

Increasing the Consumption of Micronutrient-rich Foods through Production and Promotion of Indigenous Foods

FAO-AVRDC International Workshop Proceedings
Arusha, Tanzania, 5–8 March 2002
Hosted by AVRDC-Regional Center for Africa



J. Aphane, M.L. Chadha, and M.O. Oluoch



Food and Agriculture Organization
of the United Nations



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AVRDC—the World Vegetable Center is an international not-for-profit organization committed to ensuring the world's food security through research, development, and training

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Countries participating in workshop

Chapter 1

Project Background

Introduction

Unacceptably high rates of micronutrient malnutrition persist today in spite of commitments made at the International Conference on Nutrition (ICN) in 1992 and World Food Summit in 1996 to drastically reduce such suffering. Iron deficiency, the world's most widespread nutritional disorder, affects about 2.0 billion people, mostly women and children in developing countries. Vitamin A deficiency (VAD) affects more than 200 million people and is the major cause of preventable visual impairment and blindness. It is estimated that 250,000–500,000 children are becoming blind every year due to VAD, and about half of them are dying. These deficiencies mostly affect resource-poor, rural communities who derive most of their income from subsistence farming.

Consumption of vegetables, legumes, and fruits is the most sustainable way of reducing and controlling micronutrient deficiencies in resource-poor communities. Indigenous vegetables, besides being micronutrient-rich, have the added advantage of possessing other desirable traits. These vegetables are often easier to grow, resistant to pests and diseases, and are quite acceptable to local tastes. However, in many countries, indigenous vegetables are at risk of extinction as they are being replaced by high-yielding commercial varieties. When an indigenous variety is lost, it can never be recovered. There is an urgent need for intervention to avoid such a situation.

The Food and Nutrition Division of the United Nations Food and Agriculture Organization (FAO) and AVRDC-Regional Center (AVRDC-RCA) have conceptualized a project to reduce vitamin A and iron deficiencies through increased production and consumption of indigenous foods. A major thrust of the strategy in this project is to stagger production of different varieties of indigenous vegetables, many of which are seasonal, so there is continuity of supply throughout the year. AVRDC—the World Vegetable Center is an international center with a mandate to increase production and consumption of vegetable crops. AVRDC has been active in recent years saving thousands of valuable indigenous vegetable types, as well as analyzing their nutritional contents and bioavailabilities.

The proposed project aims to identify different varieties of indigenous vegetable crops with desirable agronomic traits and then promote their production and utilization. Improving vegetable production and consumption is the most direct, low-cost way for many rural and urban poor communities to improve their nutritional status and enhance their quality of life. Development of indigenous vegetable production also provides employment opportunities to the expanding population. In addition, vegetable crops grow quickly and meet the emergent needs of food. The diversity of vegetables permits year-round production and provides a diet rich in micronutrients.

Conservation, multiplication, production, and promotion of the germplasm of landraces of vegetable crops in Africa are important to maintain the existing diversity and prevent genetic erosion of suitable traits in many species. Often these valuable species of indigenous vegetable crops in Africa are neglected in this regard. Priority crops have been identified by international and regional workshops held at Tanzania in 1990 for member countries of Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training (SACCAR), at Cameroon in 1997 for countries of sub-Saharan Africa, at Uganda in 1999 for member countries of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), and at Tanzania in 2001 for member countries of Le Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles (CORAF). These crops include indigenous vegetables such as vegetable amaranth (*Amaranthus hypochondriatus*, *A. cruentus*, and *A. hybridus*), African eggplant (*Solanum aethiopicum* and *S. macrocarpon*), nightshade (*Solanum americanum*, *S. villosum*, and *S. scabrum*), Ethiopian kale (*Brassica carinata*), jute mallow (*Corchorus olitorius*), spider plant (*Cleome gynandra*), as well as introduced vegetables such as tomato (*Lycopersicon esculentum*), onion (*Allium cepa*), and cabbage (*Brassica oleracea* cvg. *capitata*) based on their popularity, consumption, and local production.

Vegetable crops to be covered under this project will be: vegetable amaranth, African eggplant, nightshade, Ethiopian kale, jute mallow, spider plant, mungbean (*Vigna radiata*), vegetable soybean (*Glycine max*), high beta-carotene selections of tomato, and other important indigenous vegetables in each country.

Overall goal

The overall goal of the project is to promote the production and consumption of indigenous vegetable crops in vulnerable communities of four African countries to meet the recommended intakes of vitamins A and C, and iron throughout the year.

Objectives

Specific objectives of the project are to:

- Conduct workshops and Training of Trainers (TOT) courses offering special skills on production technologies, processing, and utilization of indigenous vegetables to enhance the capacity of extension staff, communities, and other stakeholders
- Collect, identify, and select as many varieties as possible of indigenous vegetable crops from the target localities to ensure diversity; this will include even rarely cultivated crops consumed only during severe drought periods
- Conduct consumer acceptability tests on promising varieties taking into consideration desirable agronomic traits

- Enhance the capacity of local staff and target communities in the maintenance of germplasm and sustainable production of selected indigenous vegetable varieties
- Multiply and distribute seed of most promising varieties
- Analyze the acceptable varieties for nutrient content
- Educate participating target communities on nutritional and intrinsic values of indigenous vegetables and the amounts to be consumed to meet their micronutrient requirement
- Enhance awareness and assist in the promotion of production technologies, processing, and utilization of selected micronutrient-rich indigenous vegetable germplasm to extension staff, farmers, NGOs, and private sector personnel in the target countries
- Evaluate biochemical parameters for vitamin A and iron status in representative samples of populations of participating communities before, at mid-point, and at the end of the project
- Establish the iodine status in populations of participating communities and develop strategies to ensure its intake
- Establish the status of vitamins A and C, and iron in populations of participating communities at the beginning and before the end of the project

Project rationale

Communities suffering from food insecurity would be able to improve their nutritional status by growing indigenous vegetables for the following reasons:

- Indigenous vegetables are culturally known and acceptable to local tastes.
- Many indigenous vegetables are rich in micronutrients and can significantly enhance the bioavailability of micronutrients in staple crops when consumed together.
- Agronomically, indigenous vegetable crops can grow under a wide range of environmental conditions, and several species are more resistant to pests and diseases than introduced vegetable crops.
- In many parts of Africa, indigenous vegetable crops are considered to be “women’s crops” in that they are mostly grown or gathered by women. Developing appropriate production practices for these nutritious crops will increase yields and make nutrients more available year-round.
- There is a high potential for women to earn additional income from selling surplus indigenous vegetables. Markets for these vegetables exist in many countries. With more information on the attributes of indigenous vegetables, such as their nutritional content and anti-oxidant properties, their market value

would further increase. Therefore, indigenous vegetable crops can play a significant role in reducing poverty and generating income that can be used to improve family nutrition.

- In the context of the current HIV/AIDS epidemic and drought in southern Africa, indigenous vegetable crops play a significant role in food security and livelihood of rural people in particular. Indigenous vegetable crops are less labor-intensive than introduced crops and also provide the needed micronutrients.

Expected outputs

Several outputs are expected to be achieved by the project:

- Capacity of extension staff, communities, and other stakeholders in target areas to produce indigenous crops, will be enhanced
- Different varieties of indigenous vegetable crops suitable for each locality identified; and new varieties from similar environments will be introduced
- Nutrient content and bioavailability of preferred local indigenous vegetables will be assessed
- A manual on the production, processing, and utilization of local indigenous vegetable foods will be produced
- Knowledge among community members about the use of locally available indigenous vegetable foods to enhance their nutritional status will be improved
- Sustainable seed multiplication, supply, and distribution systems of indigenous vegetable crops will be developed
- Levels of vitamins A and C, and iron within target communities will be increased

Implementation plan and proposed activities

The project will be a joint venture among FAO, AVRDC-RCA, and participating countries. A participatory planning and consensus workshop was held in Tanzania in March 2002 to discuss the project content, operational modalities, and mechanisms for collaboration among the four participating countries on sharing of information and technical expertise during the implementation of country projects. In this workshop, the participants (Annex 2) planned for possible funding, and agreed on the goal of the project entitled "Improving the nutritional status and health of vulnerable communities in Uganda, South Africa, Tanzania and Swaziland, through food-based approaches to meet the recommended intakes of vitamins A and C, and iron across all seasons".

In summary, it was suggested to make use of superior cultivars for already validated African indigenous vegetables (AIV) by promoting the production and consumption of micronutrient-rich indigenous foods at community level in the four African countries. This project proposal complements the future priorities of AVRDC in Africa: 1)

germplasm improvement of AIV; 2) promotion of vegetable seed industries and supplies; and 3) training.

South Africa, Swaziland, Tanzania, and Uganda were selected for participation. The main criteria used to select these countries were: 1) existing working partnership with AVRDC-RCA and FAO; 2) participation in the planning exercise; and 3) reasonably good chances for implementation and spill over effect.

While participating countries implement the project, the FAO and AVRDC-RCA will be responsible for providing technical assistance to these countries. At the country level, the national agricultural research system (NARS) and the nutrition unit of an appropriate ministry or institution will jointly oversee the in-country implementation. A horticulturist/vegetable specialist and a nutritionist will be responsible for day-to-day project activities. They will work in close collaboration with local farmers, women's groups, community members, and other stakeholders. Extension services, NGOs, and private industries are considered major stakeholders.

