# Field vegetable production in the Lake Zone of Tanzania

A.P. Everaarts, H. de Putter, A.P. Maerere and W. Amon

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***Photo cover*** Nyabange, sukuma wiki plot with Lake Victoria at the background.


Applied Plant Research (Praktijkonderzoek Plant & Omgeving, PPO), part of Wageningen UR, Business Unit Arable Farming, Multifunctional Agriculture and Field Production of Vegetables.

| | | |
|---|---|---|
| Address | : | P.O. Box 430, 8200 AK Lelystad, The Netherlands |
| | : | Edelhertweg 1, Lelystad, The Netherlands |
| Tel. | : | +31 320 291 111 |
| E-mail | : | info.ppo@wur.nl |
| Internet | : | www.wageningenUR.nl/ppo |

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A.P. Everaarts[1)], H. de Putter[1)], A.P. Maerere[2)] and W. Amon[3)]

[1)]*Applied Plant Research, Wageningen UR, P.O. Box 430, 8200 AK Lelystad, The Netherlands.*

[2)]*Soikone University of Agriculture, P.O. Box 3005, Chuo Kikuu, Morogoro, Tanzania.*

[3)]*Multiflower Ltd, Arusha, Tanzania.*

## Contents


Figure 1. Musoma, seed shop.

# 1 Summary

In November 2012 and in August 2014 surveys were carried out in field vegetable producing areas in the Lake Zone of Tanzania. The areas visited in 2012 were: (i) Kibeyo, Mugumu district, (ii) Mogabiri, Tarime district, (iii) Nyabange, Musoma rural district, (iv) Itumbili, Magu district, and (v) Nyaholongo, Nyamatale and Kagera, Misungwi district. In 2014, (i) Chamabanda, Sengerema district, (ii) Iyogelo, Sengerema district, (iii) Bugululа, Geita district, (iv) Kibwela, Geita district, (v) Kiziba, Geita district and the vegetable market in Bukoba town and a seed shop in Bukoba town were visited.

The aim of the surveys was to learn the conditions for field vegetable production and marketing in these areas. Recommendations for the development of vegetable production were formulated in order to enlarge the supply of vegetable products and secure a balanced nutrition for the rural and urban population.

Field vegetable production in the Lake Zone area is mostly small scale and rain dependent. A wide variety of crops is cultivated and production itself is professional. Production in the dry season is limited by the availability of water, and when water is available, by the amount of labour spend on hand watering the crop. Most of the information on pest and disease control is provided by the agro-dealers where farmers buy their pesticides. Packaging of products is at an elementary level. Marketing of products is mainly local, to nearby villages and towns and to the few larger cities in the Lake Zone and occasionally to Kenya.

It is recommended to demonstrate and facilitate the introduction of labour and water saving drip irrigation techniques, to reduce the amount of labour and water that is needed for crop production, thereby making expansion of the area under vegetable production in the dry season possible. Where no water is available in the dry season, the options of constructing bore holes should be investigated. The supply of information on effective pest and disease control, independent from agro-dealers, is urgently needed to improve pest and disease control and to avoid misuse of pesticides.

Stimulation of vegetable production in the rural areas will create employment. To secure future production, conservation of the natural vegetation is recommended to protect water catchment areas and avoid regional climate change.


Figure 2. Musoma, seed shop, seeds on display.

## 2 Recommendations

Following the field observations, discussion of the situation and the drawing of conclusions, many recommendations could have been formulated, but we choose to formulate only three. In the present state of development, in our opinion, the three recommendations formulated below would address the presently most urgent problems in field vegetable production in the Lake Zone, while taking a long term view as well. For a broader view of issues the reader is referred to the Discussion and Conclusions section.

- Vegetable production in the Lake Zone in the dry season is limited by lack of water, or where water is available, production is limited by the amount of labour needed for irrigating the crops by hand. At suitable locations, where no water is available, bore holes could be constructed. Where water is available, production and harvest security would benefit from the introduction of labour and water saving drip irrigation techniques.

- Presently farmers receive information on identity and control of pests and diseases mainly from local agro-dealers. Independent, especially pictorial, information on identity and control methods of pests and diseases is urgently needed to improve pest and disease control.

- On a regional scale protection of the natural vegetation from harvesting for fire wood or charcoal production, is needed to avoid regional climate change and preserve water catchment areas. The introduction of alternative sustainable energy, should reduce the dependence on fire wood and charcoal for cooking, while stimulation of vegetable production would create employment in the rural areas, lessening the dependence on making a living out of harvesting fire wood or making charcoal.


Figure 3. Musoma, seed shop, signboard.

Figure 4. Road in Mara region.

Figure 5. Ploughing with oxen near Misungwi.

## 3 Introduction

In 2012 and 2014 surveys were made in a number of field vegetable production areas in the Lake Zone of Tanzania. The aim of these surveys was to learn about the conditions for field production and marketing of vegetables in these areas. The data collected would support the development of the vegetable production sector, in order to promote production and thereby secure a continuous, affordable supply of vegetable products for the food security and a balanced nutrition of the rural and urban population.

With the aid of a checklist, semi-structured interviews were held with one or more informants in each area. Interviews were mostly done in Swahili, with direct translation to English. It proved difficult to cover all aspects of vegetable production and marketing in detail. Either information was not available or the accuracy of the answers tended to be insufficient. Nevertheless in all areas a good first impression was obtained of current vegetable production and marketing methods. The information obtained is supplemented and supported by photographs showing the crops, as well as production and marketing practices in the areas surveyed.

The result of the surveys is a qualitative description of the field vegetable production and marketing methods in the Lake Zone areas visited. The report is concluded with discussion on opportunities and constraints for development. A number of recommendations to stimulate development have been formulated.

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*See Appendix 1 for an Itinerary.*
*In Appendix 2 the pesticides mentioned by the informants are listed.*
*In Appendix 3 information is presented from the 2007/2008 National Sample Census on agricultural production in the districts concerned.*

## 4 Tanzania

Tanzania is situated in East Africa along the western coast of the Indian Ocean, in the southern hemisphere (1-12° S, 29-41° E). Tanzania is bordered by Kenya and Uganda in the north, Ruanda, Burundi and the Democratic Republic of Congo in the west and Zambia, Malawi and Mozambique in the south. The surface of the land area is 885,800 km$^2$. In 2012 the population was estimated at 45 million (Population and Housing Census, 2012). Tanzania mainland is divided in 25 regions, which are sub-divided into districts.
The Lake Zone has a tropical climate, with a rather even temperature distribution throughout the year. Because of the high altitude (Lake Victoria is situated at 1130 meters above sea level, m.a.s.l.) average temperatures are not as high as in the lowlands of Tanzania. In the areas visited the maximum and minimum temperatures range between 24 and 10 °C, with Mwanza having the highest temperatures and Bukoba the lowest (Figure 6). The yearly rainfall in the areas visited follows a bi-modal pattern, with the short rainy season from October to December and the long rainy season from March to May (Figure 7). Average rainfall is highest in Bukoba, while rainfall may be especially low in Musoma.

The areas visited were (Figure 8):

1. ***Kibeyo,*** Mugumu district, Mara region;
2. ***Mogabiri,*** Tarime district, Mara region;
3. ***Nyabange,*** Musoma rural district, Mara region;
4. ***Itumbili,*** Magu district, Mwanza region;
5. ***Nyaholongo, Nyamatale*** and ***Kagera,*** Misungwi district, Mwanza region;
6. ***Chamabanda,*** Sengerema district, Mwanza region;
7. ***Iyogelo,*** Sengerema district, Mwanza region;
8. ***Bugulula,*** Geita district, Mwanza region;
9. ***Kibwela,*** Geita district, Mwanza region;
10. ***Kiziba,*** Geita district, Mwanza region.

In the city of Bukoba, in the Kagera region, the vegetable market and a vegetable seed shop were visited.

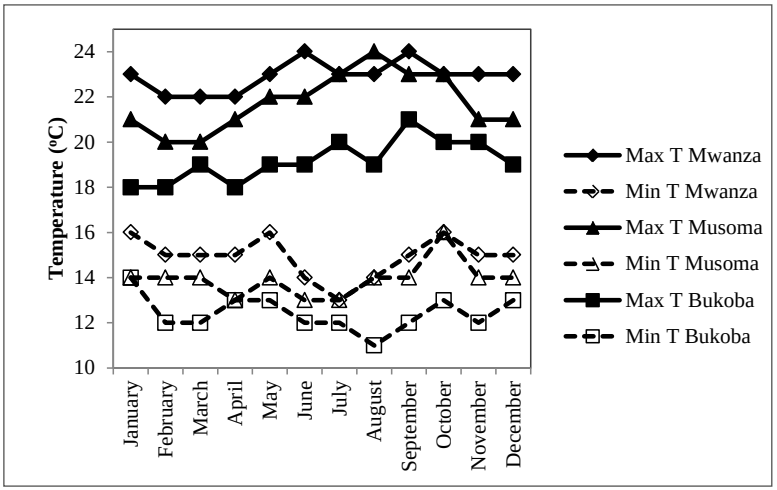



Figure 6. Mean monthly maximum and minimum temperature in Mwanza, Musoma and Bukoba (2002–2012).

