

Opportunities and constraints in the subsistence production and marketing of indigenous vegetables in East and Central Africa.

A 0699

**Report for the rainy season in
Cameroon and Uganda**

Edited by Rudy Schippers and Nicholas Fereday

March 1998

**University of
Dschang
P.O.Box 388
Dschang
Cameroon**

**Institut de
Recherche Agricole
pour le
Développement
IRAD Ekona
PMB 25 Buea
Cameroon**

**International Institute for
Tropical Agriculture - Humid
Forest Station
BP 2008 (Messa) Yaoundé
Cameroon**

**Makerere
University
P.O.Box 7062
Kampala
Uganda**

**Kawanda
Agricultural
Research Institute
P.O.Box 7065
Kampala
Uganda**

**Natural Resources Institute,
Greenwich University
Central Avenue
Chatham Maritime
Kent ME4 4TB
United Kingdom**

Contents

	Page
Abbreviations	3
Key to vernacular names	3
Introduction	4
Summary	5
Socio-economic surveys of indigenous vegetables:	9
1 CAMEROON	
1.1 Foubot area, Northwest Cameroon. <i>Dr Joseph Berinyuy, University of Dschang</i>	9
1.2 Buea area, Southwest Cameroon. <i>Dr Manfred Besong, IRAD, Ekona.</i>	15
1.3 Yaoundé. <i>Dr James Gockowski, IITA</i>	21
2 UGANDA	26
2.1 Lira district. <i>Constance Owori, Agnes Nayiga and Margaret Nabasirye, Kawanda Agricultural Research Institute.</i>	26
2.2 Peri-urban Kampala. <i>Dr Remigius Bukeny-Ziraba and John Tabuti, Makerere University</i>	31
Annex 1: Examples of farmer and trader checklists	39

Abbreviations

DFID	Department for International Development
EV	Exotic vegetable (of non-African origin)
GDP	Gross Domestic Product
Ha	Hectare
IITA	International Institute of Tropical Agriculture
IRAD	Institut de Recherche Agricole pour le Développement
IV	Indigenous vegetable (of African origin)
NRI	Natural Resources Institute

Key to vernacular names

Vernacular name Scientific name/English name

Uganda:

Doodo	<i>Amaranthus cruentus</i> (+ <i>A. dubius</i>)
Nakati	<i>Solanum aethiopicum</i> Shum group
Ntula	<i>Solanum aethiopicum</i> Gilo group - Garden egg
Jjobyo	<i>Gynandropsis gynandra</i>
Bbuga	<i>Amaranthus blitum</i> + other wild Amaranth species
Sunsa/nsuju	Pumpkin leaves
Timpa	Cocoyam leaves
Nsuga	<i>Solanum nigrum</i> / huckleberry group
Gobe	<i>Cajanus cajan</i> , Pigeon Pea
Biringanya	(brinjal) eggplant
Kamulali	Green pepper
Saga	<i>Brassica carinata</i> , Ethiopian kale

Cameroon:

Zom, Jamajana	<i>Solanum nigrum/ scabrum</i> , Huckleberry
Folon, Green	<i>Amaranthus cruentus</i> , Amaranth
Ndolé	<i>Vernonia spp.</i> , Bittergourd
Njakatu	<i>Solanum aethiopicum</i> Gilo group - Garden egg
Ekongobong	<i>Telfairia occidentalis</i> , Fluted Gourd
Kelen Kelen, Tege	<i>Corchorus olitorius</i> , Jute Mallow
Eru	<i>Gnetum buchholzianum/africanum</i>
Anchia	<i>Solanum macrocarpon</i>

Introduction

This report summarises the results of market and production surveys carried out in the rainy season in Cameroon and Uganda during the second half of 1997 as part of the DFID funded project, **Opportunities and constraints in the subsistence production and marketing of indigenous vegetables in East and Central Africa (A0699)**. The main objectives of the study was to establish the socio-economic significance of indigenous vegetables compared to exotic ones. This project is a follow up to the strategy paper on indigenous vegetables (A0515) and the subsequent workshop held in Limbe, Cameroon (A0593/A0674).

In both countries fieldwork was initiated by a planning meeting with the local collaborators. In Cameroon the meeting took place in Douala in June 1997. Three survey areas were chosen to reflect the diversity of agro-ecological conditions in Central Africa: the highland humid forest zone (Foumbot and Bamenda areas), the lowland humid forest zone (Buea area, SW Cameroon), and the urban/peri-urban area around the capital Yaoundé. Work in each of the survey areas was conducted in collaboration with a different institute: Dschang University of Agriculture for Foumbot/Bamenda coordinated by Dr. Joseph E Berinyuy; Institut de la Recherche Agronomique (IRA) for Buea coordinated by Dr. Manfred Besong, Deputy Chief of Centre, Ekona; and the International Institute of Tropical Agriculture (IITA) for Yaoundé coordinated by Dr. Jim Gockowski. Before the survey work began two four-day training seminars on informal survey methods were conducted by NRI staff; one at Dschang University with Dr. Berinyuy and the other at Ekona research station, Buea with Dr. Besong.

At the planning meeting in Kampala, Uganda in August, two areas were selected: Lira district in the northern zone where it is relatively dry and peri-urban Kampala in central Uganda. The Kampala survey was carried out in collaboration with Makerere University led by Dr Remigius Bukenya-Ziraba, Head of Biology Department and the Lira district survey with the Kawanda Agricultural Research Institute led by Constance Owori, Post Harvest technologist and Dr Silim Nahdy, Director of Research. Again, NRI provided training in survey methods at both Lira and Kampala.

The term Indigenous Vegetable refers to those crops which originated from Africa whereas traditional vegetables could be either African or introduced from e.g. South America like pumpkins or cassava. This introduction could well have taken place a long time ago but under the present context is not considered as indigenous. Exotic vegetables like cabbage, carrots or tomatoes are of non-African origin.

A second report for the dry season will be available later in the year. Individual reports for each of the study areas were prepared by the collaborating institutes and are included here. The main findings from the five survey areas, almost 1,000 interviews in total, are summarised in this report.

Summary

IVs have both subsistence and income value for the poor

In both countries indigenous vegetables were found to play an important role in both income generation and subsistence production. All the surveys provided evidence that indigenous vegetables offered a significant opportunity for the poorest people to earn a living, as producers and/or traders, without requiring large capital investments. Indigenous vegetables are also a very important commodity for poor households because their prices are relatively affordable compared with other food items.

They have also provided an important source of employment for those outside the formal sector in peri-urban areas and the outlying urban periphery, because of their relatively short, labour-intensive production systems, low levels of purchased input use and high yields. As the level of urban unemployment rose during the economic crisis, the production of these vegetables was increasingly targeted as a livelihood strategy.

The volume of production and traded IVs has increased

A wide range of vegetables, both indigenous and exotic, were found in all the study areas. Although the volume of exotic vegetables found at urban markets can be somewhat greater, especially in the high altitude areas, there are more species of indigenous vegetables being grown.

The volume of production and the number of traders of indigenous vegetables has increased in recent years although there are often supply shortages in the dry season. In Cameroon the increase in production and marketing is in response to the higher demand for indigenous vegetables from urban areas possibly as a result of the economic crisis which resulted in a strong decline of people's purchasing power forcing consumers to switch to cheaper alternatives.

The study in Yaoundé found that the sellers of exotics vegetables earned more than sellers of indigenous vegetables. Possible reasons for this include the higher perishability of exotics and the higher financial risk (exotics are more expensive to buy). Conversely the lower capital requirements and lack of barriers to entry make the indigenous vegetable market more competitive implying lower profits.

IVs are preferred to Exotics

Despite the significant exotic vegetable production, indigenous vegetables remain popular especially in rural areas. They often have a ceremonial role and are an essential accomplishment, such as a sauce, to starchy staple food. Many people consider them as more tasty than EVs. Farmers produce EVs such as cabbage for the trade because they can withstand long-distance transport and thus fetch a good price but prefer to eat their traditional crops including e.g. pumpkin leaves because of their good taste. Tomato is the most preferred exotic crop and many regard it as a traditional crop. Also onions are much appreciated and are often obtained from outside the region.

Women have an important role in both production and marketing

Women are key players in the production, processing and marketing (mainly retailing) of indigenous vegetables. Arguably the indigenous vegetable market is one of the few opportunities for poor, unemployed women to earn a living. The Yaoundé study found that in 14 satellite markets around the city about 1,000 women were engaged in selling indigenous vegetables. For these women and their families the meagre revenues earned are of the utmost importance. The average income for women engaged in selling IVs is CFA 817 per day versus CFA 1028 for sellers of exotic vegetables. The sale of exotics was found to be more risky and requires a higher capital outlay.

Men were more likely to be involved in the production of cash crops although it was observed that where indigenous vegetables were grown on a commercial scale, men were more likely to be involved.

Similarity in production systems between Cameroon and Uganda

Despite the difference in crops and geographical distance, the production systems in the five study areas were found to be very similar. Mixed farming practices were unvariably noticed for subsistence production or small-scale production for income generation during the rainy season. The more commercial production, especially under irrigation in the dry season, is usually a monocrop. For leafy vegetable production a ratoon-like system is utilised for harvesting such diverse crops as Nakati in Uganda or sweet bitterleaf in West Cameroon. Also thinning as a means of a first harvest in an otherwise ratoon crop, is utilised in both countries.

Marketing chains are well established

The marketing chains for indigenous vegetables are well established especially for the more commercial crops such as huckleberry in Cameroon. Because of their perishability the vegetables are harvested for the market either the evening before the market day or during the day of the market, quite often through contractual arrangements with wholesalers. Some wholesalers have verbal contracts with their suppliers and often provide them with credit. These wholesalers meet the farmers in their farms, at their home, in the markets and at supply or assembly centres, where usually bulk buying takes place.