Chronogram of activities

Activities	Yr. 1	Yr. 2	Yr. 3
Planning workshop	X		
Baseline studies	X		
Training in vegetable crops production, processing, and utilization	X		
Germplasm collection, identification, and evaluation	X	X	X
Analysis of nutrient content and bioavailability		X	X
Seed production and distribution		X	X
In-country training in vegetable crops production, processing, and utilization		X	X
Technology dissemination (including promotion of nutrition gardens)	X	X	X
Nutrition education and monitoring of food consumption practices	X	X	X
Development of recipes		X	X
Development of extension material		X	X
Evaluation studies			X

Chapter 2

Workshop Activities

Objectives

The purpose of the workshop was to provide a forum for a planning and consensus meeting at which policymakers, agricultural researchers, nutritionists, and extension workers from four African countries would exchange ideas and formulate strategies for international collaboration on the subject of indigenous food crops. The overall objective of the workshop was to assist participating countries to develop project proposals on promotion, production, and consumption of indigenous crops for specific and vulnerable communities in their countries.

The specific objectives of the workshop were:

- Review the concept developed by ESNA and AVRDC-RCA on this subject, and adapt the concept to each participating country
- Develop a project proposal (for each country) using available recent data to demonstrate the effectiveness of promoting the production and consumption of indigenous vegetable crops in reducing vitamins A and C, and iron deficiencies
- Develop a mechanism for liaising/collaborating with four participating countries on sharing of information and technical expertise during the implementation of country projects

Expected workshop outputs

- Additional information on the concept of increasing consumption of micronutrient-rich foods through production and promotion of indigenous foods developed by FAO and AVRDC
- Development and revision of draft project proposals on the basis of plenary and group discussions
- Commitments to revise and finalize country project proposals in consultation with relevant authorities and subsequently submit proposals within two months to prospective donors
- Development of a draft framework for international collaboration among participating countries on sharing information and resource persons

Opening session

The Director General of AVRDC, Dr. Samson Tsou, officially opened the workshop. Ms. J. Aphane, FAO Nutritionist, spoke on behalf of FAO and welcomed the participants to the workshop. The Director of AVRDC–RCA, Dr. M.L. Chadha, welcomed participants to Arusha and to the workshop.

Structure of the workshop

The workshop was divided into plenary and working group sessions (Annex 1). Country papers, working group reports, and workshop recommendations were presented and discussed in plenary session.

At the first plenary session, facilitator Dr. Mel Oluoch, Research Scientist from AVRDC-RCA, explained the structure and modus operandi for the workshop. Ms. Aphane presented the background and rationale for integrating nutritional considerations into agricultural research programs. Dr. Tsou presented AVRDC's present strategy and future plans on promoting utilization of indigenous vegetables to overcome micronutrient deficiencies. Dr. Chadha gave a presentation on RCA's activities on developing production practices and promoting indigenous vegetables and their role in improving food security in the region.

Country presentations

Prior to country presentations, Ms. Aphane presented the objectives of the workshop and emphasized the importance of achieving the expected workshop outputs.

On the basis of a framework provided by FAO (Annex 3) prior to the workshop, the four participating countries had prepared country project proposals on "Increasing Consumption of Micronutrient-rich Foods through Production and Promotion of Indigenous Foods". Country papers from South Africa, Swaziland, Tanzania, and Uganda were presented on the first and second days of the workshop. The revised country project proposals are presented in Chapters 3–6 of these proceedings.

Working group sessions

Four working groups: Policy Group, Research Group, Nutrition Group, and Extension Group, were constituted. The groups were charged with the task of defining pertinent issues and activities that should be considered by individual countries when designing and implementing country projects. The Terms of Reference for each working group are presented in Annex 4.

Chapter 3

Country Project Proposal: South Africa

Background and justification

Food security

Micronutrient deficiency continues to be a major health problem in developing countries and has far reaching consequences on growth, development, and health, especially among children. Dietary intakes of economically and socially deprived communities in developing countries usually consist of plant-based staple foods and are monotonous with little variation. Fruits, vegetables, and animal products are seldom consumed, resulting in low vitamin A intake in these communities. Vitamin A can be obtained from supplements or from foods that are either fortified or naturally rich in vitamin A and pro-vitamin A carotenoids. Three broad strategies, namely, supplementation through high-dose capsules, food fortification, and food diversification are explored worldwide for combating vitamin A deficiency, especially among children.



South Africa

The food situation in South Africa is characterized by food sufficiency on a national scale in spite of occasional food supply fluctuations. Despite this national food security, the experience of the majority of South African households is food insecurity, malnutrition, and unemployment. About 14.3 million South Africans are vulnerable to food insecurity—women, children, and the elderly are particularly vulnerable (Statistics South Africa 2000).

According to the Lund Report on Child and Family Support (GoSA 1996), one in four children under the age of six years (some 1.5 million) are stunted due to chronic malnutrition. Deficiencies in micronutrients such as vitamin A and iron are also widespread and have negative consequences for children's growth and development. Children need to be adequately nourished to ensure optimal development. Children in different stages of their life have specific nutritional needs. In South Africa, 43% of children below seven years live in a disintegrated family structure and under poverty conditions. Children in these families are vulnerable and are often living in unhealthy, unsafe, and disadvantaged communities.

Forty percent of the country's families live in poverty. Children raised in these poor families are at risk for infant death, low birth weight, stunted growth, and dropping out of school. In poverty-stricken rural areas, early childhood development (ECD), both in terms of quantity and quality, is far lower in rural areas than in urban areas.

Human development indicators measured at the provincial level reveal provincial disparities in socio-economic development for children, which highlight the vulnerability of rural children to food insecurity in the country. Food insecurity and malnutrition are highest in provinces with large rural populations such as KwaZulu-Natal, Northern Province, Eastern Cape, and the Free State. The HIV/AIDS epidemic and other communicable diseases among the poor further accentuate the vulnerability of these households to food insecurity. Urban and rural households adopt diverse livelihood strategies to reduce food insecurity. These include food production, local employment, migrant labor, reliance on social security benefits, and local support systems.

Food diversification is the more sustainable long-term strategy to address vitamin A deficiency. Although foods of animal origin are the best sources of vitamin A, these food items are expensive and often out of economic reach of poor households. For a vast portion of the population, foods of plant origin (dark green leafy vegetables, and yellow fruits and vegetables) are major sources of pro-vitamin A carotenoids. Local production of these fruits and vegetables can provide households with direct access to foods rich in pro-vitamin A carotenoids.

Strategies targeting food diversification are aimed at an increase in the production, access to, and subsequently the consumption of foods rich in vitamin A and pro-vitamin A carotenoids. Indigenous leafy vegetables are an important part of farming and consumption systems throughout Africa. They are important sources of micronutrients including vitamins A and C, iron, and others. Indigenous leafy vegetables are crucial to food security particularly during famine and natural disasters, two scourges that are currently prevalent in sub-Saharan Africa (SSA). Many such plants grow in the wild or as weeds in cultivated areas, but have also been domesticated through semi-cultivation or cultivation. When domesticated, they require few inputs and tend to grow in areas unsuitable to cultivate introduced vegetables.

With the projected urbanization in SSA to reach more than 50% of the population over the next 15 years, solutions to forestall undesirable nutrition and health impacts on this trend are needed. Potential ways in which indigenous leafy vegetables might contribute include scientific evaluation of plant properties, cultural support programs, dietary education, innovative processing, and marketing.

National policies

The democratic government after 1994 re-prioritized public spending to focus on improving the food security of historically disadvantaged groups. This reprioritization policy saw increased spending in the national government's social programs, such as school feeding schemes, child support grants, community public works programs, free health services for children between 1–6 years as well as pregnant and lactating women, pension funds for the elderly, production loan support schemes for small

farmers, infrastructure grants for smallholder farmers, and community food gardens. Various policies and strategies were developed to address the problems of micronutrient deficiency on a national scale.

The main food security challenge in South Africa is to increase the ability of historically disadvantaged groups to meet their minimum daily requirements for proper nutrition. This malnutrition of the majority population stems from the insufficiency and instability of food supply, inability to purchase food, weak institutional support networks, poor nutrition, inadequate safety nets, and weak disaster management systems.

South Africa's food security objectives are located within a broader international context of heightened awareness to achieve food security. In the Rome Declaration on World Food Security in 1996, South Africa pledged to support the World Food Summit Plan of Action to reduce the number of food insecure people by half by 2015. Several macro, sectoral, and targeted government policies and programs subsequently incorporated the process of developing this food security strategy. In turn, this food security inevitably constitutes a commentary on the same and other government policies and strategies. All of these created a useful framework within which the agricultural sector strategy are shaped. Policies of particular importance are the Presidential Imperative Programs, MINMEC Priorities, White Paper on Science and Technology, Convention on Biodiversity, and Draft National Food Security Bill.

Agriculture is one of the major contributors to the economy of South Africa; however, the biodiversity of the country has not benefited the majority of its people. Traditional foods have been substituted by a western diet that is highly processed and less nutritive. This trend could be corrected by recognizing the rural farmer's indigenous knowledge of the environment and how it can be innovatively managed to address food security problems in South Africa. Thus, recognition and utilization of indigenous foods and products will have an impact in people's health and quality of life as well as increase the potential for income generation and job creation.

Indigenous leafy vegetables are usually gathered, not cultivated. Gardening programs have been proposed but a problem in many rural areas in South Africa, and probably in many other African countries, is lack of infrastructure to be used for the implementation and promotion of sustainable gardening programs that are aimed at addressing specific nutritional needs.

