural areas where malnutrition is widespread. They provide good nutrition at low cost, in contrast to exotic species. (Mnzava 1999)

What are indigenous traditional vegetables?

Indigenous traditional vegetables can be defined as plants that are native or introduced whose leaves, flowers or fruits have been used over a long time hence have become part of the culture and tradition of a community (Maundu, 1997). The term "indigenous" has been used in generic form to accommodate those crop species, although not limited to native area, but have been produced over years for the enhancement of high value of nutritious leafy vegetable. There

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is now recognition that traditional vegetables are important for food security and that their production, processing and marketing are significant contributors to income. Marketing of traditional vegetables is increasingly becoming an important source of income for most communal communities in the SADC Region (especially women) who cannot get employment in the formal sector (Lyatuu and Lebotse, 2010).

Food security

During periods of relish shortage, especially in the dry season (the relishgap period), traditional vegetables previously preserved by drying become very important in household food security. Their ability to grow quickly and become harvestable within a short period makes them useful in sustaining nutrition intervention programmes. They offer variety and can contribute to broadening the food base (Okigbo 1977). Being accessible to the lowincome communities in rural and urban areas, they offer an opportunity of providing affordable nutrition to avert malnutrition. Indigenous plants occur naturally in an area, are usually adapted to harsh environments, generally require simpler technologies and inputs to grow and can therefore be cultivated in more arid regions (Van derWalt et al., 2005; Jansen van Rensburg et al., 2004; Chadha and Oluoch, 2002). Green, leafy vegetables are referred to as *undibo* or *imbhida* in the indigenous Nambya and IsiNdebele language respectively.

The aims of the study were:

1. To document the winter production of indigenous vegetables in alluvial gardens (*Inchelela*).
2. To document the diversity of indigenous vegetables, establish the consumption, marketing and importance of these vegetables to the households.

MATERIALS AND METHODS

Study area site description

The survey winter production of indigenous vegetables carried out in July to November 2012. The study area was in Nekatambe Ward in Hwange District of Matabeleland Province of Zimbabwe. The co ordinates are 18° 18' S and 26° 30' E and the area is in Natural Region IV. This is a lowland area with an altitude of 630 metres asl, with rainfall up to 550 mm annually. The study included a qualitative explorative phase consisting of observations, semi-structured interviews with key informants as well as focus group discussions to determine the availability, accessibility, constraints related to the production and consumption, marketing and income generation. This was followed by a quantitative household survey to determine production, consumption, processing and sale of indigenous vegetables. The quantitative survey was carried out in August 2013. Data was analysed using Scientific Package for Social Sciences Version 16 and Ms Excel.

RESULTS AND FINDINGS

During the focus group discussions, the participants identified the most important indigenous vegetables in their areas and

these were available in the summer (December to April) and those cultivated in the winter (May to November).

Demographics

Fifty seven per cent of the respondents were female and 43% were male. The youngest respondent was 20 years and the oldest was 85 years. Table 1 shows the age ranges of the respondents.

Table 1. Age of respondents

Age range of respondents	% of respondents
20 to 30 years	20
31 to 40 years	17
41 to 50 years	27
51 to 60 year	27
61 to 70 years	7
Over 71 years	3

The study revealed that vegetable production in winter gardens was an activity that used to be carried out by elderly women. Men and other household members assisted in fencing and watering. This has changed over the years since men and younger women were now involved in the winter production of these indigenous vegetables. The study found that 57% of the respondents had at least some primary education, whilst 36% and 7% had secondary and no formal education respectively (Figure 1).

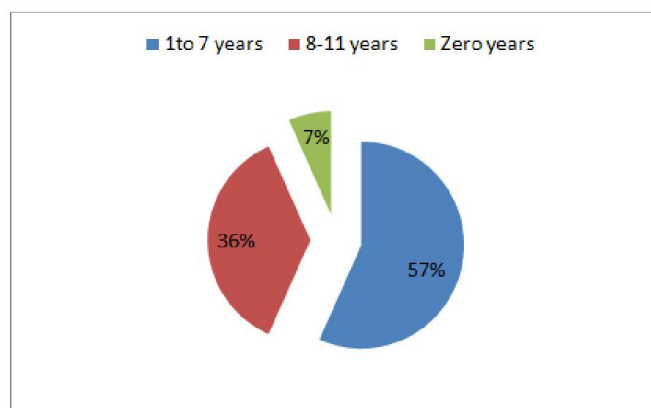


Fig. 1. Level of education of respondents

Marital status

Forty four per cent of the respondents were married whilst 10%, 15% and 15% were widowed, single and separated respectively.