Misuse of insecticides and other health constraints

Most of the problems of vegetable production are associated with pests, such as snails, caterpillars, grasshoppers and black ants that eat the leaves of most crops, and aphids that cause the leaves of huckleberry to fold up or to wilt. This has resulted in the misuse of insecticides. In particular the manufacturers instructions as far as timing of applications is concerned is often overlooked.

Around Yaoundé, Cameroon, it was found that the irrigation water comes from small streams that are often used as sewers; uncooked leafy vegetables are becoming a health hazard. Consequently, many consumers prefer to buy leafy vegetables that have been produced in remote parts of the country even though they appear less fresh. Similarly, people prefer to buy leaves with holes in them as a sign of insect presence implying they have not been sprayed with chemicals.

Lack of technical advice

Extension officers, where available, were only able to provide advice for exotic vegetables because they had received no training about indigenous vegetables. Generally improved agronomic packages provided to the farmers concern staple and cash crops and often have little or nothing to do with indigenous vegetables. There is an almost total lack of published information about indigenous vegetables. There were some reports of extension officers giving advice about IVs based on their experience with exotic vegetables but most producers still rely on the traditional technologies which in some cases are not easily adaptable to large scale production. The farmers expressed a need for assistance especially on the choice and use of crop protection chemicals.

Lack of seeds/planting materials

Several farmers produced their own seeds, collected from selected plants and some also grew seedlings for sale at the market. Other farmers obtain their seeds from specialists within their village or from the market. Farmers frequently express their wish to try out other varieties but fail to find a good source of seeds. This has occasionally resulted in a poor crop rotation and consequent build-up of especially soil-borne pathogens.

Other problems farmers faced included:

a) Over production.

Overproduction in the wet season tends to drive prices down

b) Market access

Some farms/villages are far from market centres and often without road infrastructure. This makes it difficult to move produce to the market.

c) Storage losses

Producers are often forced to sell at very low prices because produce cannot be kept after maturity.

EVs replace IVs at temperate conditions

In the cooler areas, found at higher altitudes, many farmers opt to produce EVs such as carrots and onions because they usually demand a higher price than IVs, whereas also their yield could be high. Produce from such areas is often consumed in the warmer,

lowland areas. In Southwest Uganda for instance farmers prefer to grow Irish potatoes and cabbages rather than traditional root crops and local leafy vegetables.

Many IVs are easily processed

In dry regions local vegetables are often processed during the rainy season for use during the dry season. Common examples are sliced okra, dried cowpea leaves and a wide range of other leaves, dried calyxes of roselle etc. Dried produce in the form of fruits, leaves, stems or otherwise are frequently ground to a powder which in turn is used in soups. Such products are becoming increasingly popular in Kampala as 'easy food'.

Follow-up studies are planned

The present survey has generated a wealth of interest from the in-country universities and research institutes. A number of follow-up studies are planned in Cameroon including:

a) A consumption/production survey in Yaoundé (IITA)

This will be based on a stratified random sample of households in Yaoundé.

b) Consumption and production survey of households in Yaoundé (IITA)

This study will design a household expenditure model of the ingredients used to prepare la sauce which includes indigenous vegetables as well as determine the value home gardens play in an urban setting. The study will adopt the same methodology as was used in the 1982 national household expenditure survey to allow a comparison of how consumer preferences have evolved.

c) Cost of production and income derived from selected indigenous vegetables (IRA, Ekona)

The objective of this study is to calculate the costs and benefits of producing leafy vegetables in order to understand their role in poverty alleviation.

d) Preferences of producers, traders and consumers (Buea University)

This study aims to establish what people like and dislike about three crops: huckleberry, bitter leaf and fluted gourd. The results of this survey will contribute towards the evaluation of the many different types of landraces of these crops.

e) Constraints and opportunities in post-harvest of leafy vegetables (Buea University)

This study will assess further the marketing problems that were identified in the Buea area survey such as how these problems have arisen and how they could be solved. The study will also include a description of the various forms of processing of foodstuffs sold at the markets.

f) Establish production practices of some IVs (Dschang, Buea and Ekona)

These student projects aim to provide more detailed information on a range of crops including fluted pumpkin, sweet bitterleaf, waterleaf, *Triumfetta spp* and egusi seeds through interviews with farmers.

1. CAMEROON

1.1 Socio-economic survey of indigenous vegetables in the Foubot area.¹

METHODOLOGY

Informal interviews were conducted by a team of undergraduate students² with the assistance from lecturers at the University of Dschang and local agricultural extension officers. Surveys were conducted on-farm and in local markets using semi-structured interviews (See Annex 1 for examples of checklists used). Farm interviews were conducted throughout the day at times convenient for farmers.

The market surveys were carried out early in the morning when most vegetables are traded. After first identifying and counting sellers of vegetables, semi-structured interviews were then conducted, selecting sellers at random. Points of entry and/or exits were located and main actors were interviewed including the market masters who are employed by the local council to manage the market. Young men who helped load up trucks were also good sources of information on volume of produce traded.

MARKET SURVEY

The main local markets at Foubot, Kouoptamo and Dschang were surveyed. Foubot urban market is situated along the main highway joining Bafoussam and Fouban. This is the main road linking the rest of the country with the north and through it to Central Africa and Chad. Foubot market starts early (traders and farmers are operating as early as 6.00 am). Most of the buyers are wholesalers from Bafoussam, Fouban, Bafang, Mbouda, Ngaoundéré, Yaoundé and Douala. Yaoundé, Douala and the northern cities are supplied mainly on Sunday, the main market day.

Kouoptamo is a small rural market and only opens on Fridays. It has less variety than Foubot and had virtually no exotic crops. About half of the indigenous vegetables offered at Foubot market were destined for other towns and city markets such as Douala, Yaoundé, Bafoussam and Mbouda. Bafoussam has two main markets (Marché A and Marché B) and a smaller one at the entrance to the town on the road to Mbouda. Vegetables were found in all of these markets.

It costs CFA100 to sell in the markets regardless of the quantity traded. Many of the vegetable traders consider this charge too high. Traders sell from stalls or find an open space on the ground either in or nearby the market.

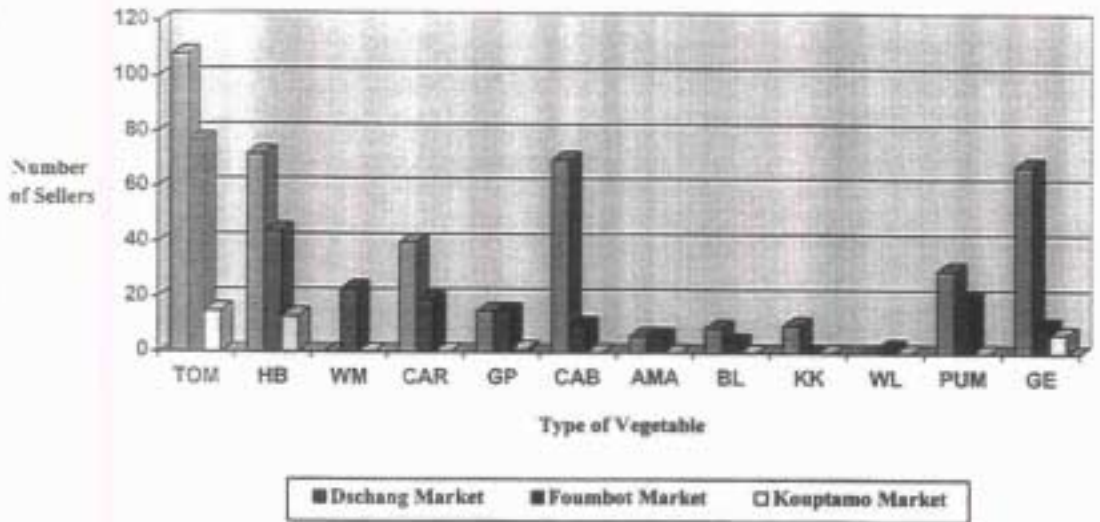
¹ This report was written by Dr Joseph Berinyuy, University of Dschang.

² The students were: Sylvia Mbinglo, Isidore Lenjo, Lucy Ntangti, Isabella Ade, Edmond Langerson and Joycelin.

Trader details

Most of the exotic vegetable traders and all the indigenous vegetable traders in Foubot market were women. Only one male farmer in Kouoptamo was selling huckleberry. Most of the retailers interviewed were also farmers and had brought their vegetables from their farms or bought extra supplies of the vegetables from their villages for the market. The traders ranged in age from 30 to 45 years.

Fig. 1: Vegetable Sellers in the Three Markets



The vegetables found in each market are shown in Fig.1³. Huckleberry and garden egg were present in all the markets with the former being the main indigenous vegetable exported out of the region. Exotic vegetables such as tomato, carrot and cabbage were very prominent in Dschang Market lending weight to the theory that at high altitudes, exotics tend to replace indigenous vegetables.

History of marketing

There was evidence to suggest that the number of traders and the volumes traded has increased over the years in response to the growing demand. Retailers have also

³ Abbreviations used in Fig. 1

Abbreviation	Full Name
TOM	Tomato
HB	Huckleberry
WM	Water melon
CAR	Carrot
GP	Green Pepper
CAB	Cabbage
AMA	Amaranthus
BL	Bitter leaf
KK	Kelen Kelen
WL	Water Leaf
PUM	Pumpkin leaf
GE	Garden Egg

increased the range of vegetables they sell in order to reduce the risk of depending upon one type of vegetable.