Various organizations, including national and provincial governments, science councils, and tertiary institutions embarked on developing strategies to assist food security in rural areas through promotion and utilization of indigenous vegetables. These efforts are focused on multi-disciplinary approaches, collaboration, and coordination between various sectors/disciplines and proved to be essential to ensure effective implementation of programs focused on alleviation of malnutrition. Various projects are currently implemented that address partially/fully the objective of alleviating malnutrition through food-based programs:

- Germplasm management of African leafy vegetables for the nutritional and food security needs of vulnerable groups in sub-Saharan Africa (SSA)—this

project aims to improve the nutritional status and livelihoods of vulnerable groups, namely women and children

- A home gardening program focusing on yellow and dark green leafy vegetables to improve household food security and malnutrition with special reference to vitamin A status of pre-school children—this project is a pilot study in Ndunakhazi KwaZulu-Natal
- Research and development of indigenous vegetables in South Africa—this project focuses on the identification of indigenous vegetables for potential use in food-based programs as well as the commercialization of those species with potential
- Facilitation of farmer participation in high value crops for niche markets in South Africa—part of this project aims to promote the utilization of indigenous vegetables on a commercial scale
- Promotion and commercialization of indigenous foods

Results from these projects indicate that for successful implementation of sustainable food-based and commercial programs, it is essential to use a multi-sectoral and multi-disciplinary approach where agriculture, health, nutrition, and education are interactively involved.

Production of indigenous vegetables in South Africa

There are many different species of leafy vegetables used in South Africa, many of which are fairly localized. Many of these species are not readily amenable to conventional agronomic studies as often they are grown in small patches in home gardens. The leafy vegetables of Africa are being displaced in many areas, leading to a decline in production, use, and diversity of vegetables being grown. This trend will clearly have a detrimental impact on the nutritional status of households, and the incomes of women farmers, in particular, who constitute the primary producers, consumers, and sellers of these vegetables. The lack of attention by research and development is leading to the underexploitation of these vegetables. The scenario thus far described encourages continuing genetic erosion, and further restricting the development options for the rural poor. Crucially, from a national and cultural standpoint, these vegetables constitute a most valuable natural resource that need to be preserved.

Some species have been identified to be important in South Africa with regard to production. They are, however, also gathered in the wild:

- Vegetable amaranth (*Amaranthus hybridus*) is the most cultivated *marog* (spinach) (Van Wyk and Gericke 2000).
- The flowers of water hawthorn (*Aponogeton distachyos*), an aquatic plant, are eaten. The newly opened flowers and some flowers with young immature fruits are harvested with their stems. The stems are later twisted off and used as feed for pigs and goats (Van Wyk and Gericke 2000).

- Spider plant (*Cleome gynandra* and *C. monophylla*) is planted on a small scale in the warmer areas.
- Cucurbits (*Cucurbita* spp.) are mainly planted for the fruit but the leaves are gathered while the vines are growing and the fruit is immature.
- Cowpea (*Vigna unguiculata*) is widely planted for its leaves, which are usually picked while the vines are growing. Any pods that develop later are regarded as a bonus.

Recent studies in the Limpopo, KwaZulu-Natal, and Gauteng provinces revealed that different species and meal preparation practices are used in different areas of South Africa. There is also an indication that information on the utilization and processing of many of these crops is being lost. The communities involved are, however, very interested to regain this lost knowledge and to participate in re-introduction and capacity building programs in this regard. Communities targeted for this project are Thembamooop, Mars/Glenroy, and Setototwane in Northern Province, Arthurstone in Limpopo Province, and Watershed and Bufort in KwaZulu-Natal Province.

Priority crops for this project are vegetable amaranth, spider plant, cowpea, lambsquarters (*Chenopodium album*), and squash (*Cucurbita maxima*). These species appear to be the most important from work that has been undertaken in various communities and from discussions with researchers at the University of the North and the University of North-West. In view of cultural and climatic differences in different areas, the priority species may vary from area to area.

At present, very little is being done to improve technologies for processing and marketing of indigenous vegetables. Various institutions within South Africa are planning projects in this regard.

Conservation of genetic diversity

Genetic diversity approaches can contribute to addressing the contribution of these species to improve the nutrition of vulnerable groups through inter and intraspecific analyses of carotenoid composition and bioavailability. Plant diversity research may offer solutions through identification of synergistic food combinations or preparation methods that mediate pro-vitamin A absorption.

The genebank in Agriculture Research Centre (ARC) in Roodeplaat maintains as seed or as in vitro or in vivo plants of various accessions of traditional and indigenous root and leafy vegetables, and medicinal plants. The seeds are stored in cold storage. In vivo plants are kept in field collections, which are planted annually, or in screenhouses. Cassava (*Manihot esculenta*) and Livingston potato (*Plectranthus esculentus*) are maintained in vitro.

Seeds of a wide variety of local and exotic *Amaranthus* species are stored. Eight of the local accessions were regenerated by researchers working in the Project 10429/RO for drought tolerance screening. Accessions of okra (*Abelmoschus esculentus*),

spider plant, dandelion (*Taraxacum officinale*), comfrey (*Symphytum officinale*), and globe amaranth (*Gomphrena globosa*) are maintained as seed accessions. Four hundred twenty nine accessions of 19 species of *Amaranthus* are held at the National Botanical Institute at Pretoria. Nineteen leafy vegetable accessions are held in the genebank of the ARC-Range and Forage Institute.

The Agro-Biodiversity Unit of ARC-Plant Protection Research Institute has developed a database for vegetables and underutilized crops. All information in the database has reference to published articles. The National Botanical Institute has conducted various eco-geographical studies and also maintains a database on indigenous plants found in South Africa.

Seed production

There is a need to train community members in producing seed of indigenous vegetable crops to maintain a continuous supply of seed for increased production across all seasons. The need is to:

- Focus more closely on the traditional and modern seed and germplasm management practices for the priority leafy vegetable species to provide the right material from which farmers can select
- Apply formal and farmer participatory germplasm management techniques to improve the purity and availability of seed for the preferred varieties of leafy vegetables
- Carry out this work in association with women farmers who are the main seed producers and marketers of traditional vegetables
- Produce guidelines on seed selection, exchange, and storage
- Take into account certain policy aspects such as seed legislation and systems, already applicable to other crops, for variety protection and in conformity with existing frameworks within individual countries

Formal seed systems and development agencies will need to ensure continuous access to the genetic resources and land, so that traditional leafy vegetables retain the strong link to the knowledge on their distribution and use. Monitoring the changing economic demand for the priority species will be important, not only to assess the diversity within the species, but also to assess the equitable distribution of benefits and continuing access to these genetic resources for women. All these are in recognition to the fact that it is mainly women who plant, market, prepare, and process these vegetables. Indeed, women are also the main consumers of these vegetables.

This project is not a stand-alone initiative. It features well within the overall strategies within South Africa as well as strategies for other related projects as discussed above. The International Plant Genetic Resources Institute (IPGRI) has developed a global project to exploit the potential contribution of neglected and underutilized crops to rural livelihoods in Asia-Pacific, Central and West Asia, North Africa, Latin America,

and the Caribbean. While this global project aims to redress the neglect of valuable plant genetic resources managed by the poor through development-oriented research in the regions mentioned above, the present proposal focuses specifically on the contribution of indigenous leafy vegetables to the nutrition and food security needs of vulnerable groups, namely women and children in South Africa. The project will also draw from experiences of other African initiatives on leafy vegetables. The AVRDC-Regional Center for Africa, for example, currently implements studies on seed production and agronomy of selected African vegetables. The International Development Research Centre (IDRC) through its "Sustainable Use of Biodiversity Program" supports or has supported a number of initiatives on indigenous vegetables relating to agronomic and ethno-botanical studies, production, and marketing aspects in Burkina Faso, Kenya, Uganda, and Zimbabwe. The Natural Resources Institute (NRI) has also been working on indigenous vegetables over the last five years throughout sub-Saharan Africa. They currently manage five projects on the subject in Ghana, Cameroon, Uganda, Tanzania, and Zimbabwe. The Food and Nutrition Division of the FAO in collaboration with the AVRDC conceptualized this project.

Nutritional value

The nutrient potential of natural fauna and flora in South Africa is not known and therefore, a challenging new area for research. Currently only 20% of South African foods have ever been analyzed for nutrient content. This is despite the fact that results of food that have been analyzed so far in South Africa show that the food composition of local foods differ substantially from those introduced from other countries. However, food composition data is essential in nutritional research for planning and assessing nutrition intervention studies, planning national food and nutrition policies, and prescribing therapeutic and institutional diets for individuals.

Identifying culturally accepted foodstuffs of a high nutrient quality can improve the general health of the community. Effective community nutrition education programs can be conducted based on this knowledge. This exercise will be conducted for the first time in South Africa, as this information was never analyzed in a systematic way to include all the different ethnic groups. To introduce adequate nutrition, it is important to bring about changes that are in keeping with established food habits of the people and are acceptable within the framework of their value system.

Applying suitable and innovative processing technologies for foods eaten by rural populations can enhance the nutrient content and economic value of the food. Once a new nutritious product has been developed, the food product could be processed and distributed within the community. Urban populations often yearn for food products that are nutritious. This is an area in the food chain that has not yet been exploited in South Africa. New markets can be developed not only benefiting South Africa, but also the entire region of southern Africa.

The appearance, flavor, and texture of vegetables are the most important characteristics influencing the consumer's acceptance and eventual interest to buy or not to buy. Information obtained in this regard will supply meaningful

recommendations to the product manufacturers and give insight into the positioning of the products relative to each other in the current market.

