PRIORITY TRADITIONAL LEAFY VEGETABLES IN THE DRY SAVANNAH ECOZONE OF GHANA

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ABSTRACT

This study identified priority traditional leafy vegetables (TLVs) in the dry ecozones of Ghana, their cropping systems and constraints to production. Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) techniques were employed to collect quantitative and qualitative information on the traditional leafy vegetable production system in the three northernmost administrative regions of Ghana. Three TLVs - Amaranthus cruentus ('alefu'), Corchorus olitorius ('ayoyo') and Hibiscus sabdariffa, Roselle ('bra') - were identified as priority leafy vegetables that need promotion to address dietary improvement needs and poverty reduction, in general, as a result of their potential for commercialization in the dry Savannah ecological zone of Ghana. Constraints to their production include the lack of reliable sources of water for irrigation; lack of improved seeds; destruction by stray farm animals; non-availability of farm yard manure and non-affordability of inorganic fertilizer. Integration of TLV production with rural poultry production could ensure the availability of poultry manure for the production of TLVs. Seed preservation techniques need to be improved, while efforts should be made to promote in situ conservation of these species. The study also recommends research and development programs on TLV for sustainable production and utilization.

INTRODUCTION

For the poor in sub-Saharan Africa, dietary improvements with micronutrients are considered to be one of the most cost-effective methods of addressing poverty and its related problems. The major sources of essential micronutrients are vegetables, especially traditional leafy vegetables (TLVs). Indeed, TLVs have been identified as some of the richest and cheapest sources of vitamins such as vitamin A, thiamine, riboflavin, ascorbic acid, niacin, and minerals like calcium, iron, zinc, magnesium and phosphorus (Eyeson and Ankrah 1975). The potential of TLVs to offer significant opportunities for the rural poor and malnourished with cheap sources of balanced diet and to earn a living with very little investment have been established in a number of studies (Schipper 2000). In northern Ghana, TLVs provide important sources of food, nutrition and medicines for both urban and rural population.

A large variety of highly nutritious TLVs, such as *Amaranthus cruentus*., *Talinum* spp., *Basella* spp., *Colocasia esculenta*, *Sesamum* spp., *Corchorus* spp., *Hibiscus* spp., *Manihot esculenta* and *Telfaira occidentalis* (Abbiw 1990), are known to be available and used in some cultures. Unfortunately, access to adequate quantities of most of these nutritionally valuable leafy vegetables is not always guaranteed. This is because the existing potential for the intensive cultivation and utilization of TLVs is not exploited for a number of reasons. The key one being that there is a gradual loss about preparation and utilization methods of traditional vegetables due to the younger generations in most developing countries erroneously thinking that TLVs are inferior to the exotic vegetables. Inspite of the enormous benefits in TLV cultivation very little research and extension have been carried out to improve the production, preservation, utilization and conservation of these bio-resources (Chweya and Eyzaguirre 1999). It is a known fact that most

government agricultural departments have very little in terms of actual work carried out or being carried out to improve the productivity of TLVs. As a result there is a gradual erosion of genetic data and production techniques on these TLVs.

The aim of the present study was therefore to study the position and the role of the traditional leafy vegetables in the socio-economic development of Ghanaian farm families by analyzing which TLVs are priority crops in the dry Savannah ecological zone and to make recommendations on improving their production and utilisation.

METHODOLOGY

A rapid rural appraisal (RRA), using method of Nabasa *et al* (1995) was carried from the 22nd April to 16th of May 2000 to identify and select key towns/ villages where traditional leafy vegetables form a major part of their food culture as well as their socio-economic wellbeing. The RRA covered all the important towns and TLV farming areas of the Northern, Upper East and Upper West Regions of Ghana. Altogether four communities; three from the Northern region and one from Upper East region of Ghana, were selected from the RRA for the PRA to gather quantitative and qualitative information on the production patterns and constraints.

Location

The selected PRA sites were Gbulahagu, Gurugu and Zagyuri in the fringes of the Tamale municipality and the Tolon-Kumbungu Districts in the Northern Region, and Binduri in the Bawku-East District of the Upper East Region.