Consumer Preferences

Leafy vegetables were generally fresh and many of them had holes in their leaves indicating that they had been attacked by insects. There was some evidence of rotting on huckleberry bundles but because most vegetables were freshly brought in from the villages there was little incidence of yellowing or wilting.

Consumers preferred fresh green leaves regardless of whether the leaves had holes or not. There were two main varieties of huckleberry: large leaf (leaf size 13 cm by 17.5 cm), and small leaf (6.0 cm by 7.0 cm). For cultural reasons in this area the large leaf was preferred. The small leaf cultivar also tended to be slightly bitter.

Marketing arrangements

Farmers bring the vegetables to the market entrance where they meet the traders. For the daily markets, farmers bring small quantities only but larger quantities are reserved for the main market day. Some traders buy the vegetables by the bundle while others buy by the bag (discarded fertiliser or flour bags). A bag may take two to three days to sell. Many of the retailers buy progressively depending on their selling rate. Wholesalers from urban centres tend to buy larger quantities and are therefore attractive to farmers who want to sell their produce as fast as possible and return to their villages.

There are no storage facilities for vegetables. Unsold huckleberry is taken back home, sprinkled with water, placed in a cool corner with stems down and propped against the wall. This method of storage has evolved over the years. Other traders say they spread the unsold vegetables on the floor when they return home. It was occasionally observed that some traders left unsold vegetables covered with old sacking overnight in the market.

The vegetables are transported to the markets from the villages by light truck or mini bus. Push carts are also prominent as a means of transport for distances of 5 to 10 km. Smaller quantities are carried by head.

No special packaging is provided for the handling of vegetables. Leafy vegetables such as huckleberry and amaranth and some spices (especially species of basil) are first tied into bundles and the bundles into bales using items of clothing or old sacking.

Huckleberry together with exotic vegetables are transported by minibus to urban centres such as Bafoussam, Bafang or Mbouda. Often this trade by-passes the markets. For example at Mbantou village, wholesalers arrive in trucks and mini buses and transport the vegetables directly to Bafoussam without taking them to the Foubot market. The farmers say they get a better return this way because they do not have to pay transport costs and it is more convenient. Even here the farmers do not have any contracts with traders; vegetables are sold on a first come first served basis or to the highest bidder.

Prices

Table 1 shows the prices for the main vegetables being sold in Foubot market. Prices tend to be driven down in the wet season because it is the main production period (the number of retailers also increases in the wet season). Also most people had access to vegetables either from their own gardens or through friends and therefore did not need to buy them from the market.

Table 1. Price of vegetables in Foubot market.

Type of Vegetable	Unit of Sale	Approx. Quantity/Weight	Price (CFA)
Huckleberry (large leaf)	Bundle	16 stems/ 1.18 kg	50 - 100
Amaranth	Bundle	0.72 kg	50
Cabbage	Head	2.52 kg	200
Garden Egg	Heap	5 or 6 (0.45 kg)	50 - 100
Green Pepper	Heap	8/9 (0.83 kg)	200 - 300

Constraints

The main problems faced by traders were: lack of financial assistance, high market fees and a lack of storage facilities. Those traders who were also farmers complained about the prohibitive cost of fertilisers and pesticides.

VEGETABLE PRODUCTION

Product inventory

Out of the six villages visited huckleberry was found to be the most common (in terms of abundance) vegetable. Commercially (and culturally) huckleberry (*Solanum scabrum*) was ranked the highest. Other indigenous vegetables grown in the area included: pumpkin leaves (*Cucurbita* spp), roselle (*Hibiscus sabdariffa*), garden eggs (*Solanum aethiopicum*), melon seeds (*Cucumis melo*), water leaf (*Talinum fruticosum*), bitter leaf (*Vernonia amagdalyna*), cocoyam (*Colocasia esculenta*), amaranth (*Amaranthus cruentus*), kelen kelen (*Corchorus olitorius*), fluted gourd (*Telfairia occidentalis*) and West African okra (*Abelmoschus caillei*).

The most common exotics were found to be : okra (*Abelmoschus esculentus*), tomato, leeks, celery, carrot, cabbage, parsley, snap bean, water melon, sweet pepper and onion.

Production details

Although farms varied in size from about 0.25-0.5 ha most of the vegetables were produced in small home gardens but where space was limited the vegetables were also cultivated in near farms. Monocropping was commonly found for crops such as

huckleberry, amaranth and water leaf. Mixed row-intercropping was common with pumpkin, melon and kelen kelen. Most bitter leaf shrubs were planted as hedges.

Vegetables were often grown on well raised beds (10 - 20 cm by 1 - 1.5 m wide). Indigenous vegetables such as huckleberry, amaranth and garden eggs (and most small seeded exotic vegetables) were often first grown in nurseries before being transplanted to the field. Planting densities varied and there was no standard spacing. All farmers produced their own seeds and some also grew seedlings for sale at the market.

Land tenure

Most vegetables are grown on the farmers own plots of land. Some farmers rented additional plots for a relatively insignificant amount. The cost of renting land was not considered a problem.

Labour

Both men and women grew vegetables although the men preferred producing exotic vegetables because they yielded the highest returns. The larger producers (up to 0.5ha) were also men. Farmers used family labour whenever possible although some hired labour is used during peak harvesting periods by the larger scale farmers.

Access to credit

Generally farmers received little external support. There were no organised farmer groups for marketing vegetables or for purchasing inputs; a necessary precondition for applying for credit.

Inputs

Organic fertilizers are mostly used and included household refuse from home gardens and chicken dropping. The most commonly used chemical fertilizers were 20-10-10 and urea. The rate of both organic and inorganic fertilizer application is very variable. Generally the inorganic fertilizers are used for the production of exotics.

The use of chemical pesticides was widespread although no advice was being given on the dosage and appropriateness of the chemicals being used (many were originally bought to use on tree cash crops). Often insecticides and fungicides were being mixed together on a very ad hoc basis until the mixture was lethal enough to kill any pests that were found on the vegetables.

Marketing/post-harvest arrangements

Because of their perishability indigenous vegetables are generally harvested the evening before market day either by hand or using a knife. The harvested leafy vegetables are then tied into bundles, which may be further tied into a bale if the harvest is large. The only indigenous vegetable that is processed to some extent is bitter leaf. It is usually cleaned, sliced and dried. In this state, it can be stored for many months without deteriorating. This method of transformation is also used for okra.

Income

Many producers consider vegetable production a viable business although the lack of farmer records makes it hard to quantify this. However, all of the producers interviewed claimed that they could make a living from producing and selling vegetables earning at least cfa150,000. In fact in Mbantou village over half of the producers boasted that revenue of more than CFA1m was attainable in a good season of huckleberry alone.

Sources of information

Extension officers only provided advice for exotic vegetables. No assistance was given for indigenous vegetables because of the lack of training and published information. There were some reports of extension officers giving advice about indigenous vegetables based on their experience with exotic vegetables. Most producers still rely on the traditional technologies which in some cases are not easily adaptable to large scale production. The farmers expressed a need for assistance especially on the choice and use of crop protection chemicals.

Constraints to Production

The main problems faced by farmers included:

- Over-supply in the wet season lowers prices
- Distance to market/poor road links
- lack of appropriate handling and storage technologies.
- Lack of technical packages and support services for indigenous vegetables. Generally improved agronomic packages provided to the farmers concern staple and cash crops and often have little or nothing to do with indigenous vegetables.
- Lack of availability, poor quality and high cost of inputs.

Solutions

Farmers considered the provision of frequent and reliable market information combined with greater technical support services to be their main priorities.

Future expectations

Many producers admitted vegetable production was hard work but agreed they would continue with this line of work (producing both exotics and indigenous vegetables) in the future. Some farmers commented that they will continue to produce because that is all they know.

1.2 Socio-economic survey of indigenous vegetables in Southwest Cameroon⁴

METHODOLOGY

Six markets were selected for the study: three relatively large urban markets and three small rural markets. The six trained enumerators were divided into three groups. Two rounds of informal interviews were carried out in each of the six markets with an interval of about four weeks. The production areas of the indigenous vegetables were obtained by talking to market administrators and the vegetable traders. The indigenous vegetables sold in the study area are all locally produced. Most exotics came from western or northwestern provinces. Subsequently, seven villages were selected for the production study.

MARKET SURVEY

The following markets were surveyed: Muea, Ekona, Likomba, Great Soppo, Mutengene and Mile 14/16.

The tax paid for selling vegetables varies according to the volume displayed by the seller. For 6-10 bundles, the tax is cfa50, for one basin (30kg) the tax is cfa100, for one hand truck (about 100 kg) the tax is cfa200. In some markets such as Likomba, vegetable sellers sold their products along the roadside and not inside the stalls because they could not afford to rent the stalls.

Trader details

Most of the traders interviewed were immigrants from the North West Province while just a handful were locals from South West Province. The traders were mainly mature females with ages ranging from 28 to 50 years. The few male retailers generally sold exotic vegetables (Table 1). Many of these traders were also farmers. The number of sellers and volume of produce traded has risen over the years due to an increase in demand from Douala. There has been little change in the range of vegetables marketed.

⁴ This report was written by Dr Manfred Besong, IRAD, Ekona.