Leafy vegetables are generally a good source of calcium, magnesium, carotene, iron, and sometimes vitamin C. Furthermore, the leaves are usually eaten cooked along with white maize porridge. The porridge is however a poor source of protein, calcium, iron, zinc, riboflavin, nicotinic acid, vitamin C, and carotene (pro-vitamin A), but is a good source of magnesium, potassium, and thiamine. A fair amount of the phosphorous in porridge is in the form of phytic acid, which is not available to the body. Phytic acid could combine with calcium, magnesium, iron, and zinc to form insoluble salts which are unavailable to the body (Wehmeyer and Rose 1983). Leaves of *Physalis peruviana* and *Prunus persica* are used to enhance the taste of maize meal (Wehmeyer and Rose 1983). Protein content from the *Amaranthus* leaves, which have a lower sulphur amino acid content but higher in lysine and tryptophane, can supplement the maize porridge and provide a more balanced meal. *Amaranthus* is a rich source of protein, vitamin A, and several other essential elements and has a high potential to develop into a commercial crop (Feine et al. 1979).

Project rationale

It is feasible to enable the nutritionally vulnerable communities to get their vitamins A and C, and iron from indigenous vegetables for the following reasons:

- Indigenous vegetables are culturally known and acceptable to local tastes.
- In general, indigenous vegetable crops are rich in micronutrients and can enhance the bioavailability of micronutrients in other staple crops when consumed together; furthermore, indigenous vegetables are normally consumed fresh and thus capture the vitamin C generally present in fresh foods.
- It is clear that research and development programs have neglected leafy vegetables and caused major gaps in knowledge and capacity to conserve and improve them. Little is known about their agronomy, genetic diversity, nutritive value, germplasm management, keeping quality characteristics, and improvement of their yield. There is an urgent need to identify the most effective commercialization, marketing, and policy frameworks to promote their use and maximize their economic value. All these activities should be taken at various levels to remove any bottlenecks for successful promotion of these vegetables.
- Indigenous vegetable crops can grow under a wide range of environmental conditions. Many of these crops show more resistance to pests and diseases compared to introduced vegetable crops. From the observations made in other related projects, there is a need to document and disseminate information on both domestic preparation and commercial processing of these vegetables. Processing and preservation of these vegetables could in turn lead to wider markets and thus increase the commercial value of the vegetables.
- In many parts of Africa, indigenous vegetable crops are considered to be “women’s crops” because they are mostly grown or gathered by women.

There is good potential for women to earn additional income from selling surplus of these crops. In many countries, markets for these foods exist. The cultivation of traditional vegetable crops is partly associated with less expensive production methods and less external inputs. With more information on the attributes of indigenous vegetables, such as their nutritional content and anti-oxidant properties, their market value would further increase.

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Logical framework

Planning period: 2002–2004

Overall goal

Improving the nutritional status and health of the Lusikisiki community in South Africa through food-based approaches to meet the recommended intakes of vitamins A and C, and iron across all seasons.

Outputs	Activities	Indicators
Component I. Policy issues that impact on nutrition		
<p>1 Promotion of activities with reference to national priorities</p>	<p>1.1 Establish a project committee to coordinate activities between the NDA, ARC, PDA Eastern Cape, DOH, MRC, PDH Eastern Cape, Landcare, NGOs, and community</p> <p>1.2 Establish a multidisciplinary team from above organizations</p> <p>1.3 Incorporate micronutrient deficiency policy in the South African country development plans</p> <p>1.4 Use existing networks (Vitamin A, IPUF, SANCRA, and others) to strengthen collaboration within the project</p> <p>1.5 Use impact assessment methodologies to measure higher level of impact such as: learning abilities of children, resistance to disease infections including HIV/AIDS, and capacity of income generation</p>	<ul style="list-style-type: none"> • Joint meetings organized • Monitoring reports prepared • Steering committee formed with research as the leading agency • Joint meetings and tours at field level organized • Policy on micronutrient deficiency incorporated • Joint national planning and monitoring workshops organized • Impact assessment reports prepared
<p>2 Regional collaboration strengthened</p>	<p>2.1 Make planting material/information available for exchange between participating countries</p>	<ul style="list-style-type: none"> • List of prioritized indigenous foods prepared (agreements signed, exchange of reports, bulletins and newsletters)

Outputs	Activities	Indicators
	<p>2.2 Attend joint training courses (special skills) conducted by participating countries</p> <p>2.3 Compile a list of South African expertise/resource persons</p> <p>2.4 Develop national manual on nutrient composition of micronutrient-rich indigenous foods to be incorporated in joint publications on nutrient analysis</p> <p>2.5 Appoint national coordinator to represent South Africa in regional committee</p>	<ul style="list-style-type: none"> • Priority training courses identified • Training materials developed jointly • List of experts available • Follow-up trips from AVRDC/FAO • Plan of analysis for nutrient content developed and shared • South Africa participated in Coordination Committee
3 Communication with outside partners	<p>3.1 Inter-country workshops and site visits to Lusikisiki</p> <p>3.2 Identify potential collaborators at regional level</p>	<ul style="list-style-type: none"> • Reports and proceedings produced • Collaboration with ASARECA, SACCAR, FAO, AVRDC, GTZ, EU, IFAD, DFID, ICRAF, SIDA, DANIDA, USAID, JICA, CIDA, UNICEF, CRHCS increased
Component II. Planning, management, and implementation of agronomic aspects		
1 Baseline survey conducted in targeted areas	<p>1.1 Conduct a baseline survey in Lusikisiki community</p> <p>1.2 Identify utilized species in the area</p> <p>1.3 Identify training needs on production skills of indigenous vegetables</p> <p>1.4 Collect indigenous knowledge on production, processing, preservation, and storage</p> <p>1.5 Compile a report and feedback meeting where collection was carried out</p>	<ul style="list-style-type: none"> • Comparative nutritional study data • Comparative survey data on the contribution of indigenous crops • Baseline survey report • Training needs assessment report compiled • Indigenous knowledge documented

Outputs	Activities	Indicators
<p>2 Courses conducted on special skills for Training of Trainers</p>	<p>2.1 Compile training courses for Training of Trainers (TOT)</p> <p>2.2 Conduct training courses on the following priority areas: seed production, IPM, processing and storage, germplasm characterization, nursery management, post-harvest handling, home gardening</p> <p>2.3 Develop training modules for extension and field workers in Lusikisiki</p> <p>2.4 Follow-up visits for extension and field workers in Lusikisiki to assess impact</p> <p>2.5 Document impact on training</p>	<ul style="list-style-type: none"> • Training courses attended at AVRDC • Reports on TOT training and modules • Impact assessment reports • At least one course conducted within two years • Training module for each course developed
<p>3 Germplasm of indigenous food species collected, identified, evaluated, selected, and conserved</p>	<p>3.1 Collect germplasm from Lusikisiki community</p> <p>3.2 Evaluate and characterize the germplasm on-station and on-farm</p> <p>3.3 Document collected germplasm</p> <p>3.4 Improve protocols on conservation</p> <p>3.5 Train farmers on on-farm seed production and protocols</p> <p>3.6 Develop protocols for on-farm seed multiplication and preservation</p> <p>3.7 Develop conservation protocols for field workers and extensionists</p>	<ul style="list-style-type: none"> • At least one collection mission by the end of Year 1 • At least five priority species evaluated and characterized by end of Year 2 • Documentary evidence available on collected germplasm • Conservation protocol improved and disseminated to at least 50% of the Lusikisiki by end of Year 1 • At least 50% of the farmers aware of the importance of germplasm maintenance by the end of Year 1

Outputs	Activities	Indicators
4 Production and post-harvest technologies developed and improved	4.1 Adopt recommended package of practices 4.2 Improve local production practices 4.3 Improve seed production system 4.4 Improve post-harvest handling technologies for freshly produced products 4.5 Increase yields of indigenous foods preferred by research and farmers	<ul style="list-style-type: none"> • Adoption of recommended package of practices • At least two new production practices adopted
5 Production and post-harvest technologies manual produced	5.1 Collect information from baseline report on indigenous knowledge 5.2 Collect, record, and exchange information	<ul style="list-style-type: none"> • Production and post-harvest technologies manual of three priority crops produced by the end of Year 2 • 50% of the stakeholders aware of the existence of that information
6 Participatory consumer acceptability tests conducted	6.1 Develop testing methodology jointly with agronomists, nutritionists, and extension workers	<ul style="list-style-type: none"> • At least one consumer acceptability test conducted for each variety before released • A list of accepted species produced by end of Year 2
7 Seeds of selected materials multiplied and made available	7.1 On-station multiplication of base seed of promising material 7.2 On-farm multiplication of quality seed 7.3 Evaluate and improve seed storage technologies 7.4 Encourage small-scale entrepreneurs for seed production	<ul style="list-style-type: none"> • Quality seed of promising materials recommended by end of Year 2 • On-farm seed storage technology recommended by end of Year 2