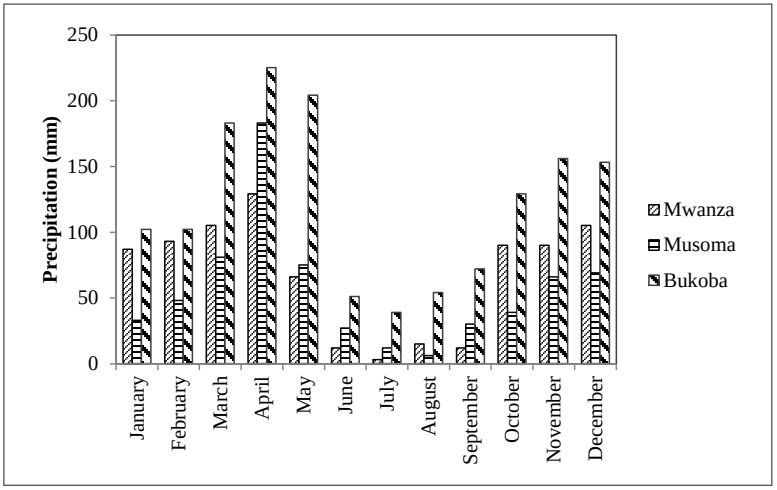



Figure 7. Mean monthly precipitation in Mwanza, Musoma and Bukoba (2002–2012).

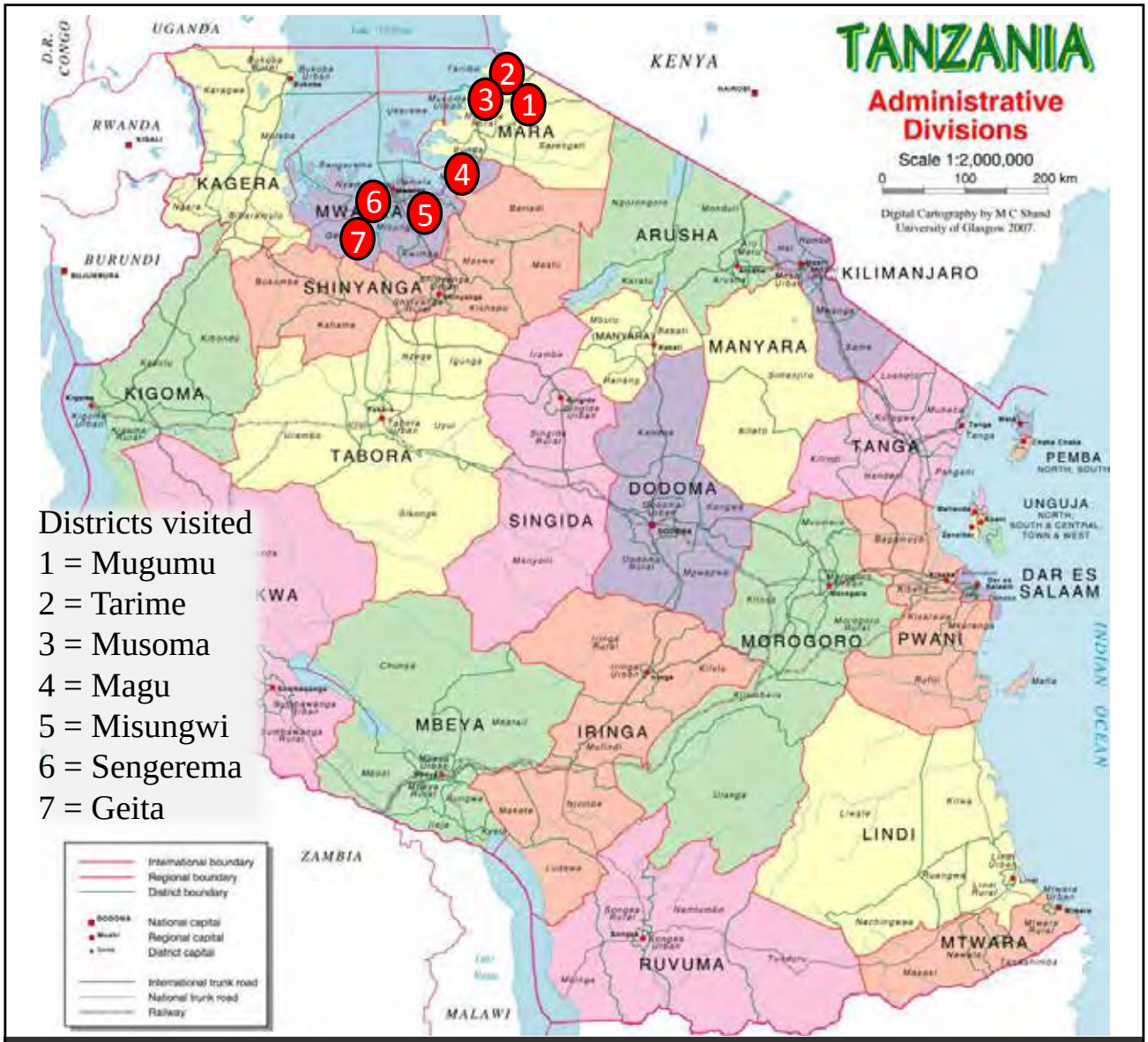



Figure 8. Map of Tanzania with the districts visited.


Figure 9. Mugumu, seed shop.


## **5** Areas visited

### 5.1 *Kibeyo,* Mugumu district

***Informant***
Mrs. Anna Ibrahim, local farmer.

***Area characteristics***
The altitude of the area is around 1600 m.a.s.l. The landscape is slightly undulating, with scattered small village compounds, consisting of a limited number of thatched roof houses, interspersed with isolated fields with food crops and vegetables with grazing grounds in between. The landscape is rather open, with scattered trees and bushes. The soils are loamy sands to sandy soils. The area makes the impression of not being densely populated. Vegetable production does not appear to take place on a large scale. Average farm size is said to be four acres of which two acres are used for vegetable production.
The long rainy season runs from March-April up to June, with a short rainy season from October-November to December.

***Crops***
Major food crops in this area are maize and cassava. Major vegetable crops are tomato and sukuma wiki. Minor vegetable crops are African eggplant, hot

Figure 10.  Mugumu district, Kibeyo village.

Figure 11. Kibeyo, sukuma wiki on sandy soil.

Figure 12. Kibeyo, field nursery.

pepper, onions and water melon.

***Planting seasons***

The main sowing seasons for tomato are January and May and for sukuma wiki are April, June and November. Planting in the production field is about one month later. African eggplant is sown in November and March and transplanted three to four weeks later. Transplants are raised in a field nursery, covered with leaves placed on a wooden rack.

***Cultivation***

Primary soil tillage of the field is with an oxen drawn plough, followed by tillage during crop growth with a hand hoe. Farm yard manure is used to fertilise the vegetable crops.

During dry periods crops are irrigated by hand once a week. Water for irrigating the crops is transported to the field from the river, about three kilometres away, by three buckets held together on a bicycle or in buckets in an oxen pulled cart.

***Pests and diseases***

Spider mites and caterpillars were mentioned as difficult to control pests. Thionex is used as an insecticide. Diseases were not identified, but the fungicides Farmerzeb and Ivory are used.

Figure 13. Road in Mara region.

Fungicides were said to be used once a week during the rainy season and once a fortnight during the dry season.

***Marketing***

Products are mostly directly sold by the farmer in Mugumu town, mainly for local consumption.

***Packaging and transport***

Bamboo crates are used for transport.

***Varieties and seed source***

The tomato variety mentioned is Anna F1. Onion variety: Red Creole. All seeds are bought in shops in Mugumu. Seed brands mentioned are: Mkulima, Seminis and Royal Sluis.

Figure 14. Mogabiri, sukuma wiki.

## 5.2 *Mogabiri,* Tarime district

***Informants***

Mr. Marwa Mahaba and Mr. Protas Nyamhanga, local farmers.
Mr. Aristides Edward Kamugisha, Officer, Mogabiri Farm Extension Service.

***Area characteristics***

The Mogabiri area is situated at an altitude of around 1700 m.a.s.l. The area has an undulating landscape, consisting of many, small to rather large terraces with food crops, like maize and cassava, and vegetables. Food crop and vegetable plots are bordered by trees and surrounded by fields with bananas. In general, the area makes a rather lush, green and fertile impression. The soil is a healthy looking, stable reddish yellow sandy loam with high organic matter content.
The long rainy season is from February to May. The short rainy season starts in August and lasts up to November.
Farmers on average have one acre, on about half of which vegetables are produced. The other half of the area is used for production of maize, cassava or sweet potatoes. The area a farmer may have for the production of banana is not included in this one acre. Land may be owned or is hired. The latter especially for production of vegetables.
Farmers may have cattle, but the cattle stay inside, on the farm (zero grazing system). Feed for the animals is collected from the farm surroundings.

***Crops***

Major food crops in Mogabiri are maize, cassava and bananas. Major vegetable crops are cabbage, sukuma wiki, sweet pepper, carrots, onion and tomato. Minor vegetable crops are amaranth, Chinese cabbage, okra, African eggplant, Swiss chard, spider flower and black eye pea.

***Planting seasons***

Tomato planting is in October, harvest starts in December. Cabbage is planted in January. Onion sowing takes place in January and July, transplanting is in March and September-October. Sukuma wiki is planted in November, with the harvest starting in January. Sweet pepper is grown from May to August or from September to January. Carrots are sown in September and harvested in January.

***Cultivation***

Major soil tillage is by oxen drawn plough, followed by land preparation with a hand hoe. Tomatoes are planted on ridges. Crops are not irrigated. Crop production is completely dependent on rainfall. Farm yard manure of cow, chicken or goat, may

Figure 15. Mogabiri landscape.

be used for fertilisation. Sulphate of ammonia, di-ammonium phosphate and urea are used as fertilisers, as well as compound NPK fertiliser. Calcium ammonium nitrate is considered too expensive. Preference, however, is given to farm yard manure.

***Pests and diseases***

Red spider mites and aphids are serious pests. Thionex is a major insecticide used. Fusarium is frequently found. Ridomil and Linkonil are used as fungicides. Illiteracy among farmers is mentioned as a problem in understanding the correct use of pesticides.