Table 1 Vegetables sellers per market (July and august 1997)

Market	Type of vegetable	Male traders	Female traders
MILE 14/16	IVs only	3	39
	Exotics only	5	7
	IVs and Exotics	0	4
GREAT SOPPO	IVs only	6	93
	Exotics only	10	25
	IVs and Exotics	6	15
MUEA	IVs only	14	192
	Exotics only	16	31
	IVs and Exotics	7	28
EKONA	IVs only	12	66
	Exotics only	6	11
	IVs and Exotics	3	6
MUTENGE NE	IVs only	1	88
	Exotics only	17	50
	IVs and Exotics	1	19
LIKOMBA	IVs only	2	36
	Exotics only	22	17
	IVs and Exotics	1	5

Product inventory

In terms of abundance the nine most important vegetables were estimated as being:

July

1. Tomato
2. Huckleberry
3. Bitter leaf
4. Fluted gourd
5. Onion
6. Amaranth
7. Water leaf
8. Corchorus
9. Garden egg

August

1. Tomato
2. Onion
3. Huckleberry
4. Bitter leaf
5. Fluted gourd
6. Water leaf
7. Garden egg
8. Corchorus
9. Amaranth

In many of the markets unsold produce are abandoned in the market creating waste disposal problems.⁵ Vegetables, particularly huckleberry are not washed before sale because water makes them more susceptible to rotting during transportation and retailing. Apart from red chilli pepper most of the vegetables are not processed or preserved before or after sale.

Marketing arrangements:

Wholesalers were observed buying vegetables in bulk during the early hours of the market and these are then transported to Douala and Limbe by truck. The wholesalers usually have contracts with the producers; the producers are given money in advance which acts as a security.

Retailers deal in smaller quantities and sell throughout the day. What is not sold is taken home by the retailers who store the produce for up to 2-3 days during which time further efforts to sell the produce are made. Most sellers sprinkle water on the vegetables to prevent withering.

Most harvesting is done during the late afternoon before a market day. Produce is tied in bundles at home and stored to keep them fresh. For example, bitter leaf is stored by placing the bundles on hedges or grass outside the home. In this way bitter leaf can be preserved for up to a week. In the dry season the indigenous vegetables are watered before putting them outside. Indigenous vegetables are usually carried from the farm to the market by children. Larger quantities are transported by truck.

Prices and income

Leafy vegetables are sold in bundles. Although the price remains the same the size varies between retailers and wholesalers. Generally one wholesaler bundle is the same size as two retail bundles. At the time of the survey all leafy vegetables were being sold at cfa50/bundle (only water leaf was cfa25/bundle). Although the prices do not vary with season but the size of the bundles are reduced in the dry season.

Constraints

Traders complained of excessive rain during August which destroyed many of the vegetables. Insects eating the leaves was a common problem. Interviews with market officials elicited the following problems:

1. Poor hygienic conditions:- Vegetables are not washed and they are displayed on the floor for sale exposing them to possible contamination.
2. Units of sale for leafy vegetables are not uniform but can vary in weight for the same price.

⁵ People from the North West who know how to preserve the bitter leaf (through washing and drying) collect such leaves to preserve for their use. They do so with the authority of the market master.

3. Bulk buyers combine the bundles in huge bales which encourage quick spoilage (encourage heat generation and wilting during transportation).
4. Unsuitable transportation such as hand trucks and passenger vehicles are used to transport the vegetables.
5. Due to heavy rains, mud is splashed on the vegetables displayed directly on the ground (usually on plastic sheets, leaves, mats etc.)
6. Most of the leafy vegetables are not sorted before sale. This means that up to 50% of the material sold is unusable stalk (bitter leaf, huckleberry) or useless flowers (water leaf). This creates enormous waste disposal problems.
7. Displaying the vegetables under direct sunlight encourages wilting and loss of quality.

VEGETABLE PRODUCTION

Farmer details

Vegetable production in this area of Cameroon is mainly undertaken by women of all ages who are generally immigrants from North West Province; the local residents are more used to producing staple crops. These vegetables are grown mainly on distant farms since productive land near the main roads and villages has been taken up by the Cameroon Development Corporation for the production of export crops such as bananas, rubber, oil palm, cocoa and Robusta coffee.

Product inventory

The most commonly grown vegetables are bitter leaf (*Vernonia hymenolepis* and *V. amygdalina*), several species of the huckleberry group, fluted gourds (*Telfairia occidentalis*), greens (mainly *Amaranthus cruentus*), water leaf (*Talinum fruticosum*) and African okra (*Abelmoschus caillet*). The vegetables are usually intercropped with staple crops during the rainy season.

Production details

Vegetable production techniques used are similar for most annual crops. The seedlings are nursed for about two or three weeks. They are then transplanted to prepared ridges. Quite often these vegetables are inter-cropped with cocoyams, maize, cassava etc. Maturity time and harvesting periods vary with the vegetable crop concerned. Huckleberry and Amaranths have a first harvest after about three weeks, fluted gourd and (sweet) bitter leaf in eight weeks and tomato in about three months. Huckleberry and Amaranth are harvested once a week, bitter leaves once every two weeks, fluted gourd once every three weeks and tomato twice a week.

Huckleberry can be harvested for up to three months, Amaranth for two months, Bayangi (sweet) bitter leaf for two to three months, fluted gourd for three years, and bitter leaf which is grown as a hedge near farmers' compounds (*Vernonia amygdalina*) for up to seven years.

The same types of vegetables are grown in both the dry and wet season. Since dry season production is limited to those farmers with access to water, crops are scarce and therefore more expensive during the dry season. Dry season vegetable production is usually in the form of or mixed farming with other horticultural crops rather than with staple crops.

Inputs

Generally, vegetable production does not require many inputs. Fertilizers (20-10-10) and pesticides (MOCAP) are applied only on huckleberry.

Labour

Both family and hired labour is used for vegetable production. Hired labour is used in performing specific operations such as bush or land clearing and ridging while family labour is used for harvesting and marketing.

Credit

Because vegetable farming does not require many inputs, farmers generally do not require credit.

History of production

Farmers have been producing indigenous vegetables for many years and the pattern of production has remained the same and the crops grown unchanged. For others because land has become exhausted through overuse the pattern of production has changed; farmers either use fertilizers or have acquired new land.

Subsistence

Traditionally farmers have produced both for subsistence and for income. For subsistence they consume several types of vegetables many times a week, depending on their preference and culture. On average huckleberry is consumed three times a week, amaranth twice a week, fluted gourd, bitter leaf and water leaf (often with eru) once a week, and *Corchorus* only occasionally. These vegetables are eaten with the starchy staples such as cassava, cocoyam, maize and plantains. While urban dwellers consume more exotic vegetables than indigenous it is the reverse situation for rural dwellers.

Source of income

The main source of income for the farmers interviewed was from the sale of agricultural (non-vegetable) produce such as cocoyam, plantain, cassava and maize. The most important vegetable crops were all found to be indigenous: huckleberry, amaranth, bitter leaf, fluted gourd and water leaf.

Marketing/ post-harvest arrangements

Harvesting vegetables is a simple process using hands and knives. The produce is taken home in basins where it is tied in bundles for the market. Sometimes the vegetables are sold at the farm. Some farmers have marketing contracts with wholesalers and they meet at regular intervals at home or in their farms.

Most of the indigenous vegetables, except huckleberry, are stored by spreading on impermeable surfaces such as fertilizer bags and water sprinkled on them. Huckleberry is stored in a cool dry place with no water since it is very susceptible to rotting.

Constraints

Most of the problems of vegetable production are pest related such as snails that eat the leaves of *Vernonia* and black ants that cause the leaves of huckleberry to fold up or to wilt. Traditional measures to counteract these pests is to cover the huckleberry plant in wood ash and remove the snails by hand. Diseases can be a major problem for huckleberry.

Expectations

Vegetable production is viewed as a traditional way of life by the farmers and all those interviewed expressed the desire to continue production.

1.3 Socio-economic survey of indigenous vegetables around Yaoundé⁶

In this report two specific aspects of indigenous vegetables and their role in poverty alleviation are examined:

- a) a comparative price analysis of vegetable marketing prior to the onset of the economic crisis in Cameroon and during the economic crisis;
- b) an analysis of marketing revenues and employment based on surveys conducted with sellers of indigenous vegetables;

a) Price Analysis of Vegetables in the Yaoundé Market

The analysis was conducted using nominal monthly and yearly retail prices from 1972 to September 1995 obtained from the Ministry of Planning. The commodities for which prices are available include tomatoes, okra, onions, cassava leaves, *Solanum nigrum/scabrum* (zom, huckleberry), *Amaranthus cruentus* (folon), and *Vernonia spp.* (ndolé, bittergourd).

One of our hypotheses is that huckleberry and amaranth are an important source of employment for those outside the formal sector in peri-urban areas and the outlying urban periphery, because of their relatively short, labour-intensive production systems, low levels of purchased input use and high yields. As the level of urban unemployment rose during the economic crisis, the production of these vegetables was increasingly targeted as a livelihood strategy.

If we make the assumption that the impact of the economic crisis on the demand for vegetables was uniformly distributed across all vegetables, then a widening price differential between huckleberry and amaranth vis-à-vis other vegetables would provide evidence in support of a more responsive supply and our hypothesis.

The price differentials between monthly prices from January 1982 through December 1986 were compared to those from December 1993 through September 1995. The results presented in Tables 1 and 2 fail to reject the hypothesis. With the exception of the *Amaranthus*-okra price differential, all monthly price differentials widened and in six of the ten comparisons there was a statistically significant increase. In general the increase in price differentials in general was greater for huckleberry than for amaranth.

⁶ This study was conducted by Juliette Mba'zoa of the University of Dschang and supervised and written up by James Gockowski of IITA.

Table 1. Monthly nominal price differentials between huckleberry and other vegetables, Jan. 1982 - Sept 1995

	Tomatoes	Okra	Onions	<i>Vernonia</i>	Cassava	n_i
-----FCFA/kg ⁻¹ -----						
Mean monthly price differential Jan 82- Dec 86	64.4	-158.5	42.7	177.3	195.3	64
Mean monthly price differential Dec 93-Sep 95	-97.0	-210.7	-142.7	81.2	97.1	22
Student's t statistic	5.74	1.26	4.14	5.84	5.34	
prob	0.000	0.213	0.000	0.000	0.000	

Table 2. Monthly nominal price differentials between amaranths and other vegetables, Jan. 1982 to Sept 1995.