Household size

The family sizes varied from 2to 15 people. Seventy per cent of the respondents had 1 to 5 household members, whilst 23% and 7% have 6 to 10 people and 11 to 15 people respectively.

Winter production of vegetables in Nekatambe Ward

Table 2 shows the major indigenous vegetables produced in winter in the alluvial gardens.

Table 2. Vegetables grown and available in winter (June to November)

Scientific name	Common name	Edible part
<i>Legenaria siceraria</i>	Gourds	Fruit
<i>Vigna unguiculata</i>	Cowpeas	Leaves and fruit
<i>Citrullus lanatus</i>	Melon	Fruit
<i>Cucumis melo</i>	Water melons	Fruit
<i>Cucurbita maxima</i>	Pumpkin	Leaves and fruit
<i>Cucurbita pepo</i>	Pumpkin	Leaves and fruit

gets to the alluvial deposit or layer. The basins are 1.5 to 2 metres apart, 0.30 to 0.50 metres in diameter and 0.20 to 0.30 metres deep. Vegetable seeds are planted in the basins at no precise spacing. Three or four seeds of the same or different vegetable varieties are planted in one basin. Weeding is done by uprooting any weeds that may grow in the basin. The main “weeds” were mainly the shooting *Phragmites mauritianus* *Argemone mexicana*. The weeds were minimal due to the basin irrigation method used and that most of the weeds are

The Plates 1 to 4 shows the main species of cultivated traditional vegetables.



Plate 1. Pumpkin *Cucurbita maxima*.



Plate 2. *Legenaria siceraria* Gourds



Plate 3. Pumpkin fruits



Plate 4. *Citrullus lanatus*

Production systems used for winter vegetable

The study revealed that indigenous vegetables are grown in winter (May to November) in the alluvial deposits gardens in river beds. Fifty per cent of the gardens were reported to be more than 100 m², whilst 30% and 13% have gardens of 76 to 100m² and 50 to 75m² respectively. The major traditional vegetables grown for cash were gourds (30%), followed by pumpkins (17%) and all management practices in these gardens were basically traditional. The respondents reported choosing a site in the river bed or island. A site with reeds, *Phragmites mauritianus* was selected, cleared and fenced with brushwood. Basins are dug by removing the sand until one

not that prolific in winter. Plates 5 and 6 show the arrangement of basins in the river bed.

Fencing

The gardens were fenced of *Acacia tortillis*, *Acacia karroo* brush wood and *Mundulea sericea* poles. The acacia brushwood is cut from the summer rain fed fields and the *Mundulea sericea* poles from the river banks. These tree species coppice easily and grow very fast. The respondents said that the cutting of the brushwood for fencing the winter gardens was also a way of preparing the fields for the rainy season. Plates 7 and 8 show the fenced winter gardens.



Plate 5. Vegetable seedlings in basins



Plate 6. Arrangement of basins



Plate 7. *Acacia karroo* fence



Plate 8. *Mundulea sericea* poles



Plate 9. Basin with manure clods

The study revealed that most seed of traditional vegetable is obtained from the previous season's crop. The farmers select the best fruits and retain them for seed production. When mature, the seed is processed, stored for use in summer and the following winter.

Soil improvement

Low cost soil fertility management options were used in the gardens. Ninety seven per cent of the respondents used goat and cattle manure and 3% used some mulching. All the respondents use decomposed leaves mixed with silt and clay that is deposited by the river floods recedes (Plate 9).

Ashes and compost were also put in the basins and these supply all the nutrients to the vegetable, hence the respondents reported not using any inorganic fertilisers.