***Marketing***

Products are mostly directly sold by the producer at the Tarime market. Occasionally middlemen from Tarime come to the fields to buy products for marketing in Mwanza or Kenya.

***Packaging and transport***

Transport of products to the local market is in plastic buckets. Wooden crates are used for long distance transport.

***Varieties and seed source***

Tomato varieties used are Mwanga F1 and Tanya (Open Pollinated, OP). Cabbage varieties found

Figure 16. Mogabiri, field nursery.


Figure 17. Tarime, seeds for sale.

are Bora F1, Victoria F1 and the OP variety Glory of Enkhuizen. Bora F1 was said not to be popular because of its taste. Onion varieties cultivated are Red Creole and Red Bombay. The sweet pepper variety used was Yolo Wonder. For sukuma wiki the variety Georgia was mentioned, while for carrot the variety was Nantes F1.

Seeds are bought in local shops. Seed brands observed: Mkulima, Seminis, Simlaw, EA Seed, Rionex, Starke Ayres and Kibo seeds.

Figure 19. Mogabiri, tomato field.


Figure 18. Mogabiri, spraying tomatoes.

Figure 20. Nyabange, sukuma wiki plot with Lake Victoria at the background.

## 5.3 *Nyabange,* Musoma rural district

***Informants***

Mr. Godfrey Majengo and Mr. Chaina Maswi, local farmers.

***Area characteristics***

The area is close to Lake Victoria. The altitude is around 1150 m.a.s.l. The landscape is rather open, with few isolated or clustered trees. Fields may be rather level and free of rocks, or alternatively, especially close to Lake Victoria, fields may be undulating and rocks and boulders are found in the fields. The soils are loamy sands. During the survey vegetable plots were found in the midst of otherwise unused areas or waste land. Fruit species like oranges, passion fruit and papaya are grown on the farms as well.

Farmers may own land or hire land for the production of vegetables. Many vegetable producers are fishermen with only a small plot of land for vegetable production.

The long rainy season is from February to May. The short rainy season runs from September-October to December.

Figure 21. Musoma, vegetable market.

### *Crops*

Major vegetable crops are tomato, onion, cucumber, water melon, cabbage and hot pepper (both *Capsicum annuum* and *C. chinense*). Minor crops are amaranth, sukuma wiki, black eyed pea, African eggplant, sweet pepper, okra (short and tall varieties) and Chinese cabbage.

### *Planting seasons*

Tomatoes are planted in August, with the harvest in November-December. Hot pepper is planted in April, the first harvest is in June and continues for a year. Cucumber is directly sown in June and harvest starts in August up to October. Okra is directly sown in February and harvest starts 35 to 60 days later. The short okra varieties can be harvested every two days during a month, the tall varieties can be harvested every two days up to two months.

### *Cultivation*

All soil tillage, land preparation and weed control is done by hand. Although some farmers own cattle, oxen are not used as draught animals for soil tillage. Mostly farm yard manure is used for crop fertilisation, especially at planting. During crop growth di-ammonium phosphate (DAP), urea and calcium ammonium nitrate may only be sparsely used. Compound NPK fertilizer is used when

Figure 22. Musoma, pre-packed tomatoes.

Figure 23. Nyabange, young tomato field.

DAP is not available. When farmers own a pump, furrow irrigation is practised, with water from Lake Victoria. Water may be supplied over a distance of up to 500 m. No permit is needed and there are no charges for pumping water. Farmers without a pump depend on rainfall. Tomatoes mostly are staked. Cucumber is grown on up to two meters high trellis.

***Pests and diseases***

White fly, aphids, red spider mite and caterpillars were mentioned as serious pests. Linkonil, Thionex, Selecron and Farmguard are used for control of insects. Ridomil, Ivory and Farmerzeb are used as fungicides.

***Marketing***

Marketing of products is mainly by middle men, who come to the field. Middlemen then sell the products in Musoma, Tarime or in Kenya. Some products, like onions, may be sold by the farmers themselves in nearby Musoma.

***Packaging and transport***

Tomatoes are harvested in plastic buckets. They are collected and transported to the farm house on a wheel barrow. At the farm house they are packed in bamboo crates, with a fresh grass layer on top, for long distance transport.

Other products may be transported in bulk, or in poly-propylene (cabbage) or sisal (onion) bags, on bicycles, motor bikes or motor tricycles, from the

Figure 24. Nyabange, tomato field near harvest.

farm to nearby markets.

***Varieties and seed source***

The hybrid tomato varieties Mwanga F1 and Assila and the Open Pollinated tomato varieties Cal J and Onyx are grown. For cabbage the variety Victoria F1 is used. An array of seeds of vegetable varieties of various brands is available in Musoma shops. The seeds for sale in Musoma, are in most cases similar to the ones available in the nearby Tarime district.

Figure 25. Nyabange, harvesting tomatoes.

Figure 26. Nyabange, harvested tomatoes.

Figure 28. Nyabange, field with amaranth.

Figure 29. Nyabange, short okra variety.

Figure 27. Nyabange, preparing tomatoes for transport.

Figure 30. Nyabange, tall okra variety.

Figure 31. Itumbili, harvested cabbage.

## 5.4 *Itumbili,* Magu district

***Informant***
Mr. John Benatus, local farmer.

***Area characteristics***
The area is a small, narrow strip of vegetable production along the Simiyu River near Magu at an altitude of 1145 m.a.s.l. The landscape is mostly open with sparse natural vegetation. The land is flat with rather large plots of vegetable crops, alternated with rice fields. The soil is a black clay soil with seemingly high organic matter content. Water is year-round available from the nearby river. Motor pumps and hoses are used for surface irrigation of the vegetable crops. Only the vegetable crops are irrigated, the rice is rain fed. The maximum distance of vegetable production from the river is determined by the power and capacity of the pump available. No houses were observed, apart from a more or less temporary shelter of the farmer.
The long rainy season is from February to May, with the short rainy season from September to December.

***Crops***
Major vegetable crops are sweet pepper, cabbage, water melon, cucumber. Minor crops are sweet and bitter African eggplant, eggplant and okra.

Figure 32. Itumbili, transport of cabbage from the field.

Mr. Benatus does not grow tomatoes because of the fluctuating market prices. Tomato production takes place in the area though.

***Planting seasons***

Sweet pepper is sown in September and January, transplanted about a month later, with harvesting in the December-March or May-August period. Cabbage is sown three times a year, with transplanting about a month after sowing. With an Open Pollinated cabbage variety harvesting is about three months after planting, while with a hybrid variety harvesting may be after 75 days in the field. Cucumber is sown in April with a harvest period of one month in June. The second crop of cucumber is sown in November with the harvest in December. Okra is sown in September for a two month harvest period starting in December.

***Cultivation***

Primary soil tillage is with oxen drawn plough. Further land preparation is done by hand. Production of vegetable crops is rotated with rice. Farm yard manure is used at planting, with calcium ammonium nitrate and urea applied during crop growth.

***Pests and diseases***

Aphids and red spider mites are important pests. Insecticides used are Thionex, Selecron, Dimethoate and Farmguard. Fungicides mentioned are Linkonil, Farmerzeb, Ivory and Victory. Both insecticides and fungicides were said to be used once a week. No mixing of insecticides and fungicides takes place.

***Marketing***

Middlemen come to the farm to buy the products.

***Packaging and transport***

Transport of products is in poly-propylene bags.

***Varieties and seed source***

For sweet pepper the variety Yolo Wonder is used. For cabbage the varieties Copenhagen Market (OP) and Gloria F1, and for eggplant the variety Black Beauty. Seed brands mentioned were Mkulima, Pop Vriend and Kibo.

Figure 33. Itumbili, clay soil.

Figure 34. Itumbili, transport of cabbage.

Figure 36. Itumbili, mature crop of African eggplant.

Figure 35. Itumbili, sweet pepper crop.

Figure 37. Itumbili, rice with cabbage crop at the background.

Figure 38. Nyaholongo, landscape.

Figure 39. Nyaholongo, field with young amaranth.

## 5.5 *Nyaholongo, Nyamatale* and *Kagera*, Misungwi district

***Informants***

Mr. Kumalija, Mr. Joseph Kazinza and Mr. Charles Musa, local farmers.

***Area characteristics***

The area is slightly sloping, with few, scattered houses. The altitude is 1200 - 1250 m.a.s.l. Hills may be barren with only a few, small trees of the natural vegetation left. Large trees appear to be fruit trees or otherwise useful trees. Banana plants were not observed. Fields are mostly accessible by small paths only. The soils are sandy, with locally areas consisting of rather coarse sandy soils. For Nyaholongo the long rainy season runs from March to June, while the short rainy season is from November to February. For the other villages slightly different periods were mentioned for the long and short rainy season.

Plots planted with vegetables, generally, are small, as often water has to be given by hand with a bucket, limiting the area that can be cultivated.

***Crops***

Maize is a major food crop in the area. Major vegetable crops are tomatoes, cabbage, onion, cucumber and dry beans. Minor vegetable crops are amaranth, carrot, sweet pepper, hot pepper, okra and Chinese cabbage. Choice of crops was said to be dependent on market prices of the products.

***Planting seasons***

Tomato sowing is in August, with transplanting in September. Harvest then starts two to three months later depending on the variety planted. A second sowing of tomatoes may be done in October or in January-February. Both determinate and indeterminate varieties are used. Cabbage is sown in April and November, with transplanting in May and December. Harvest is about 60 days later. Beans are sown in November for harvest in January. Amaranth is sown year-round and takes about three weeks to grow before harvest. Sweet pepper is sown in June, transplanted in July, while harvest starts one to one and a half month later. Chinese cabbage is sown in April, transplanted after three weeks and harvested after one month in the field. Onions may be sown in January, transplanted in March and harvested after three months in the field.