The Gbulahagu village fringes the west side of the Golinga dam. Gbulahagu is about 16 km south-west from Tamale and 6 km from Nyankpala that lies to the North of the village. Gurugu is about 8km from Tamale, on the main Tamale-Kumbungu road. This peri-urban settlement lies on the northern bank of a temporal stream. Zagyuri is also a peri-urban settlement about 8 km from Tamale on the main Tamale-Bolgatanga road. It fringes the northern boundaries of the Kamina military barracks lying on the southern bank of the Beiwani stream. This stream is also a temporal one; fed mostly in the dry season by domestic waste water from the Kamina barracks and the Zagyuri settlement.

Binduri is about 9km and 3km from Bawku and Manga, respectively. The dam at Binduri was recently rehabilitated by the Land Conservation and Small Holder Rehabilitation Project (LACOSREP). However, the study area visited, Zuri, is not in the catchment area of the dam, so the farmers depend on a stream to irrigate their vegetables. The growers in the catchment area of the dam predominantly produce onions.

RESULTS AND DISCUSSION

Even though vegetables are produced both in the dry and in the wet (rainy) seasons in the savannah zone of northern Ghana, it is more profitable in the dry season. This is because in the wet season almost every farmer produces vegetables thereby lowering the prices of the commodity. For the leafy vegetables such as *Hibiscus sabdariffa* L., most families depend on the wild varieties and volunteer crops from the bush instead of producing them on their farms during the wet season.

Every farmer would have wished to produce the crop in the dry season as well, but they are faced with lack of water. It was found that leafy vegetable production in northern Ghana was centred on three main scenarios depicted by the source of water for production. These are:

- At irrigation dam sites as in the case of Golinga, Libga, Malzeri and Bontanga in the northern region and the Vea and Tono dams in the Upper East Region.
- The availability of residual moisture as in the case of Gurugu near Tamale
- Sites where either a stream or waste water passes through as in the case of Binduri in the Upper East Region and Zagyuri near Tamale, respectively.

Table 1: The different types of vegetables used as food in Northern Ghana

Common /Local Names of Vegetables Produced	Botanical Name
Bra (roselle)	*Hibiscus sabdariffa*
Ayoyo (corchorus)\	*Corchorus olitorius*
Alefu (amaranthus)	*Amaranthus spp.*
Okro (both fruits and leaves)	*Abelmoschus esculentus*(L.) Moench
Cowpea leaves	*Vignia unguiculata* (L.) Walp
Tomatoes	*Lycopersicon esculentum* Mill.
Pepper	*Capsicum annum* (L.)
Onions	*Allium cepa* (L.)
Water melon	*Citrullus lanatus* Mansf.
Cassava leaves	*Manihot esculenta* Crantz
Baobab leaves	*Adansonia digitata* (L.)
Kapok leaves	*Ceiba pentadra* (L.)
Tamarindus leaves	*Tamarindus indica*
Garden eggs	*Solanum incanum* (L.) & *S. melongena* (L.)
Cabbage	*Brassica oleracea* (L.)
Cucumber	*Cucumis sativus* (L.)
Lettuce	*Lactuca sativa* (L.)

Proceeds from dry season TLV production goes a long way to supplement the budget for procuring farm implements, land preparation for the main season crop and support for funerals.

At the sample sites, different types of vegetables were noted as being used for food preparation (Table 1). Some were grown for the fruits and others for the bulbs, but many were for the leaves. Some leafy vegetables were not specially grown for that purpose but rather the leaves used as vegetables are picked from trees growing in the wild. Other leafy vegetables were picked from volunteer crops or crops grown for other purposes (e.g. cowpea and cassava leaves).

Cropping Patterns

From the four sites visited, (Gbulahagu, Gurugu and Zagyuri) in the Northern Region and Binduri in the Upper East Region, the cropping patterns were observed to be very similar. At all the sites, vegetables dominate in the dry season but in the wet season, cereal crops such as maize is found at the upper fringes and rice in the lower fringes of the dam site. Leafy vegetables such as *Corchorus olitorius, Amaranthus spp*, *Hibiscus sabdariffa* and *Hibiscus cannabinus* (kenaf) are intercropped with the maize on the upper fringes of the dam site. However in the case of Gurugu, and Zagyuri which are not dam sites, the cereal crop planted is mainly maize intercropped with *Hibiscus cannabinus*, *Corchorus olitorius* and *Hibiscus sabdariffa*.