Outputs	Activities	Indicators
Component III. Planning, management, and implementation of nutrition aspects		
<p>1 Increased consumption of micronutrient-rich indigenous foods</p>	<p>1.1 Conduct food and nutrition baseline surveys</p> <p>1.2 Conduct workshops to create awareness on micronutrient-rich foods</p> <p>1.3 Develop and disseminate nutrition education materials on micronutrient-rich indigenous foods</p> <p>1.4 Develop and disseminate recipes using available micronutrient-rich indigenous foods</p> <p>1.5 Conduct nutrition education programs on the utilization of micronutrient-rich indigenous foods at community level</p>	<ul style="list-style-type: none"> • Survey reports for all communities within first half of Year 1 • Workshop conducted for Lusikisiki community within the first half of Year 1 • Nutrition education materials developed • Training courses and demonstrations on utilization conducted • Recipes using available micronutrient-rich indigenous foods published
<p>2 Nutrient content of indigenous foods analyzed</p>	<p>2.1 Conduct analysis of micronutrient content of indigenous foods</p> <p>2.2 Compile and disseminate nutrient composition tables of indigenous foods</p>	<ul style="list-style-type: none"> • Analysis reports • Nutrition composition tables available and used
<p>3 Increased knowledge in communities on nutritional value and benefits of indigenous foods</p>	<p>3.1 Organize nutrition education courses on micronutrient-rich indigenous foods in Lusikisiki community</p> <p>3.2 Disseminate information through mass media on regular use of micronutrient-rich foods</p>	<ul style="list-style-type: none"> • Courses conducted • People trained • Knowledge about indigenous foods improved • Information messages developed, broadcasted, and distributed
<p>4 Increased knowledge on processing and preparation of indigenous foods</p>	<p>4.1 Demonstrate preparation and processing of micronutrient-rich indigenous foods</p>	<ul style="list-style-type: none"> • Demonstration strategies established and tested

Outputs	Activities	Indicators
	4.2 Conduct training on the uses of solar driers to minimize nutrient loss and increase shelf life 4.3 Assess impacts of solar drier approach	<ul style="list-style-type: none"> ● Driers designed and commercialized in first six months ● Training conducted for 50% of Lusikisiki in Year 2 ● Assessed report available at the end of Year 2
5 Improved capacity of extension workers (nutrition) on the use of indigenous micronutrient-rich foods	5.1 Develop materials for extension workers 5.2 Train extension workers (nutrition) on micronutrient-rich foods 5.3 Conduct consumer acceptability tests	<ul style="list-style-type: none"> ● Training material available ● Courses conducted ● People trained ● Knowledge levels evaluated ● Acceptability testing conducted using recommended methodologies
6 Improved technology opportunities and skills for using micronutrient-rich foods through use of modern information technology (IT)	6.1 Upgrade equipment for adopting IT 6.2 Develop capacity for use of IT 6.3 Develop national databank on micronutrient-rich foods and then incorporate into regional databank 6.4 Participate in existing IT networks	<ul style="list-style-type: none"> ● Appropriate equipment available ● Training courses attended ● Skills and knowledge on IT improved and evaluated ● Databanks established and used
7 Recipebook of micronutrient-rich foods for participating countries	7.1 Participate in the development of a joint recipebook	<ul style="list-style-type: none"> ● Recipebook available

Outputs	Activities	Indicators
Component IV. Extension services, capacity building, and gender issues		
1 Develop team efforts of agriculturalists and nutritionists	1.1 Joint planning for project design and proposal development 1.2 Joint monitoring of progress in agriculture and nutrition practices 1.3 Establish study groups in Lusikisiki	<ul style="list-style-type: none"> • Plans prepared • Monitoring tools are in place and used • Study groups placed on monthly basis
2 Information pooled on combating malnutrition using micronutrient-rich indigenous foods and made available for extension use	2.1 Gather indigenous knowledge and plant materials and make it available among participating stakeholders 2.2 Improve communication between scientific community and extensionists to address farmers needs 2.3 Participation of extensionists 2.4 Develop information base on micronutrient-rich indigenous foods for extension purposes	<ul style="list-style-type: none"> • Report on indigenous knowledge in Lusikisiki • Study groups and regular meetings with all stakeholders • Extensionists attend to all activities and give feedback • Extension reports • Database on micronutrient-rich indigenous foods
3 Mechanisms of capacity building is developed and improved	3.1 Conduct joint training courses for trainers in the Eastern Cape 3.2 Develop training modules 3.3 Conduct training of extensionists at community level in Lusikisiki by agriculturalists and nutritionists 3.4 Update skills on using modern communication tools	<ul style="list-style-type: none"> • Training courses presented • Training manual • Training presented • Report on impact assessment

Chapter 4

Country Project Proposal: Swaziland

Background and justification

Swaziland is a landlocked country with a total land area of 17,000 km² and a population of about one million. The Republic of South Africa surrounds the country on three sides and Mozambique borders the nation to its northeast. Administratively, the country is divided into four regions, i.e., Hhohho, Manzini, Lubombo, and Shiselweni. There are four main agroecological zones: the Highveld, which ranges in altitude from 1000–2000 m above the sea level; the Middleveld, which ranges in elevation from 500–1000 m; the Lowveld lies at an average elevation of 200 m; and the Lubombo is a plateau that lies slightly above 500 m. The climate varies from semi-arid tropical in the Lowveld to nearly temperate in the Highveld.



Swaziland

About 77% of the Swazi population live in rural areas and derive their livelihood largely from subsistence farming. Although the country suffers from intermittent drought, agricultural production has been particularly stressed by bad weather during recent years. Excess floods occurred periodically from 1999–2001 and a serious dry spell severely damaged yields during the first cropping season of 2002. The government declared a state of emergency after that drought.

Sufficient food is not produced in Swaziland and the nation increasingly relies on imports to make-up for the shortfall, which is sometimes exacerbated by drought. The National Early Warning Unit (NEWU) of the Ministry of Agriculture and Cooperatives (MOAC) estimates that the production of maize, the major staple food, will be 42% lower than average during 2002. The Government of Swaziland has recently provided approximately 5 million Emalangeni (about US\$ 500,000) to alleviate the food shortage situation, although it is estimated that the amount will cover only about 10% of the nation's food requirements. Food aid is being requested from the United Nations and other international organizations.

Chronic malnutrition among children under five years is high. Micronutrient malnutrition is high and deficiencies of iodine, vitamin A, and iron are a public health concern. A survey of schoolchildren conducted in four endemic areas in 1993 showed

that total goiter rates (TGR) ranged from 6–38%. However, a follow-up study conducted in 1998 showed a decline in TGR to rates ranging from 6–11%.

Investigation on vitamin A status among children of 6–71 months was conducted throughout the country in 1995. The results showed that a very large percentage (91.6%) of children had inadequate levels of serum vitamin A. In the same study, an examination of mothers' milk showed that 57% of mothers had inadequate levels of vitamin A in their breast milk.

A study carried out in 1997 to investigate dietary iron levels among adolescents revealed that 21% had iron deficiency anemia. Another study conducted in 1998 on pregnant and lactating mothers showed that 80% of pregnant mothers and 50% of lactating mothers are at risk of iron deficiency.

Swaziland, like other southern African countries, has been grimly affected by the HIV/AIDS epidemic. According to UNAIDS reports, Swaziland is among countries with the highest HIV prevalence in the world among the 15–49 year age group. The disease impacts more severely on the poor, and it is exasperated by the current food insecurity in the country. In turn, HIV/AIDS worsens the food insecurity problem by imposing an additional stress on the availability of labor. There is tremendous labor loss due to illness and death of the economically active group. Available labor is further reduced due to the demands of caring for the sick and orphans. Because of this loss of labor, food production and off-farm income have dwindled significantly. The livelihood of many rural households in Swaziland livelihood has been compromised, and malnutrition including micronutrient deficiencies is on the rise.

Food aid from the national government and international community is mainly in the form of staple food. Consequently, the micronutrient deficiency situation is deteriorating. Micronutrients are essential for a nutritionally balanced diet and extremely important for the nutritional care of people.

Agro-biodiversity plays an important role in the livelihood of rural Swazi people. The plant resources include wild and medicinal plants that are used for food, health care, and livelihood. During the summer months, when there is heavy rainfall, a significant amount of micronutrients are obtained from wild indigenous vegetables and fruits. From an agricultural perspective, these plants have been neglected, as they are not in the mainstream of agricultural research and production programs. In addition, most indigenous vegetables are classified as weeds by agriculturists. Therefore, on fertile soils, usually reserved for large commercial farming, herbicides are used to destroy these "weeds". The opportunity to select and preserve good species, which thrive on good soils, is therefore missed. Consequently, some species have been lost and the remaining ones are at risk of extinction.

When an indigenous plant species is lost, it can never be recovered. More labor-intensive, high-input, introduced vegetables are replacing indigenous vegetable crops. Socio-economically deprived population groups, who are usually nutritionally vulnerable, often cannot afford the required inputs. At present, because of the HIV/AIDS epidemic, labor is also a limiting resource for this population group. There is an urgent need to

save this situation, particularly given the current challenge of HIV/AIDS and drought that the country and the southern Africa region are faced with.

Project rationale

In the context of the HIV/AIDS epidemic and ongoing threat of drought in Swaziland, there are many reasons why indigenous crops may play a more significant role in the food security and livelihood of its rural people:

- In general, indigenous vegetable crops are rich in micronutrients and can enhance the bioavailability of micronutrients in other staple crops when consumed together. Indigenous crops are normally consumed fresh, thereby providing opportunity to capture the vitamin C generally present in fresh foods.
- Indigenous vegetable crops can grow under a wide range of local environmental conditions. Many species are less labor-intensive and more resistant to pests and diseases compared to introduced vegetable crops.
- Indigenous vegetables are culturally known and acceptable to local tastes.
- In Swaziland, as in many parts of Africa, indigenous vegetable crops are considered to be “women’s crops” in that they are mostly grown or gathered by women. There is a high potential for women to earn additional income from selling surplus from indigenous vegetable crops. A market for these foods exists both in rural and urban areas of Swaziland.
- The use of traditional vegetable crops is partly associated with inexpensive production methods and low level of external inputs.
- With more information on the attributes of indigenous vegetables, such as their nutritional content and anti-oxidant properties, their potential market value would increase further.