Apart from the sowing and transplanting periods mentioned, other periods may be used as well, depending on availability of water for irrigation.

***Cultivation***

Crop production in the area is determined by the availability of water. With water available within carrying distance, in buckets, from nearby ponds or streams, vegetable production may be year-round.

Figure 40. Nyaholongo, tomato crop.

Otherwise planting of vegetable crops depends on the rainfall. Therefore most of the vegetable production takes place in the rainy seasons. Yields are said to be higher with irrigated crops, due to less incidence of diseases and pests. If no vegetables can be planted because of lack of water, the farmers grow maize, cassava and sweet potatoes. Primary soil tillage in the area is mostly by oxen drawn plough, followed by land preparation with a hand hoe. Primary soil tillage and land preparation may also be completely carried out by hand. A small type of hoe may especially be used for weeding. Farm yard manure is applied at planting. Compound NPK fertiliser is commonly used during growth. Calcium ammonium nitrate may also be applied.

***Pests and diseases***

Aphids, black and red spider mites, white fly and caterpillars are serious pests. Abamectin, Kung Fu and Mocron are applied as insecticides. Damping off and late blight cause problems in field nurseries and in the field. Fungicides used are Linkonil, Milthane, Ivory and Farmerzeb.

***Marketing***

With high prices, products may be directly brought by the farmers themselves to the Buhongwa market, near Mwanza, often using a bicycle. Otherwise products may be sold to middlemen, who come to

Figure 41. Nyaholongo, rural road.

Figure 42. Nyaholongo, cucumber crop.

Figure 44. Nyamatale, transport of tomatoes to the market.

Figure 45. Nyamatale, local cattle.

Figure 43. Nyamatale, sweet pepper crop.

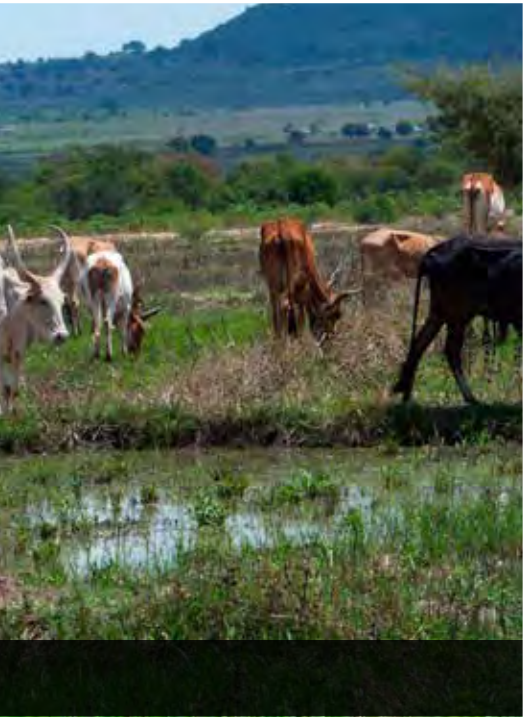


Figure 46. Kagera (Misungwi), watering the field.

Figure 47. Mwanza, Buhongwa market.

the field to buy products for the Mwanza markets or occasionally for export to Kenya.

***Packaging and transport***

Transport of products is in poly-propylene bags or bamboo baskets. Bicycle transport to the Buhongwa market takes about two hours.

***Varieties and seed source***

Tomato varieties frequently grown are Tengeru (OP), Cal J (OP), Mwanga F1, Tanya (OP) and Moyo F1. For cabbage the variety Victoria F1, for onion the variety Red Bombay, for carrots the variety Nantes and for cucumber the variety Ashley is used. Vegetable seeds are available in the local village shop. Seed brands mentioned: Mkulima and Pop Vriend.



Figure 48. Mwanza, Buhongwa market,


onions waiting for transport.

Figure 49. Mwanza, tomatoes arrive at Buhongwa market.

Figure 50. Mwanza, Kirumba market.

Figure 51.  Mwanza, cabbage arriving at Buhongwa market.

Figure 52. Mwanza, Kirumba market, leafy vegetables.

Figure 53. Mwanza, Kirumba market, cut leafy vegetables.

Figure 54. Mwanza, Kirumba market, tomatoes waiting for transport with Lake Victoria ferry.

## 5.6 *Chamabanda,* Sengerema district

***Informant***
Mr. Isa Mdetele, local farmer.

***Area characteristics***
The Chamabanda area is situated at the shore of Lake Victoria at an altitude of around 1130 m.a.s.l. It has a flat, rather open landscape, with scattered trees, especially fruit trees such as mango, citrus and guava, and plots with food crops like cassava. The soil is a sandy to sandy loam soil. The long rainy season is from December to April. The short rainy season runs from September to November.

***Crops***
Major vegetable crops in the area are water melon, onion, tomato, sweet pepper and cabbage. Minor vegetable crops are amaranth and cucumber.

***Planting seasons***
The main planting season for vegetable crops is from April to August. Crops then are irrigated by hand with water from Lake Victoria.

***Cultivation***
Mr. Mdetele has recently set up his own gravity based drip irrigation system for growing onions and water melon. Water is pumped from the nearby Lake Victoria, to an elevated reservoir drum. Crops are irrigated once or several times a day, according to crop growth conditions. The system appears to works very well. Mr. Mdetele is a pioneer with this system and he is planning to grow sweet pepper and tomato as well.
In the area manure of local cattle is used for fertilisation. Fertilisers used include di-ammonium phosphate, urea, compound NPK fertilizer (23:23:23) and to a limited extent calcium ammonium nitrate. Fertilisers are bought in Mwanza.

***Pests and diseases***
The farmer found it difficult to specifically name pests and diseases, but he actively applied fungicides and insecticides, often based on the advice of colleague vegetable producers. The fungicides he had in store on the farm were Milthane Super, Mo-Bankoner, Rido Super, Movil and Linkonil. Insecticides present included Proferon, Mocron and Subaprid. Information on how to use, and when to apply, fungicides and pesticides is given by the shop in Mwanza selling them. The farmer complained about the lack of good, reliable information about pesticides. A pictorial atlas of pest and disease symptoms would be greatly valued.

Figure 55. Chamabanda, landscape.


Figure 56. Chamabanda, drip irrigation water reservoir tank.

Figure 57. Chamabanda, water melon crop with drip irrigation.

***Marketing***

Middlemen tour the area on motorbikes, scouting for crops near harvest, to buy the product from the producers. Products are sold by the middlemen on the Mwanza Kirumba market, directly to small retailers.

***Packaging and transport***

No observations were made on packaging. Water melons were transported in bulk with small boats directly from the field, across Lake Victoria, to the Mwanza market.

***Varieties and seed source***

Three varieties of water melon are produced: Sukari F1 (EA Seed), Pata Negra F1 (Seminis) and Mshindi F1 (East West Tanzania). For onions Red Bombay is the commonly used variety. Seeds are bought in Mwanza seed shops.

Figure 58. Chamabanda, water melons near harvest.

Figure 59. Chamabanda, onions drying in the sun.

Figure 60. Iyogelo, path to the vegetable plots.

## 5.7 *Iyogelo,* Sengerema district

***Informants***

Main informants Mrs. Mama Flora and Mr. Filipo M., local farmers, with other farmers present.

***Area characteristics***

The Iyogelo landscape is flat, with almost all land divided in rather large terraced plots for the cultivation of rice. Vegetable plots may be small in area in comparison to the rice fields. Vegetable plots may be located at quite some walking distance along small paths from a main rural road. The soils are loamy sands to sandy loams. The long rainy season is from October to April. The short rainy season is from August to September. The area is located at around 1100 m.a.s.l.

***Crops***

Major vegetable crops in the area are Chinese cabbage, cabbage, okra, tomato and African eggplant. Minor vegetable crops are cucumber, water melon and onion.

***Planting seasons***

Rice is cultivated in the rainy season. Vegetables may be grown year-round, but they are especially produced during the dry season, from May to August, provided enough water is available from water holes.

Figure 61. Iyogelo, Chinese cabbage crop on beds.

Figure 62. Iyogelo, water melon crop.

***Cultivation***

Vegetables are cultivated on raised beds. During dry periods crops are irrigated by hand, with water carried in buckets from a water hole. Scarcity of water and the amount of labour that has to be spent on watering the crops by hand, limit the area of vegetables planted. Rice straw is used as mulch in the vegetable crops for moisture conservation. Cattle that is owned by the farmers, is kept on the farm. The farm yard manure is used for the fertilisation of the vegetable crops. Urea and calcium ammonium nitrate are also used. Information on the amount of fertilisers to use is given by the agro-dealer.

Farmers very much would like to invest in a water pump, to be able to increase the area of vegetables cultivated during the dry season. They, however, lack the capital, or safe and affordable credit, to do so.

***Pests and diseases***

Serious pests are aphids and red spider mites in okra and African eggplant and caterpillars in cabbage. Diseases mentioned are powdery mildew in tomato, cucumber, Chinese cabbage and also in onions, while leaf curling due to virus infection also may present problems. Insect pests, however, are considered the major problem.

The farmers bitterly complained about the lack of proper information on identification of pests and diseases and on effective methods for control. The information they have on the use of pesticides,

Figure 63. Iyogelo, water hole.

comes from the agro-dealers in Sengerema town, where they buy the pesticides. Sometimes they take affected or diseased leaves to the shop for advice. Some of the farmers in the area use no pesticides at all, because they are too expensive for them. The farmers did not have pesticides in store at the farm. This made it difficult to get reliable information on the pesticides they used.