In the dry season, at all the sites, sole vegetables such as *Corchorus olitorius, Hibiscus sabdariffa*, *Vigna uniguiculata* leaves, *Amaranthus* spp and *Hibiscus cannabinus* are produced on beds of small sizes measuring about 8 m by 5 m. While cowpea (beans) leaves, kenaf and roselle are uprooted for sale and could be replanted with the same vegetables,

corchorus and amaranthus are permanent, and only the fresh leaves are harvested from time to time for sale. Roselle, kenaf and cowpea leaves could have more than two crops during the dry season while that of amaranthus and corchorus would be cropped once, but harvested several times before the rainy season begins.

Land Preparation and Crop Establishment

At most dam sites in the north of Ghana, the Ghana Irrigation Development Authority usually tilled the soil during the rainy season using tractors before land was allocated to individual farmers. However, at all the sites visited, the soil was tilled manually, using the hoe during the dry seasons. Even though the shapes of the hoes in Northern Region differ from those used in the Upper East Region, in general, the farmers use bigger types of hoes for making of beds and ridges while the small ones are used for weed control within the crops when established.

A high proportion of land (Figure 1) is allotted for the production of *Hibiscus sabdariffa*, *Corchorus olitorius* and *Amaranthus* spp. and *Vigna unguiculata* in the order of importance.

For *Corchorus olitorius* and *Vigna unguiculata* leaves, small beds were constructed (8 m × 5 m) while for roselle (*Hibiscus sabdariffa*), kenaf (*Hibiscus cannabinus*) and *Amaranthus* spp. were on ridges of about 90 cm apart. Most of the vegetables were broadcast on the beds and ridges except onion and tomatoes which were nursed on beds and transplanted onto ridges or flats in rows.

Seeds of *Amaranthus* spp, tomato and okra are mainly obtained from the crops produced the previous year on farmers' own fields. For *Hibiscus cannabinus* and *Hibiscus sabdariffa*, farmers buy either from neighbours or from the markets. This was because kenaf and roselle were harvested at tender ages for sale and were not allowed to reproduce on their fields. However some farmers grew their own seed in the preceding wet season to use in the dry season.

Fertilizer Application

Types of fertilizers used differed from site to site. While the farmers at the Golinga dam site used mainly poultry manure, those of Gurugu relied mainly on the human waste (sewage). The poultry manure was either collected from their own poultry coops or got from friends, colleagues and neighbours living far from them who might have no use for the manure. Traditionally, the landlord controls the manure gathered in each house and therefore reserves the right to use the quantity he needed for his field while his wives and children took the remainder. If that was not sufficient, they went out to beg for the difference as in the case of Golinga dam site. Poultry manure was preferred to ruminant manure due to the faster response of the leafy vegetables to it. The relatively

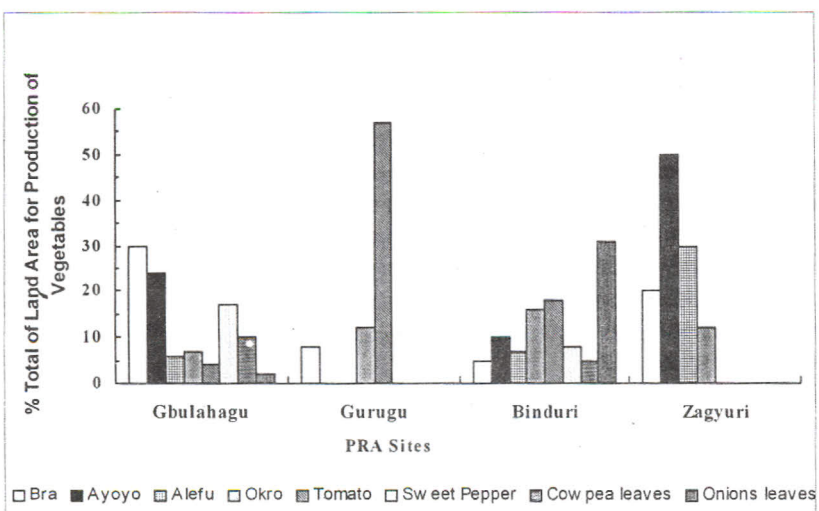

Fig. 1: Land Area Allotted to Individual Vegetables at the PRA Sites in \ Northern Ghana.