Irrigation water management

All the respondents reported using basin irrigation. Fifty seven per cent of respondents reported collecting water from shallow holes in the gardens (Plate 10 and 11). A 100 m² garden was reported to have three to four shallow wells such that only 13% of respondents reported getting water from more than 11 metres away. The study showed that 83% of respondents water

their gardens twice a week, whilst 10% and 7% reported watering thrice and four times a week. The frequency of watering was reported to be dependent on the month of the year, size of basin and the stage of crop development. The respondents reported that when the vegetables were at maturity with almost 100% ground cover, the frequency of watering was reduced. The respondents reported watering less frequently in the cooler months of June and July. The watering frequency increased to three or four times a week during the hotter months from September to November. The lower watering frequency was reported to be also due to the silt and clay texture of the alluvial deposits, capillary rise of water, damp micro climate in the gardens and the complete shading of the ground by the creeping vegetable plants. Plates 12 and 13 shows the *Cucurbita maxima* and *Legenaria siceraria* completely covering the ground.

Table 3: Pest and disease management options

Management Option	% of respondents using option	Comment
Intercropping	13	Different vegetables are intercropped
Use of ash	70	Use of ordinary ash to control aphids and stink bugs

The respondents reported that all these gardens are washed away by the flooding rivers in November, at the onset of the rain season, hence there was no vegetable production in the river beds from November to April. The respondents said that this ensured a “dead” season and this rotational system did not allow any build up of diseases and pests. In summer the respondents reported getting their indigenous vegetables from the rain fed fields.



Plate 10 and 11. Shallow water sources in the gardens



Plate 12 and 13. *Cucurbita maxima* and *Legenaria siceraria* at complete ground cover

Sixty seven per cent of respondents reported siting and locating their gardens in the river bed whilst, 33% located the gardens on the river banks and these were commenced in June (40%), whilst 33% and 27% began in April and May. The women would have finished the harvesting of small grains in their summer rain fed fields and hence have some spare time for these gardens.

Pest and disease control management

Table 3 below shows the pest and disease management options used in the winter gardens by the respondents.

Food security and livelihoods

The study revealed that the winter gardens provided employment, food security and a source of income for investment in livestock and other household assets. The study found that the primary sources of income are small livestock sales (40% of respondents), vegetable sales (37%) and casual non agricultural work 23% and the winter gardens were a major livelihood strategy for these communities.

Marketing of indigenous vegetables

Fifty seven per cent of the production and 95% of the handling and marketing was done by women. For the men interviewed, the spouses were reported to be involved in the production and marketing. The women harvest and pack the vegetables for the vendors who come to these gardens. Women vendors from other rural areas with no access to water, alluvial garden sites and urban centres of Dete, Hwange and Victoria Falls bought and transported the vegetables to strategic road side and urban vegetable markets. At each vegetable exchange point, a profit of over 100% was made. The vendors purchased a bundle of vegetables for US\$1.00, split the bundle into two and sold each at US\$1.00 bundle to the consumers. Vendors and traders travel distances of 30 to 100 kilometres to buy these vegetables for resale. The respondents revealed that retail supermarkets like TM Hwange bought gourds at US\$1.00 for four gourds. The four gourds weigh almost one kilogram and the supermarket sold the gourds at US\$2.50 per kilogram to the urban consumers. There are two types of markets where the traditional vegetables are marketed; the formal and informal markets. Formal markets are specialised types such as TM supermarket in Hwange and Zambezi Traders (Pvt) Ltd in Victoria Falls whilst informal markets include local, door to door sales in urban areas and at Lambo, Chentali and Lukosi road side markets. Seventy three per cent of the respondents reported resorting to barter trade. This was with maize, sorghum and millet (23%), whilst barter with non-food items (soap and clothing) and non staple food items (salt, sugar and cooking oil) was reported by 7% of the respondents. In barter trade, two gourds are exchanged for a 1 litre cup of grain and a bundle of about 1kg of green leaves to 1 litre cup of grain. The vegetable growers reported getting between 20 to 50 kg of grain per month. The grain is used by the household for their staple food. Barter with non food and non staple food items are done mainly in urban areas. Twenty three per cent of respondents reported sending their produce to Hwange. These growers reported moving from house to house in the residential areas where these vegetables were very popular and are on demand.