***Marketing***

The farmers may sell the vegetable products themselves at the market in Sengerema town, to traders who sell the products to end-retailers. Traders may also come to the farms to buy the products. Vegetable product prices are high in the dry season, but low during the rainy season.

***Packaging and transport***

Packaging is in bamboo crates.

***Varieties and seed source***

Seeds are bought in the agricultural supply shop in Sengerema town. No seed sachets or tins were available at the farm. Farmers each time buy only limited quantities of seeds, 'a spoon full'. They then get no information on the variety they buy. Varieties known are Sugar Baby water melon from Mkulima seeds and Tanya for tomato. No other varieties could be remembered by name. For onion 'local' varieties are used.

Figure 64. Iyogelo, okra crop.

Figure 65. Bugulula, clearing for vegetable production.

Figure 66. Bugulula, soil preparation for planting.

## 5.8 *Bugulula,* Geita district

***Informant***

Mr. Juma Lutubija, local farmer.

***Area characteristics***

The immediate Bugulula landscape consists of forested hills, interspersed with large rather flat areas. The area where vegetables are produced is far from main roads. The area is located at around 1150 m.a.s.l. Clearing of forest is going on to prepare land for vegetable production. The soils in the area are sandy to sandy loam soils. The long rainy season is from October to April. The short rainy season is in August and September.

***Crops***

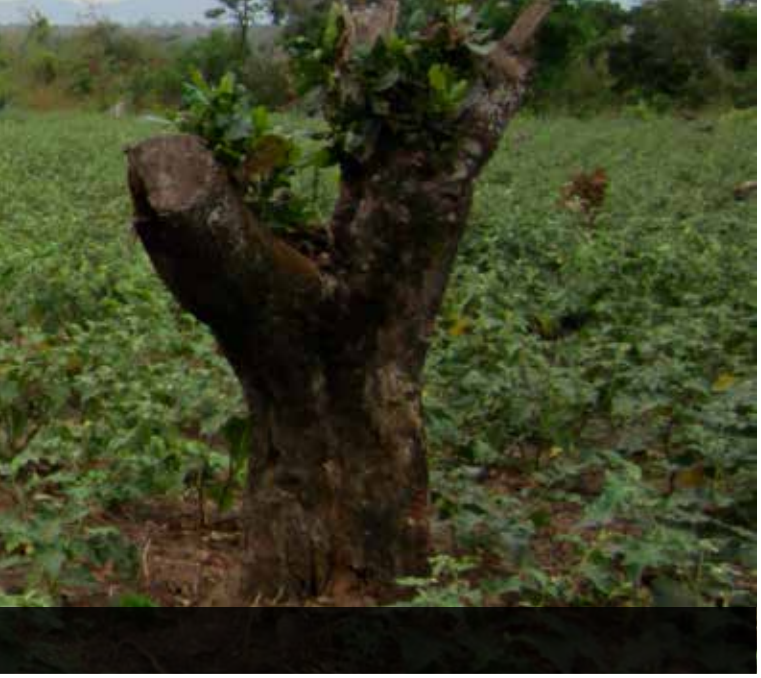
The main crop in the area is rain fed rice. Major vegetable crops are tomato, cabbage, onion and African eggplant. Minor vegetable crops are sweet pepper, Chinese cabbage, amaranth, water melon and okra.

***Planting seasons***

When enough water is available, vegetables are cultivated throughout the year. Farmers in the area have built a dam in a small stream, to collect and store water for furrow irrigation during dry periods.

Figure 67. Bugulula, African eggplant.

Figure 68. Bugulula, young onion plants on raised beds.



***Cultivation***

Cultivation of vegetable crops in the area is expanding. Farmers stated that they have a serious lack of knowledge on how to produce vegetable crops under the local conditions. Farm yard manure is sparsely available and only used for 'expensive' vegetable crops like water melon. For the other crops no farm yard manure is used. Fertilisers are not used at all, as they are considered too expensive. A number of crops observed in the area clearly seemed to grow below potential because of lack of nutrients.

Farmers complained about the lack of capital to expand their business, by, for instance, building a better and larger water reservoir.

***Pests and diseases***

Red spider mites are a serious pest in the area. Caterpillars and thrips may damage cabbage. Pesticides used are Dume, an insecticide, and Linkonil and Fungozeb as fungicides. Information on how to use pesticides is given by the keeper of the shop in Nyawilimilwa, where the farmers buy the pesticides.

Farmers complained that pesticides may be polluted, or tampered with, by which they become ineffective or sometimes outright harmful to the crops.

Figure 69. Bugulula, cabbage field.

***Marketing***

Farmers bring the products themselves by bicycle to Geita town, or nearby villages, where they sell the products to traders.

***Packaging and transport***

No observations were made.

***Varieties and seed source***

No information was obtained from the farmers. A visit to the seed shop in Nyawilimilwa showed the following *brands* and varieties present: *Seminis*: cabbage, Oxylus F1; onion, Jambar F1; tomato, Anna F1. *Mkulima*: eggplant, Black Beauty; cabbage, Glory of Enkhuizen; onion, Red Bombay, Red Creole; cucumber, Ahsley; tomato, Tanya; Chinese cabbage, Mchihili; water melon, Sugar baby. *Pop Vriend*: carrot, Nantes; onion, Red Creole. *Kibo*: water melon, Crimson sweet; carrot, Nantes. *EA Seed*: water melon, Sugar baby; onion, Red Bombay. *Starke Ayres*: onion, Red Creole.

Figure 70. Main road to Kibwela.

## 5.9 *Kibwela,* Geita district

***Informant***
Mr. Budodi Boniphace, local farmer.

***Area characteristics***
The Kibwela area is an intensively developed agricultural area at around 1150 m.a.s.l. The landscape is gently undulating, with scattered trees and banana plants. The soil is a sandy to sandy loam soil. The long rainy season is from September to May, while the short rainy season is in July to August. The latter period usually does not supply enough water for vegetable production. One farmer may grow up to five acres of vegetable crops. Individual plots with vegetables are rather large.

***Crops***
Major vegetable crops are tomato, cabbage, sweet pepper, African eggplant, cucumber, onion, water melon and amaranth. Minor crops are Chinese cabbage, eggplant and carrots.

***Planting seasons***
Vegetables are cultivated throughout the year, provided enough water is available. Otherwise the crop production area is limited by the watering capacity.

***Cultivation***
Main soil tillage is with oxen drawn plough. All farmers in the area apply farm yard manure at planting as a basis for nutrient supply to the crop.

Figure 71. Kibwela, water hole.

Figure 72. Kibwela, path to vegetable fields.

Figure 74. Kibwela, cucumber crop.

Figure 73. Kibwela, tomato crop.

Figure 75. Kibwela, farm homestead.

Either farmers have farm yard manure from own cattle or they buy farm yard manure. Urea, calcium ammonium nitrate, compound NPK fertiliser (23:23:23), di-ammonium phosphate and foliar fertilisers are used.
Outside the rainy seasons crops are irrigated by hand or by hose and furrow irrigation with the aid of a motor pump. Water is supplied from water holes at the farm.

***Pests and diseases***
Downy mildew is a serious disease in tomatoes, together with soil borne wilting. Especially in the rainy season tomato fruit borers are a problem. The high incidence of mites and thrips in the area is said to limit the cultivation of sweet pepper. White fly and aphids are noxious pests in cabbage and cucumber.
Pesticides are used, but the farmer frequently notes that they do not work well. Insecticides used are Mocron, Selecron and Bamic. For control of fungi Linkmil is used.

***Marketing***
Middlemen come to the farms from Geita town to buy the products. Alternatively, farmers hire a truck and bring the product themselves to the market in Geita or even as far away as Kahama (Shinyanga). The large crop plots sometimes create problems. When the crop matures, large quantities of products need to be marketed in only a short period of time.

***Packaging and transport***
No observations were made.

***Varieties and seed source***
No information was obtained.

Figure 76. Kiziba, discussing the tomato crop.

## 5.10 *Kiziba,* Geita district

***Informant***

Mr. Method Chiza, local farmer.

***Area characteristics***

The Kiziba area is located in a slightly undulating, hilly area, at around 1250 m.a.s.l., with sandy to sandy loam soils. The landscape is open with few trees and the land is divided in small to rather large terraces for crop production. Maize is the main food crop in the area. The long rainy season is from November to March. The short rainy season runs from August to October.

***Crops***

Major vegetable crops are tomato, cabbage, sweet pepper, African eggplant, onion and water melon. Minor vegetable crops are carrot, okra and amaranth.

***Planting seasons***

The main planting season for vegetable crops is from September to January, when crop growth is supported by rainfall. Vegetables are also planted in the April to July period. However, planting of crops in this period is limited, as crops have to be irrigated by hand with water from water holes.

Figure 77. Kiziba, soil preparation for planting.

Figure 78. Kiziba, sandy soil.

Figure 80. Kiziba, multiple cropping of beans

Figure 79. Kiziba, African eggplant.

and African eggplant.

***Cultivation***

Labour availability and the walking distance between water hole and vegetable plots limit the area that can be cultivated in the April to July period. The farmer stressed that he very much would like to have a motor pump, to be able to increase his area of vegetable production in the dry period. However, it is difficult to accumulate enough cash at any moment to buy a pump and there are no opportunities to get safe and affordable credit.

Farm yard manure left by roaming cattle is collected from the fields, or from cattle night shelters, and applied as a base dressing at vegetable crop planting. Limited amounts of urea and calcium ammonium nitrate are used during crop growth. Other types of fertilisers are not available in the area.

***Pests and diseases***

Fruit borers in tomato, leaf eating insects in amaranth and caterpillars in cabbage are major problems in the area. Pesticides are used only limitedly. Fungicides may be used against mildew. The farmer found it difficult to mention brand names of pesticides.