high level of urea in chicken droppings (the white portion attached to them) was readily absorbed by the vegetables than the other nitrogen forms from ruminant manure.

At the Gurugu site where they depended on residual moisture and human waste from the city, individual farmers made arrangements with the municipal assembly to dump the sewage on their plots some few weeks before the soil was tilled for vegetable production during the dry season.

At the Zagyuri and Binduri sites, even though some of the farmers used organic manure, majority of them used in-organic fertilizers like compound fertilizers (15–15–15) and ammonium sulphate but in very limited quantities due to the cost.

Priority Traditional Leafy Vegetables in the Study Area

Both the rapid rural appraisal, conducted throughout the dry-savannah ecozones in Ghana and subsequently the participatory rural appraisal, at the four selected sites, established that the most important traditional leafy vegetables are *Amaranthus* spp., *Corchorus olitorius and Hibiscus sabdariffa*. Figures 1 and 2 support the justification for referring to these three TLVs as the priority traditional leafy vegetables of the dry Savannah ecological zone of Ghana.

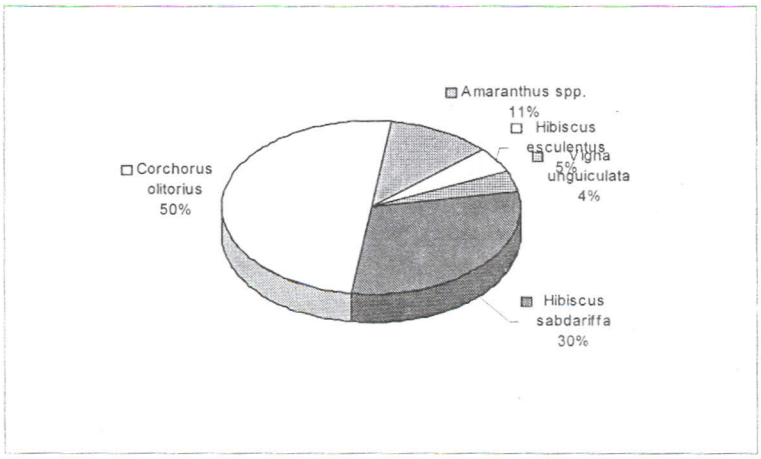

Fig.2: Labour Distribution on some Traditional Leafy Vegetables at Gbulahagu

Figure 1 shows that total land apportioned for these three TLVs during the cropping season was greater than the fruit vegetables. Zagyuri vegetable farmers have specialised more on these TLVs just as was the case with farmers at Binduri, where about a quarter of the land area is devoted to the main traditional leafy vegetables. In Gbulahagu about 60% of total vegetable land is put to them.

In terms of use of on-farm labour, Figure 2 shows the relative importance of these three priority TLVs over the others. At Gbulahagu, for example, nearly 50% of labour used in the cultivation of vegetables is allotted to *Corchorus olitorius*. Most of this labour is used in the harvesting of the leaves that entails picking and becomes more tedious when the leaf size reduces due to aging of the plant.