and 30% reported having not made any thing as yet since they had just commenced their gardening. The study showed that 70% of the respondents used the income realised to buy food stuffs for the household, 13% used it for medicines and hospital fees and the remaining 17% used the money to buy small livestock (goats and chickens). The small livestock are easily sold to raise income for the household in times of need. No training on indigenous vegetables production has been received from any organisation. The knowledge that they were using has been passed from one generation to the next. Initially alluvial gardens were an activity carried out by women, however men have now also engaged in the winter production of the indigenous vegetables having realised that it was an income generating activity. The study revealed that indigenous vegetable consumption in these rural communities was very high with 40%, 23% and 7% having consumed fresh vegetables once, twice and thrice per day in the week prior to the study respectively. The 30% of the respondents who reported not having eaten any fresh vegetables in the past seven days prior to the survey were those who were still establishing their gardens when the survey was conducted. All the members of the households were reported to be eating vegetables.

Preservation of vegetables

The study showed that many of the leafy vegetable are preserved by sun drying of fresh, blanched or cooked leaves. Both these methods transform the leafy vegetables into dry products that have long shelf lives. Dried vegetables are used by the households during the times of the year when the supply of fresh vegetables is low. It was reported that 3%, 13%, 30%, 23% and 7% consume dried vegetables more than five times, four times, thrice, twice, once whilst 23% did not eat any dried vegetables. Ninety seven per cent of the respondents processed the surplus vegetables and 3% did not. The main processing methods are drying in direct sunlight (77%), dry in shade (7%), boil and dry in direct sunlight (13%). Three per cent reported making dried melon and cucumbers.



Plate 14. Dried vegetables



Plate 15. Boiled cow pea leaves with tomato being

Income generation and its utilization

The study revealed that 47% of respondents made more than US\$200 in the two months prior to the study, 13% and 10% reported having made US\$101-200 and \$50-\$100 respectively

The melon or cucumber rind is removed and the melon cut into thin slices. These slices are dried and can be cooked during the lean season as thick porridge and relish. Plates 14 and 15 shows some dried vegetables and the drying method used.

DISCUSSION

Consumption of indigenous vegetables and fruits

Consumption of vegetables in sub-Saharan African countries is low as compared to other countries like those in Asia and Latin America. World Health Organisation (WHO) and Food and Agricultural Organisation (FAO) recommend that a person should consume 400 grams of vegetable daily, or 146 kg per year (Haskell *et al.*, 2004). Indigenous vegetables have been verified to be superior nutritionally compared to exotic vegetables. They are good sources of vitamins, minerals and fibre. Consumption of indigenous vegetables observed in this study was high. Just as observed in the road side markets and household garden production, cowpea and pumpkin leaves and gourds were the most popular indigenous vegetables. These vegetables are consumed by more than 60% of the households. About 50.8% of the households reported having consumed it in the last 7 days preceding the survey.

A wide range of indigenous vegetables are available and can enable rural households to meet their varied household needs for food, nutrition and medicines. These species are often part of the traditional diet and culture and the subject of a body of indigenous knowledge regarding their management and use (De Pee *et al.*, 1995). Despite this their consumption levels have been decreasing with time as more emphasis is directed towards the exotic fruit varieties. The study showed that the vegetables produced in the irrigated winter gardens are a risk avoidance strategy adopted by the rural households in order to meet their vegetable and nutritional needs. The irrigation of the gardens makes it possible to produce food and raise income to buy other food and non food items.

Current situation of marketing of indigenous vegetable by communal farmers

Informal markets are the main marketing channel of marketing indigenous vegetables though this channel has many disadvantages to both the seller and buyer. The seller may walk long distances without guaranteed buyers. Damages are also relatively higher during transportation and in the event that the vegetables are not bought due to lack of market information. The growers get low profits due to high transportation costs and poor negotiation power. Poor or absence of market information system, lack of promotion to articulate need and lobby for interest in the traditional vegetables industry contribute to low returns from sale of these vegetables.