	Tomatoes	Okra	Onions	<i>Vernonia</i>	Cassava	n_i
-----FCFA kg ⁻¹ -----						
Mean monthly price differential Jan 82- Dec 86	-80.1	-303.0	-101.8	32.8	50.8	64
Mean monthly price differential Dec 93-Sep 95	-149.40	-263.0	-195.0	29.9	44.7	22
Student's t statistic	2.98	-0.977	2.38	0.300	0.481	
prob	0.006	0.33	0.023	0.765	0.632	

The decline in nominal vegetable prices that occurred as a result of the economic crisis (significant for all commodities except onions and tomatoes) is a result of both decreased aggregate demand and an increase in production for those commodities (huckleberry and amaranths) which are produced in the urban periphery (Table 3). The decrease in the prices of leafy vegetables and okra have permitted the urban poor to maintain their nutritional intake of essential vitamins and minerals. As noted the decline in huckleberry was particularly significant. The statistically significant ($p < .01$) decrease in the coefficient of variation for indigenous vegetables provides more evidence of their increased production since the start of the economic crisis. The decline in monthly price variation most likely indicates an increase in the dry season production when price variation from the mean is normally the greatest.

Table 3. A comparison of average monthly retail vegetable prices and price variation in the Yaoundé market -prior to and during the economic crisis.

Commodity	period	Mean Price	Std Deviation	Student's t	Bartlett's test for homogeneity of variance ¹
		FCFA kg ⁻¹		prob	prob
tomatoes	1983-86	247	77		
	1993-95	264	94	0.378	0.256
okra	1983-86	470	255		
	1993-95	378	138	0.038	0.002
onions	1983-86	268	117		
	1993-95	310	170	0.295	0.205
cassava leaves	1983-86	116	89		
	1993-95	71	24	0.020	0.000
<i>Vernonia</i> spp.	1983-86	134	55		
	1993-95	85	30	0.000	0.002
huckleberry	1983-86	311	124		
	1993-95	168	45	0.000	0.000
amaranth	1983-86	167	66		
	1993-95	115	28	0.000	0.000

¹ Chi-square statistic with 1 df.

The data set was used to estimate seasonal multiplicative indices of monthly price variation (Figure 2). Okra, cassava and bitter leaf exhibited the greatest variation with prices highest from January to April. Among the leafy vegetables, huckleberry and amaranth did not vary a great deal reflecting the production of these vegetables during the dry season in the inland valleys of the urban periphery of Yaoundé.

The correlation matrix of deseasonalized monthly time series can provide information on the relationships between commodities and the relative strength of those relationships indicating the degree to which commodities are substitute or complement goods. A priori we would expect the highest coefficients among the leafy vegetables and positive though smaller coefficients between leafy vegetables and tomatoes and okra indicating weak substitute relationships. Onions which is a complement in the preparation of *la sauce* would be expected to have negative coefficients.

The empirical findings are more or less in alignment with a priori expectations (Table 4). The highest correlations were between bitter leaf, huckleberry and amaranth and to a lesser degree cassava leaves, indicating that these vegetables are relatively close substitutes in consumption. Onions had negative coefficients with all variables, except for okra and tomatoes where no significant correlations were noted. Okra which is used to prepare *la sauce gombo* does not appear to have any close substitutes in consumption on the basis of its insignificant correlations with the other commodities. (Note: There may well be a correlation with *kelen kelen* (*Corchorus olitorius*) which is used for the production of a similar sauce but no statistical records over the earlier periods were available for comparison). Tomatoes did have significant positive coefficients with cassava leaves, amaranth and huckleberries, indicating that tomato-based sauce is a substitute for leafy vegetables.

Figure 2. Seasonal indices of monthly retail vegetable prices in the Yaoundé market.

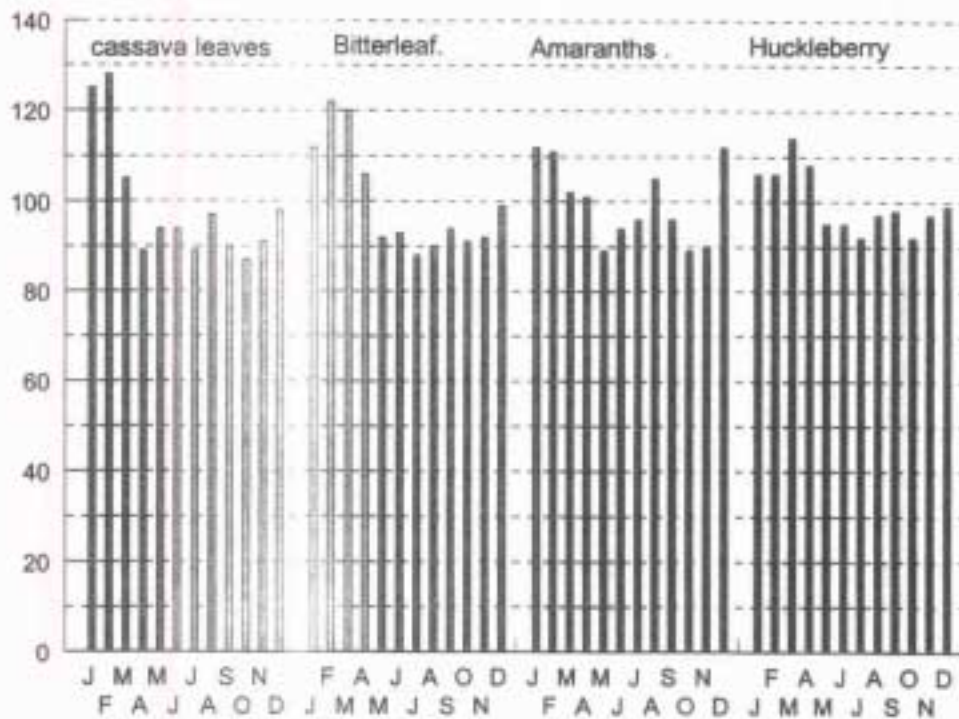


Table 4. Correlation matrix of deseasonalized Yaoundé monthly vegetable price data, 1983-95.

	TOM	OKRA	ONION	CASS	VERN	AMAR	HUCK
TOM	1.000						
OKRA	0.048	1.000					
ONION	0.074	0.069	1.000				
CASS	0.310	-0.024	-0.572	1.000			
VERN	0.177	0.169	-0.342	0.492	1.000		
AMAR	0.471	0.026	-0.235	0.553	0.578	1.000	
HUCK	0.436	0.184	-0.333	0.545	0.719	0.721	1.000

n=84, 1% two-tailed significance level of the correlation coefficient $r = .283$

2. Analysis of indigenous vegetable markets in Yaoundé.

Following a rapid market appraisal in which an approximation of the most important markets and commodities was obtained, the sellers of tomatoes, okra (both indigenous *caillei* and exotic *esculentus*), cabbage, huckleberry, amaranth, bitter leaf and kelen kelen were targeted. Interviews were conducted with 102 market women. For each of these vegetables, gross marketing margins were calculated which were then used to estimate earnings per hour and daily earnings.

The majority of sellers were estimated to fall between the ages of 16 and 50 years. The typical market woman sold 1.7 different products with a mean daily earning of 525 FCFA per product, and a total daily earning estimated at 893 FCFA (\$1.53 at current

US\$ exchange rate) for an average 12 hour day's work. By groups, sellers of the exotic vegetables (tomatoes, okra and cabbage) earned significantly more ($p < 0.001$) than sellers of indigenous vegetables. The estimated daily revenues per product were 645 FCFA and a total daily earning of 1028 FCFA for sellers of exotics versus 429 FCFA and a total daily earning of 817 FCFA for indigenous vegetable sellers.

There are several explanations for this disparity in earnings. Sellers of indigenous vegetables cited a lower marketing loss percentage than exotics (12.8% versus 16.1%, $p < 0.10$). In general we would expect sellers of risky commodities to normally demand a risk premium. The financial risk of selling exotic vegetables also was higher. A mean of 2851 FCFA was spent per transaction on purchasing product by retailers in the indigenous vegetable market versus 4927 FCFA for exotic vegetables and the average weekly expenditures by retailers for resale was also significantly higher ($p < 0.05$) for exotic vegetables (13 038 FCFA versus 10 878 FCFA).

The variation in daily earnings, expenditures, and estimated physical losses across different commodities are presented in Table 5.

Table 5. Estimated daily earnings, weekly expenditures and weekly sales in the vegetable markets of Yaoundé, October 1997.

	daily earnings per product	average expendi- ture per purchase	weekly average expendi- tures	weekly average total sales	total estimated physical losses % of total	n_i
	FCFA	FCFA	FCFA	FCFA		
tomato	557	6121	14585	18422	16.7	15
cabbage	1235	7146	18620	26880	16.3	8
okra (exotic)	470	2037	8129	11360	15.0	10
okra (indigenous)	318	3173	18588	20787	14.0	10
amaranth	624	1511	12721	16870	14.0	15
huckleberry	294	1127	4869	6630	10.0	15
kelen kelen	435	5153	8288	11216	12.0	15
bitter leaf	610	1621	10729	14715	14.6	13
Overall Average	525	3812	11836	15393	13.9	101

The low capital requirements for getting into the indigenous vegetable market and the relative lack of barriers means that this is a very competitive market and earnings are in general low. This market offers poor, unemployed women one of their few opportunities for earning an honest living. Based on a rapid reconnaissance of 14 satellite markets in Yaoundé, we estimate that roughly 1000 women are engaged regularly in selling indigenous vegetables. For these women and their families the meagre revenues earned are of the utmost importance.