Amaranthus spp. is a leafy vegetable with a growth period of 1-2 months depending on the different genotypes found in the study area. Amaranthus are very fast growing crops with an extremely high yield potential. It is possible to obtain 30 t ha^{-1} of fresh leaves or 4.5 t ha^{-1} of dry matter in 4 weeks from direct sowing (Norman, 1992). Propagation of *Amaranthus* is by seed. Seeds are either sown in drills or are broadcast both in the nursery and on the field. Harvesting of the leaves begins when the plant is about 15-20 cm high. It was found out that the predominant species cultivated are mostly green. However, some species had purple leaves. Nordeide *et al.* (1996) established in Mali that cultivated *Amaranthus* spp. are the dominant green leafy vegetables used throughout the year, both at the rural and urban centers. This is because of the wildly perceived notion that they are rich in vitamin A, minerals and protein. Older leaves of *Amaranthus* contain high levels of calcium oxalate. This does not dissolve readily during cooking (Abbiw, 1990).

Two cultivars of corchorus are grown at the study areas and they match the descriptions given by Epenhuijsen (1974). One has a broad and coarsely serrate leaves whilst the second has finely serrate, elliptical-ovate leaves. These were referred to as *Oniyaya* and *Angbadu* cultivars, respectively, by Epenhuijsen (1974). According to the growers, consumers prefer the latter. *Corchorus olitorius* is a tropical short-day plant with a critical day length of 12 h (Njoku, 1958 and Fawusi & Ormrod, 1981).

Hibiscus sabdariffa L., popularly called bra in the study area belongs to the Malvaceae family and is grown for leaf, fleshy calyx, seed or fibre depending on the respective properties of the numerous genotypes. Roselle is a tropical short-day plant with a critical day length of 12-12.5 h. This may be the reason why it thrives best in the dry season under irrigation.

Production Constraints

Lack of Water

With the exception of the dam sites owned by IDA where water might not be a problem as expressed by the farmers at the Golinga dam site, other farmers lacked constant and reliable water supply. This situation contributes to low yield and does not encourage expansion of land area. At such sites, farmers suggested that they could increase their farm sizes if they were assisted to construct dugouts or local wells that would provide them with sufficient water through the dry season. There is the need to research into water harvesting and conservation techniques at these sites.

Crop Destruction by Stray Farm Animals

These sites are within the villages where animals are kept on free range during the dry seasons. These animals go into the vegetable farms and cause a lot of destruction to the crops. Farmers need assistance in the form of local institutions at the village level to prevent animal destruction. Farmers saw the erection of fences around their vegetable plots as an extra expenditure that will raise the cost of production.

Lack of Improved Varieties

Most of the farmers obtained seeds for the following season's crop of vegetables from crops produced on their own fields. Apart from the fact that these may not be improved varieties, they could also be mixtures of several varieties that lower yields. A relevant research domain in our opinion is to purify the existing varieties they are presently using and select and breed varieties of shorter duration with better water and nutrient use efficiency.

Traditional leafy vegetable seeds were preserved in rugs to ensure aeration. However, seeds of roselle lose their viability before the end of the year. *Amaranthus* spp. seeds cannot be stored beyond a year. Apparently, they lose their viability when the weather becomes humid leading to the development of fungal growth that manifests when the seeds were sown hampering germination and establishment. Securing the availability of seed for a longer period will be a boost to food and income security.

Soil Fertility Maintenance

High cost of inorganic fertilizer and scarcity of poultry manure were mentioned as the constraints in the production of leafy vegetables. Soil fertility maintenance was a great issue to the gardeners interviewed. Almost all of them were ignorant about compost and liquid manure preparation. An integration of poultry and TLV production would be a sustainable production system to promote.

CONCLUSION

Farmers in Northern and Upper-East Regions grow a wide range of vegetables; however *Amaranthus* spp, *Corchorus olitorius and Hibiscus sabdariffa* were identified as priority traditional leafy vegetables (TLVs) that need promotion to address dietary improvement needs and poverty in general in the dry Savannah ecological zone of Ghana. Most farmers would like to grow these TLVs both in the wet and dry seasons but are constrained by the lack of reliable sources of water for irrigation; lack of improved seeds; destruction from stray farm animals;

non-availability of poultry manure and non-affordability of inorganic fertilizer. The production of TLVs could be integrated with rural poultry production to ensure the availability of poultry manure for the production of TLVs. Seed preservation techniques also need some improvement. All these could be packaged into a technological development and transfer approach by research and extension agencies to improve the production segment of the TLV value chain.

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