Nutrition

Indigenous vegetables play an important role in the African agricultural and nutritional systems. They are used in meals as side dishes, relish and/or for food variety and for decoration. The high protein and vitamin content in these vegetables can eliminate deficiencies amongst children, pregnant women and poor people living in rural areas. Since they are cheaper, the traditional vegetables can replace meat in the diets of those who cannot afford to buy meat. Cowpea leaves have high vitamin and protein content, and they also fix nitrogen in soil (WHO, 2003).

Some indigenous vegetables have medicinal value. People suffering from diseases such as high blood pressure, HIV/AIDS, cancer, hypertension have been advised to consume indigenous leafy vegetables. Table 4 shows the nutritive value of some selected indigenous and exotic vegetables popularly grown, consumed and marketed in the study area and many parts of the country.

Table 4. Nutritive value of selected indigenous leafy vegetables and exotic vegetables popularly grown, consumed and marketed in many parts of Africa (Nutrient content per100g fresh weight)

Vegetable	Protein (%)	Ca (mg)	Fe (mg)	B-Carotene (mg)	Vitamin C (mg)
Indigenous leafy vegetables					
Amaranth	4.0	480	10	10.7	135
Spider plant	5.1	262	19	8.7	144
Cowpea	4.7	152	39	5.7	87
Nightshade	4.6	442	12	8.8	131
Jute mallow	4.5	360	7.7	6.4	187
Common Exotic Vegetables					
Kales	2.5	187	32	7.3	93
Cabbage	1.4	44	0.8	1.2	33
Spinach	2.3	93	32	5.1	28

Source FAO and WHO, 2003

Lubhancho House, a locally based church organisation was the only institution in Hwange District that was reported to be encouraging the production, consumption and utilisation of indigenous vegetables. This organisation works in all rural and urban communities of the district. The government extension agents have not been involved in these alluvial gardens and this shows that whatever the communal farmers are doing has been passed down from one generation to the next as a way of mitigating against times of food and vegetable shortages.

Drying

Direct sun drying and boiling and drying are the most common method of drying indigenous vegetables. The drying process starts from the cleaning of vegetables, partial boiling in salty water and then placing in the sun. When drying boiled vegetables, water is drained out before placing them in direct sunshine. This leads to a loss in water soluble vitamins. Solar driers can also be used so that one produces more hygienic and clean dry vegetables but these technologies have not been used or introduced to the communal farmers or groups in Hwange District.

Conclusion and Recommendations

Production of indigenous vegetables is one of the fields that offer employment with higher profit returns, yet the starting capital required is lower than for most other agricultural investments. Nutritionally, indigenous vegetables can provide widely accessible sources of essential vitamins particularly A, C, and minerals (such as calcium and iron) as well as supplementary protein and calories. The market potential of indigenous vegetables is very large and has not been fully exploited. Current economic situation in the district and country provides opportunities for an expansion of indigenous vegetables production and marketing to enhance increased income of communal farmers. Moreover, there is a huge potential to commercialise indigenous vegetables, which currently are used mainly for subsistence in rural areas in

either fresh or processed form. This sector is very important as it employs disadvantaged individuals and groups who cannot get formal employment anywhere else, except by growing these indigenous vegetables.

It has been recognised that an important factor in improving the viability of rural livelihoods in developing countries is the promotion of sustainable agriculture. As opposed to relying solely on cash crops, this can be more easily achieved through the promotion of the nutritious indigenous vegetables and domestication of various indigenous fruit trees that can be cultivated and owned by communal farmers. These vegetables grow under a wide range of environmental conditions, several species are more resistant to pests and diseases, are more nutritious and could most sustainably reduce micronutrient deficiencies in resource poor communities (WHO, 2003). Therefore, through multifunctional and integrated farming systems, these indigenous vegetables can support environmental and social sustainability by providing food as well as promoting economic growth (Flyman and Afolayan, 2006). It is, therefore, important to promote their production and consumption. This can be done through sensitising a community's own resource persons on the nutrition and adaptability of these products. The indigenous vegetables could also be incorporated in the on-going food-based approaches of diversifying home and kitchen gardens.

Institutional Support

The study revealed that there is no support from government or other organisation in the training of farmers in indigenous vegetables. Training should be mainstreamed in the curricula in the training of extension personnel and this can be cascaded down to the farming communities.