2. UGANDA

2.1 Socio-economic survey of indigenous vegetables in Lira District.⁷

METHODOLOGY.

Three sub-counties in Lira district were selected based on geographical location and local climatic conditions:

1. Adekokwok- situated in the western part of the district. The main urban centre, Lira, is within this sub-county.
2. Omoro- situated in the dryer eastern part of the district.
3. Awelo - situated in the southern part of the district near a lake.

During the wet season survey 30 market participants (market master, retailers and consumers) and 165 farmers were interviewed using participatory appraisal techniques. The interviews were carried out by a team of two district extension staff in each study area supervised by the District Agricultural Officer.

MARKET SURVEY

Six markets, two in each of the selected sub-counties were surveyed. These were: Lira main, Kakoge, Omoro, Ogowie, Etam and Anyangoga. The markets surveyed in Omoro and Awelo operate twice weekly but those in Adekokwok are open daily because of the larger number of customers. Traders who sell in Omoro and Awelo sell in other local markets such as Inyoge, Oora-aora, Nyamuguru and Amugu in Omoro sub-county, and Kayago, fish landing sites and other informal markets in Awelo sub-county.

Trader details

A total of 23 traders were interviewed from 6 markets . Generally retailers were interviewed but some wholesalers were found in markets in Adekokwok sub-county (Lira main market and Kakoge).The market master reported that wholesalers only sell their produce very early in the morning outside the gates of the main Lira and Kakoge markets. There are no wholesalers in the other markets. Table 1 shows the markets surveyed and the number of retailers in each market at the time of the survey. There were about twice as many exotic vegetable sellers than indigenous vegetable sellers. Very few retailers sold both indigenous and exotic vegetables. Most of exotic vegetable sellers were found in Lira's main market. Many retailers were also farmers.

⁷ This report was written by Constance Owori, post harvest technologist; Agnes Nayiga, socio-economist and Margaret Nabasirye, biometrician all from Kawanda Agricultural Research Institute.

Table 1. Vegetable sellers per market (two of the three sub-counties only)

Sub-county	market surveyed	No. of IV retailers	No. of EV retailers	No. of both IV and EV retailers	Total No. of retailers
Adekokwok	Lira main	6	60	8	74
	Kakoge	10	3	2	15
Omoro	Omoro	11	9	0	20
	Ogowie	3	2	1	6
	Total	30	74	11	115
	%	26%	64%	10%	100%

Generally there were twice as many women vegetable sellers as men although in Omoro market it was found that about 90 % of the vegetable sellers were men. Most traders were aged between 18-35 and only had about 1-3 years experience of selling vegetables. Respondents indicated that there has been no major change in the type and range of vegetables sold.

The number of vegetable sellers in Lira's main market has decreased in recent years because five new smaller markets have opened in the town. Overall however the number of sellers and volume of sales has increased. The rise is attributed to the growing perception by farmers of the economic value in producing vegetables. The loss of cattle to rustlers is also believed to have led to a shift in production away from staple crops to horticultural crops as the latter do not require draught power to plough the fields. Also swamp land which was previously used for cattle grazing is now available for vegetable production .

Product inventory

14 different types of indigenous and exotic vegetables were being sold in the markets. *Hibiscus sabdariffa*, *Cowpeas* and *Amaranthus* spp. were most commonly sold indigenous vegetables in Adekokwok and Omoro (No indigenous vegetables are sold in Awelo markets). For exotics, eggplants, tomato and onion were the most common.

Other vegetables on sale were: *Crotalaria ochroleuca*, *Gynandropsis gynandra*, *Corchorus* spp, *Solanum aethiopicum*, *Amaranthus* spp, *Brassica* spp, Cabbage, Pumpkin leaf and carrots

Most vegetables are produced within 20 miles of Adekokwok markets and less than six miles for the Omoro markets. Retailers themselves produce a large quantity of vegetables that are sold in Awelo (50%) and Omoro (100%) markets although traders in Adekokwok are more likely to purchase supplies from wholesalers or other farmers either at the markets or at their farms.

Consumer preferences

Interviews with consumers revealed that all ate *Gynandropsis gynandra*, *Amaranthus* spp and tomatoes. Results also indicate that more consumers ate indigenous vegetables than exotics. The table shows that *Amaranthus* spp is the most preferred vegetable followed by *Hibiscus Sabdariffa* and *Crotalaria ochroleuca*. The least preferred vegetables are egg plants and Cowpeas. Tomato is the most frequently consumed vegetable followed by onions then *Amaranthus* spp. *Crotalaria ochroleuca* and cabbage are the least frequently consumed vegetables. Consumers interviewed reported that cleanliness and lack of insect damage are the most important qualities required by consumers in both indigenous and exotic vegetables.

Marketing arrangements

There appears to be few contractual arrangements between farmers and traders. Those traders who do not rely on their own production reported that they simply purchase vegetables from any available supplier. In the more sophisticated markets in Lira some traders had developed contacts with farmer whereby they would buy from particular farmers on a regular basis or provide exotic seeds (especially cabbage) to farmers who in turn supply vegetables.

The frequency of vegetable purchases relates to the frequency of the market. In urban Lira where there are daily markets produce is bought virtually every day. Because of the problems of storing perishable products usually traders only buy enough to sell in a day. Produce left unsold at the end of the market day is usually taken home and consumed or preserved and sold in a dried form. The main exceptions to this are *Crotalaria ochroleuca* and garden eggs which can last for up to four days.

Post harvest techniques

After harvesting most indigenous vegetables are washed, trimmed and packed into baskets or sacks. Exotic vegetables are handled in different ways depending on the vegetable.

In Omoro sub-county some indigenous vegetables such as *Hibiscus sabdariffa*, *Crotalaria ochroleuca*, *Cowpeas*, *Corchorus* spp and also egg plant were reportedly being sold dehydrated (mainly during the dry season). Reasons given for drying included ease of transportation (dried vegetables are lighter) and ease of storage (they last longer). Only women were reported to be involved in the drying of vegetables but both men and women retailers sold dried vegetables. Vegetables are generally dried by leaving out in the sun for 1-2 days although *Cowpeas* was first steamed and then sun-dried for 3-4 days.

Concerning storage, generally, fresh vegetables were stored for 1-3 days and dried ones for 2-5 months. Most respondents stored their vegetables at home except at Lira main market where they stored them at their stalls. The commonest storage method involved spreading vegetables on a mat or bag and either covering with a damp cloth or

sprinkling with water. Some indigenous vegetables such as *Cowpeas* and *Hibiscus sabdariffa* are left standing in basins/pans filled with water. Dried vegetables are generally stored in polythene bags or sacks.

Prices

Respondents in all markets sold their vegetables in bundles (indigenous vegetables) and heaps (exotic & indigenous vegetables) of varying weights. In each sub-county, however, the price of the bundle was shs50 and a heap shs50-100. For purposes of price comparisons, the heaps and bundles in different markets were weighed and average prices determined per kilogram. Table 2 shows the average prices of vegetables at the time of the survey.

Table 2. Average vegetable prices.

Vegetable	Average price (Ug shs) per kg		
	Adekokwok	Awelo	Omoro
<i>Hibiscus sabdariffa</i>	1000	-	150
<i>Crotalaria ochroleuca</i>	800	-	50
Cowpeas	700	-	50
<i>Gynandropsis gynandra</i>	800	-	100
<i>Corchorus</i> spp	600	-	-
<i>Amaranthus</i> spp	700	-	100
Garden eggs	500	-	-
Tomatoes	1000	-	-
Egg plants	500	-	100
Cabbage	500	200	-
Onions	900	500	-
Carrots	800	-	-

Results above show that generally the prices of vegetables in Adekokwok markets are highest. Among the indigenous vegetables, *Hibiscus sabdariffa* had the highest selling price per kilo equivalent to that of tomato. Generally there wasn't much difference in prices between indigenous and exotic vegetables in specific markets.

Of the traders who commented on price changes, most claimed that prices had been stable over the past years although prices do vary on a daily basis depending for example on the number of buyers and sellers, the time of day (in the evening the price of vegetable can be reduced to enable the seller to get rid of produce) and the trader's bargaining skills.

Respondents who reported that prices had been stable stated that the size of the bundle/heap varied according to the season. During the wet season (April-September) the supply of vegetables increased and this led to an increase in the size of the bundles/heap - equivalent to a fall in the price per kg. Conversely in the wet season when suppliers were scarcer bundles would often be halved in size - a doubling of prices.

Some traders however were convinced that prices had risen in response to the drought which had affected subsistence production.

Income

Almost half of those interviewed ranked selling vegetables as their main source of income followed by selling cotton, cassava, rice and beer. For individual vegetables cowpeas, *Crotalaria ochroleuca*, egg plant and *Hibiscus sabdariffa* were the most important.

Constraints and solutions.

Respondents claimed that high market dues was their main constraint followed by high post harvest losses and lack of improved seeds. Other problems included lack of transport to market, poor storage facilities (and knowledge on preservation methods), unhygienic market conditions and high prices in the dry season.

In line with their problems respondents suggested a reduction in market dues followed by better provision of good quality seed, training on better storage and processing methods and the provision of loans for solving their constraints.

Future expectations

The majority of traders planned to continue selling the same vegetables in the future.