Objectives

The main objective of the project is to reduce micronutrient deficiencies and to improve the level of food security in Swaziland. This will be accomplished by the following specific objectives:

- Promote production and consumption of indigenous foods among nutritionally vulnerable rural communities, particularly those that are most affected by drought
- Train community members to produce seed of indigenous vegetable crops to maintain an ample and continuous supply of seed across all seasons
- Evaluate food quality, food safety, and the nutritive value of indigenous vegetables

- Enhance the capability of the existing food technology laboratories by providing training to two chemical analysts and two microbiologists and supplying them with essential analytical equipment and other material

Expected outputs

- Community members will be trained to produce a sustainable supply of seed for indigenous crops across all seasons
- Different species of indigenous vegetable crops suitable for each locality will be collected, identified, and evaluated. New varieties from similar environments will be introduced
- Nutrient content of preferred local indigenous vegetables will be analyzed and their bioavailability measured in cooked and raw forms
- A manual on the production, processing, and utilization of local indigenous vegetable foods will be published
- Community members will be trained on using indigenous vegetables to improve their nutritional status
- Workshops and Training of Trainers courses will be conducted for extension staff and other stakeholders in these areas to impart special skills on production technologies, processing, and utilization of indigenous vegetables
- Sustainable seed multiplication, supply, and distribution systems will be developed or enhanced
- Nutritional status of vitamins A and C, and iron of the population will be improved

If approved, this project would complement the current project, “Emergency Assistance to Drought-affected Smallholding Farmers in Swaziland”, with a strong element of sustainability.

Work plan

The following activities will be carried out to achieve the objective outlined above:

1–3 months

- Identify project site
- Conduct baseline nutrition survey
- Collect seed and propagation material of indigenous vegetables and fruit trees
- Conduct community workshop and seminars to introduce the project
- Purchase laboratory equipment and other materials

4–6 months

- Distribute seeds, seedlings, and fertilizers to the community
- Conduct field demonstrations
- Conduct nutrition workshops and seminars
- Training of chemical analysts

7–12 months

- Determine appropriate processing, preservation, and packaging of the food commodities
- Conduct consumer acceptability tests
- Analyze the food crops for nutrient contents
- Develop production guidelines
- Conduct workshops on processing and storage of indigenous foods

13–15 months

- Continue with training workshops
- Conduct nutrition education seminars for community members
- Conduct workshops on processing and storing indigenous foods
- Continue with analysis for nutrition contents

16–20 months

- Continue with processing workshop
- Compile recipebook using indigenous vegetable crops

21–24 months

- Publish recipebook
- Develop a document on nutritive value of indigenous foods

Capacity building***Trained extension officers***

Extension officers in home economics/nutrition and agriculture will be trained on production and processing of indigenous foods. The officers will also be trained to develop appropriate messages on nutrition education.

Trained laboratory personnel

The project will provide training for two chemical analysts and two microbiologists to establish and monitor levels of micronutrients in fresh and processed foods, as well as to monitor microbial contamination to ensure safe and good quality food.

Improved national food laboratory facilities

The project will improve the laboratory capability of the food science and technology units in the Malkerns Research Station. Equipment, chemicals, and reagents will be provided for analysis of micronutrients.

Greenhouses

The existing greenhouses in Malkerns Research Station will be used to propagate seed of indigenous vegetables and fruits. Additional staff will be trained to operate the greenhouses, and thus, the capacity of the greenhouses will be fully utilized.

Regional processing units

Two regional food-processing units, one in Manzini and the other in Lubombo, are almost ready for use. These units will be equipped and used for training farmers in the processing of all types of food to ensure the availability of vegetables and fruits throughout all seasons. Once trained, community members will have access to these units for their projects.

Reporting

Each consultant will prepare a report at the end of his or her mission, providing findings, conclusions, and recommendations. Compiled quarterly reports and a final report will be provided to FAO and the MOAC.

Government contribution and supporting arrangements

The project shall be located in Malkerns Research Station of the MOAC. A national officer will serve as national project coordinator and will be responsible for coordinating the project's activities and inputs.

The MOAC will provide suitable office accommodation, communication facilities, and secretarial assistance for the project consultants and will also provide transport as necessary for field trips and local travel. Staff of the Food Technology Unit and Horticulture Unit will act as full time central points for the consultants and will assist them in implementing planned activities. In addition, the Principal Home Economics Officer, Chief Research Officer, and the Department of Extension will ensure the availability of staff as appropriate to work with project consultants. The MOAC will provide the premises for holding training workshops/seminars and will ensure the necessary support for the successful organization of training activities.

Chapter 5

Country Project Proposal: Tanzania

Background and justification

Tanzania is a developing country whose economy is highly dependent on agricultural production. Food insecurity is a common phenomenon in the country, leading to increased levels of malnutrition, especially among women and children. Food insecurity in Tanzania is due to serious disparities in production and consumption of food; regional and seasonal variations in food insecurity are also significant. The chronically food insecure are illiterate, small land-holding farmers with inadequate resources. Transitory food insecurity in Tanzania exists in rural areas with long dry seasons and absence of irrigation particularly in Dodoma, Tabora, Singida, and Shinyanga, and in some parts of Tanga and Arusha. According to the Rapid Rural Survey of 1991, the range of per capita calorie intake varied from 2884 calories per day in the rice farming system to about 1500 calories per day in the sorghum/millet and coffee/banana farming systems.



Tanzania

Inadequate food intake is one of the immediate causes of malnutrition in Tanzania. Although Tanzania is known to be self-sufficient in aggregate food production, many households have limited access to food especially during lean seasons. Access to food is primarily dependent on the ability to buy or produce one's own food, particularly traditional cereals, tubers, and legumes.

Periods of nutritional stress often occur during the wet season and just before harvest when household food supplies are low and energy requirements are high. Although these conditions may result from poverty or non-availability of nutrient-rich foods, many households lack the necessary information on management of their own food stock as well as simple and appropriate technologies for food preservations, both of which are necessary conditions for increasing household availability of food. During times of nutritional stress, households are also known to broaden their food basket to include underutilized foods such as forest products.

Mortality rates of infants and children below the age of five remain high at 92 and 141 per 1000 live births, respectively (1996 data). Malaria, acute respiratory infections, and diarrhea continue to be main causes of such deaths. About 200,000 children

below the age of five die every year primarily from preventable causes. Fifteen percent of those deaths are attributed to malaria, which is on the increase. Low birth weights and related complications are major causes of neonatal deaths, which account for nearly 40% of infant mortality. Although coverage for antenatal care is good with more than 70% routine attendance, poor quality of services contribute to high maternal mortality rates estimated at 770 per 100,000 live births.

The national government under the Ministry of Agriculture and Food Security aims at addressing the issue of household food security through the promotion of drought tolerant crops, home gardening, and processing and preservation technologies to increase the availability of food at the household level and to improve the consumption of food items rich in micronutrients. A well-developed home garden has the potential (where access to land and water is not a major problem) to supply most of the non-staple foods and some of the staple foods that a family needs every day. These gardens supply the households with vegetables, fruits, roots and tubers, legumes, spices, fish, and other animals. However, the fact that the project area will be in the semi-arid regions of mainland Tanzania, where micronutrient deficiencies are high and water for home gardening is scarce, water harvesting strategies as well as food processing technologies shall be adopted as part of activities to be implemented under this project. In addition, household food security issues would be addressed through the development of household food assessment tools. This information will assist households to manage their food stocks, and also to identify those households likely to be vulnerable at any time of the year.

Another important aspect of household food security in Tanzania is the important role that women play in food production and in income generation. Although women are known to produce around 60–70% of all foods consumed by rural households and generate about 33% or more of household income, their role in the management of these resources and in decision making is not well documented. The division of labor within the household also poses a serious constraint on women's time both to increase food production and provide care to children.

Fundamental to developing an effective intervention program is the understanding of household food insecurity, its causes at the community level, and the role village authorities play in identifying resource poor households and mobilizing support to improve their situations. Efforts to improve household food security should consider an innovative approach for improving women's access to and control over resources.

The national government is committed to fighting poverty as one of its priority development programs. The thrust is to achieve greater participation among all development agencies working on the problem of poverty. It has been shown that poverty is severe in rural areas particularly in areas with unreliable rainfall, lacking in infrastructure, and poor access to markets. The government is approaching a process of change and reforms in which social development is the highest priority. Through these reforms, communities are expected to significantly benefit, especially women and children. Reforms in the financial, economic, health, and education sectors as well as the civil service are either accomplished or ongoing. Human development continues to be the centerpiece of the government's policy for social development.

As part of these reforms the government has formulated a social sector strategy in 1994, which sets out new directions in financing and monitoring of health, education, nutrition, population/family-planning, water, and sanitation related services. The new strategy places first priority on health and basic education and to decentralize responsibilities and decision-making processes while encouraging the private sector to play a prominent role in the delivery of services. The social sector strategy together with the ongoing Civil Service Reforms would result in sectoral reforms intended to increase effectiveness, efficiency, equity, accountability, and sustainability in the delivery of health and education services. Recent trends are discouraging in that gross primary school enrollment has dropped from 93% in 1980 to 69% in 1994 with many children entering Grade 1 at the age of 9 or 10 years.