***Marketing***

With limited amounts of product, the product is sold to the nearby market in Katoro by the farmer himself. The product is transported by the farmer using a bicycle. With larger amounts, the farmer hires a truck transport to bring his product to the market. He directly communicates by mobile phone for orders with end-retailers at the market. No middlemen are involved between the farmer and retailers.

***Packaging and transport***

Packaging of tomatoes in the area is in bamboo crates. No other observations were made.

***Varieties and seed source***

The farmer buys the seeds for his crops in Katoro, but no names of varieties can be recollected, except for the tomato varieties Tanya and Moneymaker. For African eggplant the farmer produces his own seed.

Figure 81. Bukoba, entrance to the vegetable market.

## 5.11 *Bukoba,* vegetable market

***Vegetables for sale***

A visit was paid to the main vegetable market in Bukoba town (population 129,000). Despite the fact that the visit took place during the dry season, a wide variety of fresh vegetable products was available at the market: peas, potatoes, onions, tomatoes, carrots, cabbage, eggplant, sweet pepper, water melon, African eggplant, okra, Chinese cabbage, sweet potato leaves, pumpkin leaves and amaranth. Various species of dry beans were offered for sale. Tomatoes, onions and cabbage are major vegetable crops traded. Large quantities of onions were kept in store. Vegetables arrive daily at the market from surrounding areas.

***Marketing***

From discussions with traders and retailers it was learned, that several systems of marketing by vegetable producers could be distinguished. (i) The producer brings the product himself to the market and directly sells to a retailer. (ii) The producer sells his product on the farm to a middleman, who sells to a middleman at the market, who in turn sells to a retailer. (iii) The middlemen come to the farm to buy the product and sell to middlemen at the market, who sell to retailers.


Figure 82. Bukoba, vegetable market, leafy vegetables for sale.


Figure 83. Bukoba, vegetable market.

Figure 84. Bukoba, onions arriving at market.

Figure 85. Bukoba, vegetable market, onions in store.

The woman of Figure 86, hires her stall, of about 1.40 m wide, at the market at TZS 21,000 a month. Her main products are tomatoes, onions, cabbage and potatoes. She buys product from middlemen in amounts of around 100 kg or more. Sometimes she sells this amount in two days, but sometimes it takes a week to sell all product of a kind. At the time of the visit she paid TZS 900 per kg of tomatoes to the middlemen. She charges TZS 1200 to 1300 per kg to consumers. Her profit is TZS 300 to 400 per kg of tomatoes.

Consumer prices at the market are higher in the dry season as compared to the rainy season.

Figure 86. Bukoba, vegetable retailer.

Figure 87. Bukoba, vegetables at the market.


Figure 88. Bukoba, seed shop.

Figure 89. Bukoba, seeds on display in shop.

## 5.12 *Bukoba,* seed shop

***Visit to seed shop***

A visit to a seed shop in Bukoba showed a limited assortment of seed brands present.

Only seeds of two brands, Royal Seed (Kenya Highland Seed) and EA Seed were sold.

Varieties on display were, Royal Seed: carrot, Nantes; Swiss chard, Ford Hook Giant; cucumber, Ashley; cabbage, Glory of Enkhuizen; okra, Clemson Spineless.

Varieties on display for EA Seed were: onion, Red Creole; kale (sukuma wiki), Keeper; amaranth (no name); celery, Tall Utah; tomato, Tengeru 97, Tanya; African eggplant (no name); beet, Detroit Dark Red; carrot, Nantes; Chinese cabbage, Chihili; sweet pepper, Yolo Wonder; water melon, Sugar Baby; cabbage, Glory of Enkhuizen; onion, Red Creole.

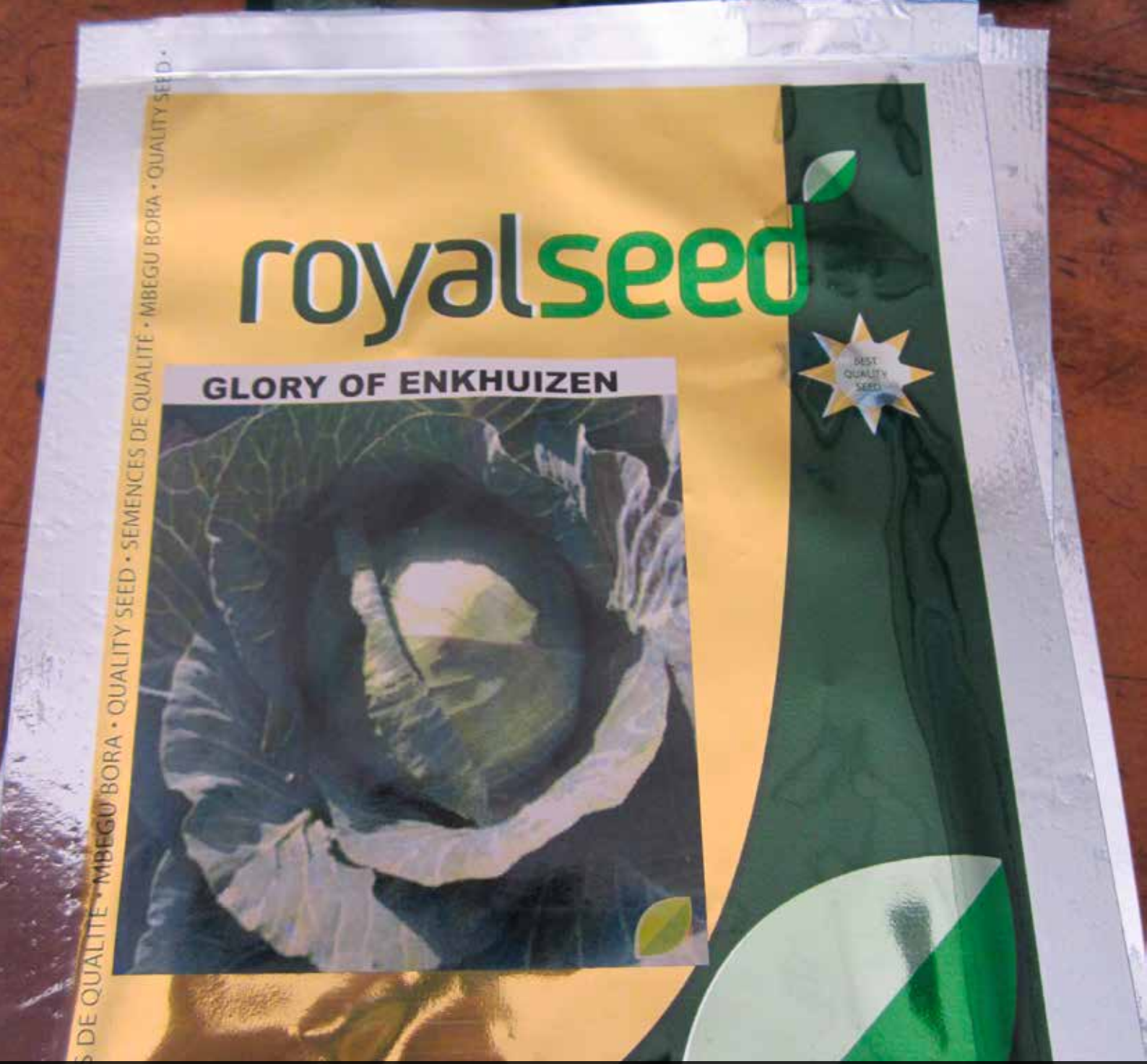



Figure 90. Bukoba, cabbage seed for sale.

# 6 Discussion

***Area characteristics***

The altitudes of the areas visited varied from around 1600 to 1700 m.a.s.l. in the Mugumu and Tarime districts to 1100 to 1250 m.a.s.l. around Lake Victoria in the Musoma, Magu, Misungwi, Sengerema and Geita districts. While crops like cabbage, sweet pepper and African eggplant may be found at both altitudinal zones, crops like cucumber and dry beans were found at the lower altitudes only.

The areas differ considerably from each other. The Kibeyo area in the Mugumu district did not appear to be densely populated, while cattle is prominently present in the landscape. The Mogabiri area appears to be rather densely populated, while cattle that is present, is kept at the farm. In both areas primary soil tillage is done by oxen drawn ploughing. In the Nyabange area no cattle is found and all soil tillage and land preparation is done by hand.

The situation in Itumbili would seem to be rather typical. The year-round availability of water from the Simiyu River permits permanent vegetable production. The black clay soil allows the cultivation of rice as an important food crop. The location, in terms of distance to the river, and the area of the crops produced, however, depends on pump volume and power capacity.

Individual vegetable plots in the Misungwi district are small and production is mostly dependent on rainfall. Although the important Mwanza market, with a large number of consumers, is nearby, with a good tarmac road connection, and despite the fact that locally water for irrigation is available, this situation did not appear to have resulted in a relative larger scale of vegetable production in the dry period. Small volume traders on bicycles play an important role in daily trade and supply to Mwanza.

In Chamabanda the farmer interviewed has set up a system for permanent vegetable production, pumping water year-round from Lake Victoria to water his crop with a gravity based drip irrigation system. This system might serve as an example for all locations with vegetable production where water is available year-round from Lake Victoria, rivers, ponds of bore holes.

In Iyogelo vegetable production is mostly limited to the rainy season. Water availability and the labour needed to water the crop with buckets by hand, limit vegetable production in the dry periods.

The farmers in Bugulala have built a dam in a small stream to collect and store water for dry periods. The farmers, however, appear to lack information on proper crop production methods for fertilisation and pest and disease control. The clearing of vegetation in the area, on the one hand

Figure 91. Main national road.