Research

Research findings on the use and importance of indigenous vegetables should be made available to the end user/s through collaboration between research, extension personnel and all other stakeholders. The generated knowledge and technology should be made available to the farmers. Researchers should continue collecting and recognising indigenous knowledge and improving on that knowledge. Extension should be strengthened with emphasis on linkage with research, dissemination and sharing of available information through farmer field schools, agricultural shows, networking between institutions through radio and magazine is essential.

REFERENCES

African leafy vegetables in South Africa. 2007.
 Aphane, J., Chadha, M.L and Oluoch, M.O. 2002. FAO-AVRDC International Workshop proceedings, Arusha, Tanzania. Increasing the Consumption of Micronutrient-rich Foods through Production and Promotion of Indigenous Foods.

Chigumira-Ngwerume, F and Grubben, G.J.H. 2004. *Cucurbita maxima* Duchesne In: Grubben GJH and Denton OA (eds.) *PROTA 2: Vegetables/Légumes* [CD-Rom]. PROTA, Wageningen, The Netherlands. 263-267.
 De Pee, S, West, C.E., Muhilal Karyadi, D., Hautvast, J.G.A., 1995. Lack of improvement in vitamin A status with increased consumption of dark-green leafy vegetables. *Lancet*; 46(8967):75-81.
 Diet, 2003. nutrition and the prevention of chronic diseases. Joint WHO/FAO expert consultation. WHO technical report series no. 916. Geneva: World Health Organization;
 FAO. 1990. Utilization of Tropical Foods: Fruits and Leaves. FAO Nutritional Paper 47/7. Rome: FAO.
 Flyman, M.V, Afolayan, A.J., 2006. The suitability of wild vegetables for alleviating human dietary deficiencies. *S Afr J Botany* 2006;72:492-7.
 Haskell, M.J, Jamil, K.M., Hassan, F., 2004. Daily consumption of Indian spinach (*Basella alba*) or sweet potatoes has a positive effect on total-body vitamin A stores in Bangladeshi men. *Am J Clin Nutr*;80:705-14.
 Lyatuu, E., Lebotse, L. (Eds) 2010. Marketing of Indigenous Leafy Vegetables and
 Maunder, E.M.W and Meaker, J.L. 2006. The current and potential contribution of home-grown vegetables to diets in South Africa. *University of KwaZulu-Natal, Discipline of Dietetics and Human Nutrition, School of Agricultural Sciences and Agribusiness, Private Bag X01, Scottsville, Pietermaritzburg 3201, South Africa*
 Mnzava, N.A and Chigumira Ngwerume, F. 2004. *Cleome gynandra* L. In: Grubben GJH and Denton OA (Eds.) *PROTA 2: Vegetables/Légumes* [CD-Rom]. PROTA, Wageningen, The Netherlands. 191-195.
 Mnzava, N.A. 1989. Indigenous vegetables in Zambia. Proc. 1st Svaloef/BITS Seminar on Organization and Management of Seed Production and Supply. Lusaka, Feb. Sveriges Utsades. Tidkrift. 99(4):24 (Abstr.).
 Mnzava, N.A. 1993. Traditional Vegetables in Tanzania. Paper presented at the 1st National Research Planning Workshop. Arusha, Tanzania. (Unpublished Proceedings).
 Okigbo, B.N. 1990. Vegetables in Tropical Africa. Pp. 29-52 in *Vegetable Research and Development in SADCC Countries* (R.T. Opena and M.L. Kyomo, eds.). Proceedings of a workshop held at Arusha, Tanzania, 9-13 July 1990. AVRDC Publication No. 90-328. Asian Vegetable Research and Development Centre, Taiwan.
 Okigbo, B.N. 1977. Neglected plants of horticultural and nutritional importance in traditional farming systems of tropical Africa. *Acta Hort*. 53:131-150.
 van Heerden, I., Wenhold, F., Oelofse, A. (?). How Smallscale Farmers can improve their Incomes. Agricultural Research Council, Dar es Salaam, Tanzania
 Jansen van Rensburg, W.S., van Averbek, W., Slabbert, R., Faber, M and van Jaarsveld, P.