Project rationale

Tanzania has a population of over 30 million people of which 6 million are children below five years of age. The Tanzania Demographic and Health Survey (TDHS) in 1996 found that the nation has an infant mortality of 88 per 1000 children and a mortality rate of 137 per 1000 in the case of children below five years old. Like in other developing countries, nutritional problems in Tanzania are protein-energy malnutrition (PEM), iron deficiency anemia (IDA), vitamin A deficiency (VAD), and iodine deficiency disorders (IDD). Of these, PEM and IDA are the most prevalent. Both of these nutritional disorders affect all age groups but are most common in children below five years.

According to the TDHS in 1996, 47.0%, 5.6%, and 29.0% of children below five years old were stunted, wasted, and underweight, respectively. IDA ranged from 27–95% depending on region and some children were affected by more than one nutritional disorder.

Although the 1996 TDHS revealed that infant and under-five mortality continues to decline, the HIV/AIDS pandemic is poised to begin reversing these gains. With an estimated 10% of the sexually active population being HIV positive, child mortality rates may increase by 30–50% unless dramatic measures are taken to contain vertical transmission of HIV from mother to children.

A study of 10 regions in 1998 by the Tanzania Food and Nutrition Center indicated that 24% of children between six months and six years had VAD. The same study documented that approximately 69% of women had breast milk retinol levels below 30µg/dl. This implies that VAD is a serious public health problem in Tanzania, which leads to xerophthalmia and nutritional blindness. Another micronutrient deficiency of public health of significance is iron/folate deficiency, which causes nutritional anemia.

Several factors are implicated as major causes of VAD in Tanzania. First, there is a chronic inadequate intake of vitamin A-rich foods and its harmful effects are frequently exacerbated by other dietary deficiencies. Other major causes are drought and the high frequency of infection from diseases such as diarrhea, measles, and worms. The problem of VAD is especially high in those areas affected by drought, such as Dodoma, Singida, Shinyanga, Tabora, and Mwanza. VAD is also seen in regions where vitamin A-rich foods are available, such as Kilimanjaro, Kagera, Tanga, Mbeya, and Morogoro.

Young children are at greatest risk of VAD because of increased vitamin A requirements and also due to their exposure to repeated infectious diseases such as measles, diarrhea, PEM, tuberculosis, pneumonia, and bronchitis. Diarrhea, parasitic infections, and other intestinal disorders interfere with the absorption of vitamin A. Severe forms of PEM, respiratory track infection, measles, and other febrile illnesses that increase metabolic demands will also interfere with absorption, storage, and use of vitamin A.

Since vitamin A cannot be synthesized in the human body, it must be supplied in the diet as either preformed vitamin A (retinol) from animal foods or pro-vitamin A from plant sources of which the beta-carotene is the most important. Important animal sources rich in vitamin A (retinol) include milk, liver, eggs, and fat. Sources of plant origin include red palm oil, dark green leafy vegetables, carrots, and yellow fruits (e.g. paw paw and mango). Foods of animal origin are expensive and unaffordable to the majority of poor people in Tanzania. The sources of plant origin are cheaper but seasonal in nature and often perishable, as such they need to be preserved. Traditionally people dry these foods in open sunlight with extensive loss of beta-carotene. One of the simplest methods of drying green leafy vegetables and fruits is through the use of solar driers covered with black cloth or plastic sheets to filter the UV light, which destroy beta-carotene in foods.

Iodine deficiency disorders (IDD) are widespread in Tanzania, particularly in Ruvuma, Lindi, Mbeya, Rukwa, Kigoma, Kagera, Mara, Arusha, Kilimanjaro, Tanga, Dodoma, Morogoro, and Iringa regions. According to national surveys conducted between 1980 and 1990, about 26% of the population suffer from IDD. Targeted follow-up surveys since 1995 show dramatic reductions in total goiter rate (TGR); for example, rates in Mbeya have declined from 88 to 24% and rates in Mbozi have dropped from 83 to 26%. The causes of IDD are mainly lack of iodine in food and water. An effective method used to reduce IDD is to fortify salt with iodine. Salt production in Tanzania is adequate to meet the people's requirements; however, some of the problems facing the salt industry in Tanzania are poor distribution of iodized salt, national government and local authority taxes, poor handling of iodination machinery, and high prices of local iodized salt as compared to imported sources.

Iron deficiency anemia (IDA) is the most prevalent nutritional deficiency worldwide. It is a major public health problem in Tanzania with adverse consequences especially for women of reproductive age and for young children. The consequences of IDA are numerous as iron plays a central role in the mechanism for oxygen transport, and is essential in many enzyme systems. Of greatest concern is that IDA in infants and children is associated with impaired physical and cognitive development. In adults, IDA leads to weaknesses and fatigue, which reduces capacity for physical work and productivity. In pregnant women, it contributes to maternal morbidity and mortality as well as low birth weight.

The prevalence of anemia in Tanzania varies from 0–100% depending on population group and geographic location. Pregnant and lactating women and children under five constitute the most vulnerable groups. There is also a geographical distribution of anemia, which is determined by altitude and disease patterns. The problem is most serious in the coastal belt and other low altitude areas and decreases to negligible

levels in attitudes above 3000 m above sea level (ASL). Higher prevalence of anemia is also found in regions with high fertility levels such as Kilimanjaro, Kagera, and Rukwa. This is because of the frequent pregnancies, which deplete the maternal iron reserves.

Project areas

The project will be implemented in two regions of mainland Tanzania that are severely affected by micronutrient deficiencies. Tabora region is located between 3°45'–7° S and 31–34° E in the midwestern part of the central plateau. It has an area of 76,120 km², which is around 9% of mainland Tanzania. The region has an average altitude of 1150 m ASL, daily mean temperature of 23°C, and mean annual rainfall of 800 mm. The growth rate is 3.8% with per capital income of Tsh 196803 (USD\$189.00) and life expectancy is 49 years. In Tabora region, the project will be implemented in Igunga district with a population of 267,056. The maternity rate in the district is 151 per 100,000. The project will also be implemented in Dodoma region in the Dodoma rural district.

Institutional strengths and weaknesses

The national government aims at creating a favorable socio-political context with a people-centered development goal. The government strongly advocates for social action with a community orientation. This is backed up by a decentralized administrative structure, which is conducive for social mobilization combining for both bottom-up and top-down systems. The Ministry of Agriculture and Food Security will implement the project in collaboration with other stakeholders in the field of agriculture.

Improvements in the efficiency and effectiveness of providing public service is a goal of the socio-economic reforms implemented by the government, including the Local Government Reforms Program and the Public Service Reforms Program. A key improvement is the transfer of political, financial, development planning, and implementation authority from the Central Ministry to local government authorities (LGAs) and rural communities. This is to develop decentralized planning and execution of local programs to evolve at the district level through participatory planning, implementation, as well as coordination. It also aims at creating active participation of citizens at the community level.

The presence of a strong institutional base in nutrition related activities is complementary to the government's commitment for a demand driven research program using a farming systems approach. This approach diagnoses farmers' problems and guides the organizational aspects by emphasizing on-farm research and adaptive research, which is also an added advantage for project implementation. A system of allocating funds to the districts through District Agriculture and Livestock Development Officers for contracting research activities has been pioneered by Dutch Aid in the lake zone and has been tested in a pilot project funded by Irish Aid. Under this approach the district is empowered to award contracts to government research stations, universities, or non-governmental bodies and is seen as a way of achieving greater

accountability by researchers and giving extension staff the responsibility of identifying research priorities. Responsiveness to clients needs would also be served by strengthening links between research stations and the district's extension activities within their respective zones, ensuring that research topics are demand driven with priority to solving local problems.

Public sector research efforts are directed toward areas where the private sector is unlikely to be involved with greater importance attached to effective dissemination of research results through handbooks, extension leaflets, as well as scientific publications in domestic journals. The project would therefore be implemented as part of the research-extension linkage where research findings will be disseminated to the target group under a decentralized system in which responsibilities for extension services is passed to districts. In principle, decentralization would bring about greater responsiveness and accountability on the part of the extension service to the needs of their clients particularly women and youth who still receive little attention in extension programs. However, the constraints to providing an effective extension service relates to a lack of participatory skills among extension staff and inadequate number of staff.

The project will build the capacity of the extension staff in working with farmers by introducing participatory technologies and gender analysis skills to staff within the project area based on the fact that indigenous crop management and gathering is the domain of women. Women are main actors in biodiversity management through their multiple roles as farmers, herders, forest gatherers, primary health care givers, food processors, selectors and preservers of seeds, and keepers of the natural environment.

Biodiversity management therefore needs to be located not only in the farms, forests, and rivers, but also in and around the home. Food and medicinal plant processing and preparation are undertaken, and plant and tree species are often maintained in home gardens. At the market, women buy, sell, and exchange food, seeds, and other plant products. For sustainable use of biodiversity, gender analysis will be integrated in all issues of research for researchers to identify and redress inequities between women and men. This would also ensure better local management and sustainable use of micronutrient-rich foods in the regions.

The project will be strengthened through the establishment of District Steering Committees under the National Agricultural Extension Project. These committees will oversee the implementation of the project.

The project aims at promoting community seed production for micronutrient-rich vegetable crops. The government has adopted this system of on-farm seed production because the existing seed production system is not able to meet the demand for seed. The performance of the national seed industry has been poor, fulfilling less than 10% of the nation's seed requirements. The government's policy on seed production is to encourage the private sector and to facilitate the establishment of formal and informal seed production, processing, and marketing. The public sector has a role to ensure a continuous supply of improved seed varieties through plant breeding programs for varietal evaluation and release and quality control through the Tanzania Official Seed Certification Agency (TOSCA).