Figure 92. Path to vegetable fields in Kiziba, Geita district.

illustrates the apparent attractiveness of vegetable crop production, while on the other hand it shows the threat of expansion of vegetable production to natural resource conservation.
The Kibwela area has good potential for vegetable production and the production methods appear to be well developed. Water is the main limiting factor for expansion of vegetable production. The same factor, water, also limits the expansion of vegetable production in the Kiziba area.

Infrastructure for vegetable production and trade, like feeder roads to the fields and transport facilities in the areas visited appeared to be less developed as compared to other major vegetable production areas in Tanzania, like Arusha, Lushoto or Mbeya. In general the paths leading to the vegetable fields are narrow and vegetable plots commonly are found at some distance from main rural roads. Not all rural roads are in a good condition and may become especially difficult to travel in the rainy season, hampering transportation of products.

***Crops***

A total of eighteen vegetable crops was observed or mentioned for commercial production. The greatest diversity was found in Mogabiri, Nyabange, Misungwi and Kibwela, while the least diversity

Figure 93. Rural road in Sengerema district.

was found in Kibeyo. Also the Itumbili area appeared to specialise in a few crops only. African eggplant, cabbage, onions, sweet pepper and water melon are major crops, with sukuma wiki and hot pepper (both *Capsicum annuum* and *C. chinense*) being among the less frequently observed crops. In fact, sukuma wiki was only found in the eastern part of the Lake Zone, in Kibeyo, Mogabiri and Nyabange. Cucumber and dry beans were only found in the lower altitude areas around Lake Victoria.

***Planting seasons***

In most cases, planting seasons depend on the rainfall distribution pattern throughout the year. Only in situations where water is available year-round from Lake Victoria, rivers, ponds or from water holes, and the water is within carrying or pumping distance from the field, vegetable production may take place during the dry seasons as well.

***Cultivation***

The area of vegetable crops on a farm is generally small, half an acre or so, except where farmers more or less specialise in vegetable production. Labour is mostly supplied from the household and the area cultivated may be limited by the availability of labour within the household. In terms of planting, sowing, plant arrangement in the field and weed control, production itself appeared to be professional. Of a number of crops, like tomato,

and cabbage, hybrid varieties are cultivated. Transplants may be raised in protected nurseries and staking of tomatoes is practised.
When available, farm yard manure is only given at planting. Fertiliser use is limited. It is not clear whether this is exclusively because of costs, or also because of a lack of understanding of the relation between nutrient supply and crop yield and quality. With a better crop nutrient supply higher yields are likely to be obtained.
Vegetable production in the Lake Zone in general appeared to be regionally, i.e. Lake Zone, orientated and hardly or not connected to the development going on, and to the knowledge available, in other vegetable production areas in Tanzania.

***Pests, diseases and weeds***

Aphids, red spider mites, white fly, thrips, caterpillars and tomato fruit borers were mentioned as insect pests. Insecticides are regularly used and quite a number of brands are available in the agro-supply shops. The insecticides mentioned and/or observed mostly belong to the broad spectrum insecticides, such as organophosphates and pyrethroids (Appendix 2). The more selective insecticides Abamectin and Bamic, may be used for control of mites.
Although mention was made of the use of fungicides, fungal diseases were not brought forward as a serious limitation in crop production or for product quality. Fungicides most commonly used were the so-called contact fungicides. These have a preventive mode of action only (Appendix 2).
Weed growth was never mentioned as an obstacle to crop production, nor did weed control came forward as a difficult or time consuming activity. No mention was made of the use of herbicides.
Farmers complained about the lack of reliable information on pests and diseases and on the best methods for pest and disease control. Most of the information available to them comes from the agro-dealer where they buy the pesticides. The agro-dealers may not be the most reliable source of information, as they will be inclined to stimulate their trade.
A pictorial atlas of pests and diseases for correct identification, with information on active ingredients for effective control, would be of great value to the producers, opening the now seemingly almost complete monopoly on information held by the agro-dealers.
On one occasion farmers complained that pesticides may be polluted, by which they become ineffective or even outright harmful to the crops. Quality control of pesticides and guaranteed purity of the products on sale, is essential, to ensure effective control of pests and diseases.

### *Water management*

Vegetable crop production in the Lake zone predominantly depends on rainfall. The area with year-round vegetable production is limited due to lack of water in the dry seasons. All farmers stressed this lack of sufficient water during the dry periods and the limitations posed by watering the crops by hand with buckets of water from a pond or water hole.

Especially nearby the shores of Lake Victoria more permanent vegetable production would seem to be possible (where Bilharzia is present, water would have to be pumped from some depth and distance from the shores as to avoid taking up the *Schistosoma* parasite). Also rivers that carry water year-round can be utilised as a source of irrigation water. With the help of water saving irrigation techniques, such as gravity based drip irrigation, opportunities would be even better. At present, when water is available, the area cultivated is limited by the labour needed to water the crop by hand with water carried in buckets from the source. Where presently pumps and hoses are used, such as around Nyabange and in Itumbili, fuel costs were said to be high. Increase in efficacy of irrigation, using drip irrigation systems, would help to better manage these costs by reducing pumping hours. The operation set up by the farmer in Chamabanda (Figure 56, 57, 58) serves as a good example of what can be achieved.

A program that would help farmers to get safe and affordable credit to acquire easy to operate pumps, a water reservoir and drip irrigation equipment, would greatly stimulate vegetable production and thereby contribute to economic development in the rural areas.

### *Marketing*

The general picture that emerges of Lake Zone vegetable production and marketing, is that of rather small scale production, in plot size, in total areas and in quantities produced. Small scale production results in small product volumes, often making producers dependent on middle men for marketing, as costs and efforts of marketing small volumes are disproportionately high. The products are mainly marketed close to the farm at the local village and nearby small town markets and at the larger markets in Musoma (population 178,000), Mwanza city (population 707,000) and Bukoba town (population 129,000). Either the farmer brings the product to the market himself, or middlemen come to the field to buy the product. The farmer informant in Kiziba had direct contact by mobile phone with traders at the town vegetable market to take orders. This is a recent and encouraging development, making producers less dependent on middlemen.

Figure 94. Main rural road in the Mara region.

Figure 95. Rural roads may become inaccessible in the rainy season.

The marketing appeared to be restricted to the Lake Zone, occasionally including Kenya. Storage of products was not mentioned, nor were vegetable storage facilities observed. There appears to be no trade from the Lake Zone to Dar es Salaam or to other large cities in the other parts of Tanzania. During the surveys in the Lake Zone no long distance transport trucks loaded with vegetable products were observed, as is a common sight in other major vegetable production areas in Tanzania. A small portion of products in the Mara region is marketed to hotels and lodges in the Serengeti (Mafuru *et al*., 2007). To cater to this high-end market, reliable year-round supply of high quality products is essential, necessitating year-round water availability.

In the Magu area, one large scale modern vegetable production farm exists, making use of plastic houses. This farm sells directly to supermarkets in Dar es Salaam, as well as to Kenya. Both types of production and marketing, however, are exceptions in the area.

***Packaging and transport***

Packaging of products is mainly in bamboo crates and in poly-propylene or sisal bags. Transport from the field may be by bicycle and oxen drawn cart, with transport by public transport or trucks starting from main roads. Where accessible, small trucks may go directly to the field.

Given the lack of proper packaging material, the often rough road conditions on the countryside and the considerable distances to markets, post-harvest losses are likely to be high. Especially in the rainy season, when the unpaved feeder roads to the fields may be less or hardly accessible.

***Varieties and seed sources***

Agro-supply shops usually have seeds of a number of brands and of a variety of crops for sale. Mostly the choice of variety per crop is, however, limited. For commercial vegetable production, all farmers mentioned that they buy their seeds in the agro-supply shops. Farmers may buy small quantities of seeds, without being informed of the crop varieties' name. Only one farmer interviewed, mentioned that he produced his own seed, of one crop, African eggplant.

In how far varieties for sale in the shops have been repeatedly tested for performance under the local conditions is not clear.

***Environmental protection***

The observed ever present harvesting of wood from the natural vegetation for use as fire wood, or for the production of charcoal for cooking, is a serious and continuing threat to the conservation of the natural vegetation as a safe-keeper of the local

Figure 96. Hot pepper (*Capsicum chinense*).

Figure 98. Year-round water availability from Lake Victoria.

Figure 97. Hot pepper (*Capsicum annuum*).

Figure 99. Year-round water availability from rivers.

climate. With less and less woody natural vegetation left, the local climate is likely to become drier, with dire consequences for local crop and livestock production. In the areas with steep hills, the protection of the soil on the slopes by the natural vegetation is essential to preserve the water storing capacity of the eco-system of the hills. This eco-system acts as a reservoir that collects water in the rainy seasons, which then is released gradually in the streams and rivers during the dry periods. The substitution of fire wood and charcoal, by e.g. natural gas, supplied in affordable refillable canisters, and or by sun powered cooking equipment, deserves to be a national top priority in natural vegetation conservation and watershed management.

Stimulation of vegetable production in the rural areas may help economic development and create employment, making people less dependent on fire wood and charcoal production for a living.

Figure 100. Carrying water.

Figure 101. Discussing pesticide use.

# 7 Conclusions

Vegetable production in the areas visited mostly is carried out as small scale operations, depending on rainfall. Vegetable producers themselves appear to be professional in terms of crop production, but they are often dependent on middlemen for marketing, possibly reducing the profitability of their operations. Packaging and transport of products are at an elementary level.