2.2 Socio-economic survey of indigenous vegetables in the peri-urban area of Kampala.⁸

METHODOLOGY

The study was divided into two parts: a market survey and a production survey. Enumerators were selected from Makerere University students and these were given training in rapid appraisal techniques by Nicholas Fereday from NRI. Because of the limited budget only six enumerators participated in the survey work although many more benefited from the training course. The enumerators used a number of participatory methods including semi-structured interviews with checklists (See Annex 1) and ranking exercises. In total 116 farmers were interviewed and 40 traders (retailers and wholesalers).

The market survey was conducted first and once a number of market actors were interviewed it became clear that most of the vegetables sold in the Kampala markets came from three districts surrounding Kampala: Mpigi, Mukono and Luweero. All the farmer interviews took place in these three districts. The interviews were carried out by four groups of two enumerators. Each group talked to about 30 farmers.

MARKET SURVEY

Eight markets were surveyed and a general product inventory was recorded in the six main ones. These were: Owino, Kalerwe, Mengo-Bulange, Nakawa, Nateete and Kasubi.

Trader details

Most of the retailers were middle aged women who were also farmers. Over half of the retailers observed in the markets were selling exotics only.

Table 1: Number of retailers selling different vegetable types.

	Mengo-Bulange	Nakawa	Nateete	Owino	Kalerwe	Kasubi	Total	%
IVs only	11	7	30	14	100	24	186	22.5
Exotics only	25	4	210	8	180	46	473	57.1
IVs and exotics	3	18	10	8	120	-	169	20.4
Total	39	29	250	30	400 (approx.)	70	828	100

Product inventory

Twenty nine different types of vegetables were being sold in the Kampala markets. Out of the retailers selling either IVs only (or both IVs and exotics) the most common

⁸ This report was written by Dr Remigius Bukeny-Ziraba and John Tabuti, Makerere University

vegetables were, in order of importance, *Solanum aethiopicum* Shum group, *Amaranthus lividus*, eggplant, garden egg, *Gynandropsis gynandra* and tomato.

Table 2 Vegetable types sold by different retailers

Vegetable type	Number of traders selling
<i>Solanum aethiopicum</i> Shum group	24
<i>Amaranthus lividus</i>	22
garden egg	14
eggplant	14
<i>Gynandropsis gynandra</i>	14
Tomato	13
<i>Amaranthus dubius</i>	10
Onion	9
Green pepper	9
Pigeon peas (=indigenous)	7
<i>Solanum anguivi</i>	7
Cabbage	7
Huckleberry	6
Okra (2 types)	6
<i>Hibiscus sabdariffa</i> (=toselle)	5
<i>Corchorus olitorius</i> .	4

Corchorus spp. and *Hibiscus sabdariffa* did not sell well because they were bought by people from northern Uganda who are not well represented around Kampala. Vegetables were sourced from within a radius of 40km except for one wholesaler who collected his onions from villages about 400km from Kampala.

History of marketing

The majority of traders have been selling vegetables for a period of 1-5 years. There was no particular preference between exotics and IVs in the choice of vegetables a trader started with.

Marketing arrangements

Retailers bought vegetables early each morning (5.00 - 7.00am) from farmers and wholesalers who travel to the markets. A retailer would generally sell in the same market because of limited capital and transportation costs to other markets. None of the retailers interviewed had contracts with wholesalers.

Post-harvest techniques

The only preservation techniques used by traders on IVs was to immerse the roots in water and sprinkle water on the leaves. The vegetables were then covered under plastic sheeting to reduce their transpiration. In this way they could keep for 2-3 days. Preservation was done only in the dry season as in the wet season the vegetables are already moist. Generally vegetables were washed prior to selling.

Seasonality

Tomatoes, cabbages and other exotics are more abundant in the dry season whereas IVs are more of a wet season crop. There has been an increase in the number of vegetable sellers because of higher demand of vegetables.

Prices

There has been no significant changes in prices over time. Selling prices in Nakasero market are better because the clientele is middle and upper class. Periods when customers are generally poor are those when they have many other obligations, for example, at times of paying school fees. Some traders were reported to have given up vegetable trading because of the increased number of sellers.

Income

In terms of income ranking IVs scored highly. Of the ten most important vegetables from which marketeers derive their income, five were indigenous. Over half the retailers listed farming as an alternative source of income.

Table 3 Ranking of traders' income from vegetables (the most important only).

Vegetable type	Rank
<i>Solanum aethiopicum</i> Shum	1
Tomatoes	2
Okra	3
<i>Amaranthus</i> spp	4
<i>Solanum anguivi</i>	5
Spinach	5
Garden egg	6
Green pepper	7
Cabbage	8
Lettuce	8
<i>Gynandropsis gynandra</i>	9
Onions	10
eggplant	11
<i>Hibiscus sabdariffa</i>	12
<i>Corchorus</i> spp.	13

Constraints and solutions

Judging by the frequency a particular problem was mentioned it appears the high prices during the dry season are the major problem. High prices deter consumers and make it harder to buy from wholesalers.

Table 4 Problems faced by traders.

Problem	Frequency
Increase in price (due to dry weather)	9
Market fees	8

Transport costs	8
Poor market (unstable prices)	8
Lack of proper storage facilities	8
Competition with roadside traders and other traders	7
Surplus (due to wet weather)	7
Perishability (a bigger problem in the wet season)	6
Elements (bad weather)	
Inadequate capital	5
Labour	3
Bad debtors	2

Future expectations

The majority of the traders expected to continue trading vegetables because they found it profitable.

PRODUCTION SURVEY

Farmer details

Of the 116 farmers interviewed, 44 were women. The majority of the farmers were between the ages of 25 and 44.

Product inventory

Table 5 Most popular vegetables grown

Vegetable	Mpigi (Busiro county)	Mpigi (Kasangati County)	Mukono	Luweero	Total	Percentage
Nakati (=Shum)	26	31	27	25	109	92
<i>Amaranthus cruentus</i>	25	31	17	25	98	83
<i>Gynandropsis</i> *	19	24	14	7	64	54
Garden egg	13	12	23	9	57	48
Cabbage	13	8	17	11	49	42
<i>Amaranthus blitum</i> + <i>A. dubius</i> *	12	9	19	5	45	38
Tomatoes	8	7	12	9	36	31
Eggplant	6	5	7	8	26	22
Beans	19	-	-	-	19	16
Green pepper	9	2	1	6	18	15
Huckleberry*	4	4	2	2	12	10

* These vegetables may have been growing in many more farmers' homes. However, since they grow partly as spontaneous crops, many farmers may have ignored them in their answers.

Over 40 different types of vegetables were being grown in the survey area. Table 5 shows the most popular ones. Shum and Amaranth are the most popular IVs whereas cabbage and tomato are the most popular exotics. IVs are probably more popular

because of cultural reasons but also because they are cheaper to propagate in terms of inputs required.

The popularity of leafy vegetables (LVs) is also due to their ease of preparation which is mainly by steaming and also boiling. Tomatoes are not usually eaten fresh but are used to flavour food and other vegetables. Farmers were found to consume all types of vegetables they grow.

Production details

Most vegetables are grown on family land. Renting is also common and about a quarter of those interviewed admitted squatting on the former King's land (Mailo land) with no land titles. Some rent land for short periods of 1-2 years. Most vegetable gardens were found to be less than 500m from their homes. Vegetable gardens were less than 0.5ha in size although some of the larger commercially orientated farmers had plots up to 4ha.

Most commercially orientated farmers grew their vegetables in swampy areas because they were less likely to dry out in the dry season, ensuring an all year supply of vegetables. Most subsistence farmers and others without access to a permanent water source grew indigenous vegetables on well drained soils in the wet season to take advantage of the rains. Farmers mainly practice intercropping of the various indigenous vegetables, particularly *Solanum aethiopicum* Shum and *Amaranthus lividus*, or *S. aethiopicum* Shum, *A. lividus* and *Gynandropsis gynandra*. Exotics on the other hand are monocropped. Intercropping results in lower individual harvests when compared to monocropping but it is practiced in order to get a double harvest (two crops), take advantage of inadequate land and to reduce soil erosion due to high crop density. Intercropping also eases weeding for as one harvests one crop, he/she can take care of the weeds.

Labour

Farmers employ both family and hired labour. The hired labour is used to clear land and to harvest vegetables while family labour is employed for weeding.

Credit

The majority of farmers do not access to credit facilities.

Inputs

Farmers raise their own indigenous vegetable seeds and are therefore much cheaper to the exotic seeds which are bought. The farmers of Mukono district who receive advice from extension staff used mainly organic manure when compared with other farmers who mainly use fertilizers. Most farmers apply pesticides, especially on Shum and exotics. The cost of fertilizer and pesticides is high. Lack of extension services is a major problem. Farmers need advice on pest and disease control, nursery techniques and proper garden management practices.

History of production

The majority of farmers have been growing vegetables for between 1 and 6 years

It was noted that some people had given up farming when they obtained paid employment because vegetable growing was too demanding and not always very profitable. Out of 42 farmers, 27 reported that they started vegetable growing by planting IVs, 10 started with exotics and 5 with a mixture of IVs and exotics.

Purpose of production

Most of the farmers grow vegetables as a cash crop and even those who grew for subsistence needs sold the surplus.

Table 6 . Primary objective of vegetable growing by farmers.

District/County	Number of farmers growing for		
	The market	Subsistence	Both
Mpigi/Busiro	22	7	1
Mpigi/Kasangati	14	16	-
Mukono	14	15	1
Luweero	26	1	-
Total	76	39	2
Percentage total	64	33	2

Farmers reported that Nakati was the most profitable vegetable crop. This is partly due to the fact that in comparison to exotic crops there are fewer purchased inputs and the harvesting period is longer.