Where water is available, the introduction of water saving irrigation techniques, such as drip irrigation would be a much needed first step to improve productivity and achieve year-round production. The feasibility of making available safe and affordable credit to acquire simple, reliable, robust gravity drip irrigation systems, with a motor pump and reservoir tanks, would need to be investigated. To reduce costs a pump could be owned and shared by a group of farmers, or a pump could be operated by one farmer serving the others for a fee. The operation set up by the farmer in Chamabanda (Figures 56, 57, 58) serves as a good example.

Variety testing under the local conditions is needed to evaluate performance of different varieties of a vegetable crop. Best performing varieties should then be demonstrated on plots in farmers' fields.

A better nutrient supply through the increased use of farm yard manure and fertilisers would need to follow. Demonstration and training could be carried out by local government institutes in close co-operation with national and international seed and agro-supply companies.

Especially at the Lake Victoria shores and near rivers, where sufficient water is year-round available, the introduction of reliable, yield improving, water efficient irrigation techniques, that increase yield and harvest security, would help the farmers to be able to use more expensive, but better performing hybrid varieties of crops like cabbage and tomatoes. These areas could then serve as pilots for other vegetable producing areas in the Lake Zone.

The knowledge level of farmers in understanding pest and disease control is low. Consequently, there is an urgent need for reliable information and material for the correct identification of pests and diseases and on the mode of action of pesticides. A pictorial atlas of pests and diseases of the vegetable crops with simple and short explanations, together with a guideline for the choice of pesticides and methods of control, as based on active ingredients, would be of great value to the producers. Presently most of the information on pest and disease control come from the agro-dealers

selling the pesticides.
Training of farmers and agro-dealers in pest and disease control and pesticide application methods is recommended.

A draw back for producing and marketing greater quantities of vegetables in the Lake Zone area may be the absence of large urban markets, except for Mwanza city. The economic development of the Lake Zone region is largely focussed on, and centred in, Mwanza city. By infrastructure and economic orientation the Lake Zone is less well connected to the east and south of Tanzania, creating a barrier for the trade of vegetables from the Lake Zone to other parts of Tanzania. This situation as such is not easy to change, but in order for vegetable production in the Lake Zone to grow, marketing opportunities outside the Lake Zone region would need to be created.

The opportunities for trade outside the Lake Zone may be there. Presently urbanisation in Tanzania is comparatively low at 27 per cent. In general urbanisation in Tanzania, and in nearby Kenya, is likely to continue, necessitating an increased supply of vegetables from commercial production to the urban populations. Rising incomes in the cities and increased public awareness of the necessity of daily vegetable and fruit consumption are likely to fuel this demand. Nationwide government promotion to consume more vegetables to combat hidden hunger may help to increase demand further. Organisation of farmers in producer organisations, creating greater product volumes for sale and a better bargaining position, will help to address these markets outside the Lake Zone.

Vegetable production usually is not the only activity of a farmer and his family. Growing food crops, raising cattle, whether or not in a zero grazing system, trade, being a craftsman, or other activities, all may be part of the economic strategy of the farmer and his family. Proposed changes in the vegetable production and marketing system would need to fit in this overall approach.

Particular attention would have to be paid to the role of women. Woman may play a role as middle(wo)men, while they certainly are active as workers in the fields, as retailers on the markets and as consumers who decide which, and how much, vegetables to buy, prepare and eat.

Figure 102. Road-side vegetable market.

Figure 103. Bringing tomatoes to the market in Geita.

## 8 Acknowledgements

We thank our informants and the other people we met during the surveys, who helped us to get a first impression of field vegetable production in the areas visited. We gratefully acknowledge the assistance of Multiflower Ltd., Arusha, in the preparation and execution of the survey in 2012. Without the help of East West Seed Tanzania, Moshi, the survey in 2014 would not have been possible. We especially thank David Mgalula for organising the contacts in the Mwanza region and joining us during the survey. We also thank East West Seed Tanzania for a contribution to the costs of printing.

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## 9 Literature

Everaarts, A.P., H. de Putter and W. Amon, 2011. A survey of field vegetable production in Tanzania. Recommendations for improvement. Applied Plant Research, Wageningen UR, Lelystad, The Netherlands. iv+66 pp.

Grubben, G.H.J. and O.A. Denton (Edts), 2004. Plant resources of Tropical Africa 2. Vegetables. PROTA Foundation, Wageningen, Netherlands/ Backhuys Publishers, Leiden, Netherlands/ CTA, Wageningen, Netherlands. 668 pp.

Grubben, G.H.J., W. Klaver, R. Nono-Womdim, A. Everaarts, L. Fondo, J.-A. Nugteren and M. Corrado, 2014. Vegetables to combat the hidden hunger in Africa. Chronica Horticulturae 54, 24-32.

Mafuru, J.M., A.K. Babu and T.F. Matutu, 2007. The impact of market links on horticultural production in the Mara Region, Tanzania. Regoverning Markets Innovative Practise series, IIED, London. 42 pp.

## 10 List of Figures

Figure 104. Transport of charcoal.

Figure 105. Transport of fire wood.

Figure 106. Women play an important role in vegetable production and marketing.

# 11 Appendices

## 11.1 Appendix 1. Itinerary

| **November 2012** | Production areas and other places visited in **bold**. |
|---|---|
| 4 | Arusha - Mugumu |
| 5 | Mugumu - ***Kibeyo*** - Tarime |
| 6 | Tarime - ***Mogabiri*** - Musoma |
| 7 | Musoma - ***Nyabange*** - Mwanza |
| 8 | Mwanza - ***Nyaholongo*** - ***Nyamatale*** - ***Kagera*** - Mwanza |
| 9 | Mwanza - ***Itumbili*** - ***Buhongwa*** and ***Kirumba market*** - Mwanza |
| 10 | Mwanza - Arusha |
| **August 2014** | Production areas and other places visited in **bold**. |
| 10 | Arusha - Mwanza |
| 11 | Mwanza - ***Chamabanda*** - ***Iyogelo*** - Geita |
| 12 | Geita -***Bugulula*** - ***Kibwela*** - Biharamulo |
| 13 | Biharamulo - ***Bukoba market*** - Bukoba |
| 14 | Bukoba - ***Bukoba seed shop*** - Geita |
| 15 | Geita - ***Kiziba*** - Mwanza |
| 17 | Departure from Mwanza |

## 11.2 Appendix 2. Pesticides mentioned, details and active ingredients

| Insecticides | Active ingredient |
|---|---|
| Abamectin 18 EC | Abamectin |
| Bamic 18 EC | Abamectin |
| Dimethoate 40 EC | Dimethoate |
| Dume 40 EC | Dimethoate |
| Farmguard 344 SE | Cypermethrin and Imidacloprid |
| Kung Fu 5 EC | Lambda-cyhalothrin |
| Mocron 720 EC | Profenophos |
| Proferon 720 EC | Profenophos |
| Selecron 720 EC | Profenophos |
| Subaprid 200 EC | Imidacloprid |
| Thionex 35 EC | Endosulfan |

| Fungicides | Active ingredient |
|---|---|
| Farmerzeb 80 WP | Mancozeb |
| Fungozeb 40 WP | Mancozeb |
| Ivory M72 | Mancozeb and Metalaxyl |
| Linkmil 72WP | Mancozeb and Metalaxyl |
| Linkonil | Chlorothalonil |
| Mo-Bankoner 720 EC | Chlorothalonil |
| Movil 5 EC | Hexaconazole |
| Milthane Super 80 WP | Mancozeb |
| Rido Super 72 WP | Mancozeb and Metalaxyl |
| Ridomil Gold 68 WG | Mancozeb and Metalaxyl |
| Victory 72 WP | Mancozeb and Metalaxyl |

## 11.3 Appendix 3. National Census data 2007/2008. Area per crop (ha)

| Region | District | Spinach | Okra | Water melon | Amaranth | Chillies | Carrot | Tomato | Cabbage | Onion | Afr Eggplant | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mara** | Bunda | 0 | 274 | 98 | 0 | 20 | 0 | 90 | 137 | 0 | 0 | 619 |
| | Musoma Rural | 0 | 0 | 24 | 0 | 10 | 0 | 457 | 61 | 0 | 0 | 552 |
| | Musoma Urban | 2 | 0 | 0 | 2 | 0 | 0 | 14 | 3 | 0 | 0 | 21 |
| | Rorya | 0 | 70 | 0 | 0 | 0 | 0 | 70 | 0 | 0 | 0 | 140 |
| | Serengeti | 0 | 9 | 206 | 0 | 0 | 0 | 111 | 9 | 0 | 0 | 335 |
| | Tarime | 14 | 28 | 453 | 57 | 0 | 57 | 241 | 113 | 0 | 0 | 963 |
| | **Total** | **16** | **381** | **781** | **59** | **30** | **57** | **983** | **323** | **0** | **0** | **2630** |
| **Mwanza** | Geita | 20 | 0 | 0 | 0 | 22 | 15 | 217 | 67 | 142 | 0 | 483 |
| | Ilemela | 30 | 0 | 0 | 65 | 18 | 5 | 335 | 238 | 10 | 0 | 701 |
| | Kwimba | 0 | 0 | 0 | 0 | 0 | 0 | 132 | 0 | 0 | 0 | 132 |
| | Magu | 0 | 0 | 0 | 0 | 0 | 0 | 273 | 0 | 0 | 0 | 273 |
| | Misungwi | 0 | 0 | 0 | 8 | 9 | 0 | 450 | 21 | 102 | 0 | 590 |
| | Sengerema | 13 | 0 | 0 | 32 | 54 | 81 | 436 | 0 | 55 | 0 | 671 |
| | Ukerewe | 0 | 0 | 0 | 37 | 0 | 0 | 74 | 0 | 8 | 0 | 119 |
| | **Total** | **63** | **0** | **0** | **142** | **103** | **101** | **1917** | **326** | **317** | **0** | **2969** |