Table 7 Income ranking by farmers

Vegetable	Number of farmers	Rank
Nakati	59	1
Cabbage	21	2
Tomatoes	11	3
Amaranth (<i>A. cruentus</i>)	53	4
Green pepper	10	5
Garden egg	27	6
Gynandropsis	26	7
Eggplant	12	8
Wild amaranth	10	9

Most farmers have been growing vegetables for a long time (more than 4 years), and they don't expect to change. Many farmers considered themselves as poor but have no better alternative economic activity than vegetable growing. The most important alternative source of income to vegetable growing is food (staple crops or meat) and cash crop growing. Growing indigenous vegetables is considered to be more profitable than pig rearing and other selling food crops. Therefore the primary objective for growing vegetables is mainly for earning an income whilst subsistence is secondary. Amaranth was a popular cash crop because it matures earlier but has to be sold quickly because of its perishability.

Farmers were found to consume all the types of vegetables they grew. *Solanum aethiopicum* Shum and *Amaranthus lividus* are the most popular local vegetables, whereas cabbage and tomato are the most popular exotics. Farmers were found to increase their production of vegetables in general. *S. aethiopicum* Shum is the most profitable crop because of its popularity (good taste) by consumers when compared with other vegetables. *Amaranthus dubius*, *Gynandropsis gynandra* and eggplant are less popular with consumers. *A. dubius* has a reputation to grow in dirty areas for example close to toilets, hence its unpopularity. *Gynandropsis gynandra* and also *Solanum nigrum* and *Solanum anguivi* are not liked because of their bitter taste, while eggplant is unpopular because it has a flat taste and needs frying before consumption. *G. gynandra* and *Solanum anguivi* have a cultural value beside their commercial and subsistence value; they are believed to cure hypertension. *G. gynandra* is also liked by the aged because it is believed to improve sexual potency.

Sources of information

Vegetable farmers reported that they had received advice on vegetable growing from the following sources; family, fellow farmers, schools, extension workers, associations, farm supply shops, seminars and workshops and the media (radio). The majority of the farmers got their knowledge from fellow farmers and to a lesser extent extension workers. The latter are mainly farmers from Mukono district because they are close to the District Farm Institute that is frequented by senior government officials including ministers. This may make the extension workers more vigilant and also the staffing level may be better than in other areas.

Marketing/post-harvest arrangements

Farmers used pick-ups, school vans, bicycles, motorcycles and taxis to transport their produce to the markets. Pick-ups are the most favoured mode of transportation to markets more than 20 Km from the gardens. While some accompany the vegetables on the pick-up others go by taxi.

Farmers harvest in the evening. After harvesting, leafy vegetables are tied into big bundles weighing up to 30 Kg or more. The little preservation done on IVs is by dipping roots of the vegetables in water in an appropriate vessel, but the leaves must never touch water because they rot when they touch water.

Some farmers reported that they stay in the market overnight in order to capture the market very early the next morning. It was important for farmers to sell early in the morning so as to find a buyer. Most farmers do not have contracts with their customers. They sell mainly to wholesalers, retailers and consumers. Most of the farmers sell twice a week in markets.

According to the majority of farmers, vegetable prices have been increasing with time possibly because there are more consumers of vegetables (in urban areas), while according to some prices were falling because many people have joined the vegetable

growing business. The Christmas season was identified by some as a good season for selling; the prices are higher.

Vegetable prices are better during the dry season when there is a scarcity of vegetables. At this time those growing in swamps benefit from higher prices. For many the wet season is better than the dry season because in the dry season they would not earn anything since the majority do not have irrigation facilities.

Constraints and solutions

Farmers listed many problems but the most common was pest and diseases (and the lack of pesticides). Table 8 lists the main problems.

Table 8 Main problems faced by farmers.

Problem	times mentioned
Pests and Diseases	90
Inadequate capital /no credit	67
Water logging/ rains /drought	58
Lack of pesticides	53
Poor value of IVs/ poor markets	52
Lack of fertilizers	43
labour problems	39
Poor transportation facilities	36
Land problems	32
lack of equipment	27
Lack of seed	18
No cultivation knowledge	18

Farmers are looking towards the government to solve their problems. The farmers wish list includes the following:

- 1) government should develop the vegetable market and create an export market,
- 2) government subsidy for farm inputs like fertilizers etc.,
- 3) government establishes/improves the extension service,
- 4) government should make soft loans available to farmers,
- 5) farmers establish farming associations/groups to for example improve their marketing. Through associations/groups they may be able to buy vehicles or contract vehicles to transport their vegetables.

Annex 1: Examples of farmer and trader checklists

Trader checklist

This checklist details subject areas and possible questions to help you when interviewing traders. Many of the topics may be answered by direct observation or other PRA techniques such as ranking or scoring exercises. Keep in mind that the objective of the study: **to establish the socio-economic value of indigenous vegetables relative to exotic vegetables**. We are only concerned with vegetables (IVs and exotics). When taking notes you may find it easier to use the headings in bold as summary headings. Note date, time and location of interview.

Remember you need to collect enough information to be able to write a comprehensive report of the survey area. Don't forget the six helpers: who? what? where? how? when? why?

Market description. (not everyone has to do this)

Draw a sketch map.. Count the number of sellers of vegetables differentiating between those who sell IVs only, exotics only, or both IVs and exotics. Try and talk to the market master or mistress. Are there more or less sellers of vegetables (IVs and exotics) than in previous years?

Trader details

Market actor (retailer, wholesaler, etc.) Gender / age (approx.). Who is growing these vegetables? Source: name of village.

Product Inventory

What vegetable crops are being sold (IVs and exotic)? Where are they grown: home, near or far garden?

Trader perceptions of consumer preferences

What are the consumer preferences (likes and dislikes? Substitutes? qualities?)

History of marketing

How long have you been selling these crops (IVs and exotic)? Has your choice of crops changed over the years? Are there more or less sellers of these products (IVs and exotics) than in previous years?

Marketing arrangements

What are the marketing arrangements between you and the farmers/wholesalers? Where do you meet? How often? Time and location Do you have contracts with your suppliers? How much do you buy? How long does it take to sell? Which other markets do you sell in? Why don't you sell in other markets? Are the prices different in other markets? What services do retailers/wholesalers provide to farmers such as loans, etc?

Post-harvest techniques

Is the produce sold processed? Who does this? How long can you store the product? Provide details. How do you prepare the produce for market? Estimate of losses?

Seasonality

At what times of the year are the vegetables most/least available? Has supply changed over the years?

Prices

What price do you sell at? Buy at? What is the unit of measurement (buying and selling)? Do prices change between the wet and dry season? Has the price changed over the years?

Income

Is this your main source of income? Ranking/scoring exercise:

- Rank commodities on sale in terms of importance as a source of income
- Rank vegetables (both IVs and exotics together) in order of importance as a source of income.

Constraints and solutions

Ranking/scoring exercise: What are your main problems in the marketing of IVs and exotics? How do you think these problems could be resolved?

Future expectations: Will you continue to sell the same IVs and exotics in the future?

Farmer checklist

This checklist details subject areas and possible questions to help you when interviewing farmers. Many of the topics may be answered by direct observation or other PRA techniques such as ranking or scoring exercises. Keep in mind that the objective of the study: **to establish the socio-economic value of indigenous vegetables relative to exotic vegetables**. We are only concerned with vegetables (IVs and exotics). When taking notes you may find it easier to use the headings in bold as summary headings. Note date, time and location of interview.

Remember you need to collect enough information to be able to write a comprehensive report of the survey area. Don't forget the six helpers: who? what? where? how? when? why?

1. Farmer details

Gender / age (approx.)

2. Product Inventory

What vegetable crops are being grown (IVs & exotic)? Where are they grown - home, near or far garden?

Source: name of village

3. Production details

For IVs describe current productions and harvesting techniques (Indigenous Knowledge). Eg. Details of intercropping/monocropping, duration & frequency of harvesting periods, etc.

- *Inputs*: What types of inputs such as fertiliser and pesticides are used? Source and cost? Does the use of these inputs vary between IVs and exotics or subsistence and cash crops?

- *Land tenure*: (This is a sensitive issues - ask towards end of interview) Is the land owned, rented, being used illegally, borrowed, free access?

- *Labour*: Do the men and women tend to different crops? Is hired labour ever used?

- *Seasonality*: Does the type of IVs and exotics grown depend upon the season? Provide details.

- *Access to credit*: Do you have access to credit (formal and/or informal)?

4. History of production

How long have you been growing these crops (IVs and exotic)? Has production changed over the years?

5. Purpose of production

Why are these crops being grown (subsistence, income, cultural)? Which purpose is the most important?

6. Subsistence (home consumption)

For each vegetable how often is it consumed (daily, x times/week, occasionally, rarely...)? How is the vegetable used/prepared? What are the preferences (likes and dislikes)? *Ranking/scoring exercise*: Rank IVs and exotics in order of importance in terms of subsistence value. Where possible rank IVs and exotics first separately and then combined.

7. Income

What are the farmer's sources of income (including off-farm income)? Seasonality to the sources of income?

Ranking exercises: 1) Rank sources of income in order of importance. 2) Rank just the vegetables (both IVs & exotics together) in order of importance as a source of income.

8. Sources of information/advice

Do you receive any advice from extension officers, friends, etc. For which crops?

9. Marketing/post-harvest arrangements

Where do you sell these products? Who does this (gender)? How often? Who do you sell to? Contracts? Could you sell more? Describe the chain of events from harvesting to point of sale (include processing, packaging, transportation, storage, and gender details). What are the prices per unit? How does this change between the wet and dry season? Has the price changed over the years? Estimates of losses?

10. Constraints and solutions

Ranking/scoring exercise: What are your main problems in the production and marketing of IVs and exotics? How do you think these problems could be resolved?

11. Future expectations: Will you continue to grow the same IVs and exotics in the future?