The most promising approach to improved seed production for seed crops including indigenous food crops is the promotion of community-based seed production. This approach builds upon pilot projects funded by bilateral donors and NGOs in Dodoma, Iringa, and Morogoro. This approach is based on continued government support for the production of breeder and foundation seed and for inspection, with small-scale farmers carrying out seed multiplication. In this system, selected farmers normally receive specific training in seed multiplication and are supplied with foundation seed; they then multiply the seed under the supervision of extension workers. TOSCA is responsible for inspecting fields and the final product. Farmers sell the seed produced locally as Quality Declared Seed (QDS) with sample packaging and labeling. This project will, therefore, further enhance the promotion of quality declared seed with particular reference to indigenous micronutrient-rich foods where very little has been done in research and seed production despite the importance of these food crops in the reduction of micronutrient deficiencies.

Objectives

Overall objective

Promote production and consumption of micronutrient-rich indigenous food in vulnerable communities in the semi-arid regions of mainland Tanzania to reduce child and maternal malnutrition by improving food intake particularly micronutrient-rich foods

Specific objectives

- Evaluate biochemical parameters for vitamin A and iron status in representative samples of population of participating communities before, mid-way, and at the end of the project
- Measure urinary iodine excretion in a representative sample to establish the iodine status in population of participating communities
- Develop strategies to ensure intake of good quality iodized salt by participating communities
- Collect, identify, and select as many varieties as possible of indigenous vegetable crops including rarely used crops consumed during times of severe droughts from target localities to ensure diversity
- Analyze selected varieties for nutrient content
- Multiply and distribute seeds of selected varieties rich in micronutrients
- Conduct workshops and Training of Trainers courses on producing, processing, and utilizing indigenous vegetables to enhance the capacity of extension staff, communities, and other stakeholders in pilot areas

- Enhance the capacity of local staff and target communities in the maintenance of germplasm and sustainable production of selected indigenous vegetable varieties
- Educate participating target communities on nutritional and intrinsic values of indigenous vegetables and the quantities to be consumed to meet their micronutrient requirements
- Conduct consumer acceptability tests on all varieties considering desirable agronomic traits, and then select suitable varieties for promotion
- Enhance awareness and assist in the promotion of producing, processing, and utilizing selected micronutrient-rich indigenous vegetable germplasm to extension staff, farmers, NGOs, and private sector personnel in the country

Strategies to control micronutrient deficiencies

- Strengthen consultative and task force groups on coordination of micronutrient control
- Promote food-based interventions for the control of micronutrient deficiencies including salt iodations and fortification
- Promote improved solar driers for preservation of fruits and vegetables rich in micronutrients
- Promote family/community action to provide school meals in primary schools
- Review and strengthen systems for micronutrient information, collection, processing, and dissemination at community, district, and national levels
- Build up capacities through training and education on nutrition problems
- Integrate pertinent food intake and micronutrient information into school curricula
- Diversify the diet through the promotion of production, consumption and preservation of fruits and vegetables rich in vitamins A and C, and iron
- Strengthen multi-sectoral approach to implement activities addressing underlying and basic causes of inadequacy of food intake and micronutrient malnutrition
- Promote the role of parents and the community to take necessary corrective measures

Capacity building

Training of Trainers courses will be organized for district subject matter specialists on home gardening as well as preparing, processing, and preserving indigenous vegetables and fruits.

Reporting

Quarterly reports, annual reports, and the project's final document will be prepared.

Government contribution and supporting arrangements

The project will be implemented in the selected districts by using available government structures. The Department of Research and Development will be responsible for the overall implementation of the project. Horticulture Research Institute (HORTI-Tengeru) will be responsible for collection, selection, purification, and production of appropriate breeder and parental seeds based on consumer's preferable characteristics. In achieving this role, HORTI-Tengeru will collaborate with VTRI-Makutopora (Dodoma, Singida regions) and ARI-Tumbi (Tabora, Shinyanga regions). The government's contribution will be in the form of human and physical resources at all levels of project implementation.

A project coordinator will be responsible for overall project implementation and will serve as a liaison with other stakeholders to ensure successive implementation. Technical staff from the agricultural departments in respective districts will oversee the implementation at the grass-root level with support from horticulturists, extension agents, and nutritionists. The horticultural staff will be responsible for the promotion of home gardens where varieties of indigenous crops will be promoted with the support from agricultural extension agents. The extension personnel will disseminate and train farmers, particularly women, on production techniques. The nutrition staff will promote the consumption of indigenous crops by developing recipes based on consumer tastes and in collaboration with women. Training on techniques related to preservation and storage of the products will be carried out.

A Project Steering Committee will be established within the Ministry of Agriculture and Food Security and be chaired by the Permanent Secretary or his/her representative. The Project Steering Committee will decide on the guidelines, work plans, and budgets for the implementation of the project, and review progress based on quarterly reports. This should allow sufficient flexibility, as activities should reflect actual demand for services by farmers. The National Project Coordinator will serve as Secretary to the Steering Committee and members will include government staff from the sub-sectors.

The collaborating institutions will be the Asian Vegetable Research and Development Center–Regional Center for Africa (AVRDC–RCA), Sokoine University of Agriculture/Tanzania Food and Nutrition Center, and District Councils (subject matter specialists in the fields of horticulture, nutrition, community development, and health).

Logical framework

Planning period: 2002–2004

Overall goal

Improving the nutritional status and health of vulnerable communities in Tanzania through food-based approaches to meet the recommended intakes of vitamins A and C, and iron across all seasons.

Outputs	Activities	Indicators
<i>Component I. Policy issues that impact on nutrition</i>		
1 Participatory planning workshop organized for project beneficiaries	1.1 Organize a planning workshop to identify priorities for the project 1.2 Prepare work plans and budgets 1.3 Identify key stakeholders	<ul style="list-style-type: none"> Five participants selected from eight districts within four regions
2 District leaders and stakeholders in the pilot areas sensitized on the effects of micronutrient deficiencies	2.1 Organize meetings for district leaders, NGOs, and other stakeholders for the support of the project 2.2 Print and distribute leaflets produced by other institutions related to micronutrient deficiencies in Tanzania 2.3 Publicize the harmful effects of vitamin A, C, iron, and iodine deficiencies through mass media	<ul style="list-style-type: none"> One seminar organized per district in the project area Three leaflets produced, one each for VAD, IDD, and IDA
<i>Component II. Planning, management, and implementation of agronomic aspects</i>		
1 Germplasm of micronutrient-rich indigenous vegetable crops and fruits identified and documented	1.1 Collect and identify available species of indigenous vegetables and fruits using participatory methods 1.2 Evaluate, characterize, and select germplasm with desirable characters on-station and on-farm	<ul style="list-style-type: none"> Ten preferred vegetable species and five fruit cultivars documented in each district

Outputs	Activities	Indicators
	1.3 Document the attributes of the desired species	
2 Identified germplasm of indigenous vegetables and fruits multiplied and distributed to farmers	2.1 Multiply parent materials on-station at HORTI-Tengeru, ARI-Tumbi, VRTI-Makutopra, and HASHI/ICRAF Lubaga 2.2 Distribute vegetable seeds and fruit planting materials to the pilot areas for on-farm multiplication 2.3 Train farmers on how to produce seeds and manage planting materials	<ul style="list-style-type: none"> • Five preferred vegetable species and two fruit cultivars multiplied
3 Home gardens established	3.1 One-day seminars and training sessions are held to demonstrate growing of vegetables and fruit trees 3.2 Supervise the establishment of home gardens	<ul style="list-style-type: none"> • One seminar organized per target community and at least five gardens are established in each division
Component III. Planning, management, and implementation of nutrition aspects		
1 Initial surveys carried out in pilot areas to establish prevalence of VAD, IDD, and nutritional anemia	1.1 Selection of study areas in Dodoma, Tabora, Singida, and Shinyanga regions 1.2 Develop and pre-test questionnaire for formal surveys 1.3 Carry RRA to collect information on deficiencies of vitamin A, iodine, and iron 1.4 Interview key informants using the pre-coded questionnaires 1.5 Establish vitamin A, iron, and iodine status of the community in pilot areas	<ul style="list-style-type: none"> • Eight baseline surveys conducted

Outputs	Activities	Indicators
2 Food recipes developed and demonstrated to farmers	2.1 Refine vegetable preparation methods for maximum retention of vitamins A, C, and other essential vitamins 2.2 Develop simple processing and preservation methods of indigenous foods 2.3 Analyze nutrient contents of raw and processed indigenous foods 2.4 Document improved methods for preparing, processing, and preserving indigenous foods	<ul style="list-style-type: none"> • Five recipes for the preferred vegetable crops developed
3 Final baseline survey carried out to establish status of vitamin A, iodine, and iron in the pilot areas	3.1 Administer interviews using pre-coded questionnaires to district nutritionists/ medical practitioners at village and ward levels 3.2 Organize rural appraisal to representative groups of communities in pilot areas 3.3 Carry out assessment of vitamin A, iodine, and iron status in the study areas	<ul style="list-style-type: none"> • Eight baseline surveys
Component IV. Extension services, capacity building, and gender issues		
1 Training of Trainers courses on gardening, processing, and utilization of indigenous vegetables and fruits to enhance capacity of extension staff, communities, and other stakeholders in project area	1.1 Subject matter specialists trained in the areas of nutrition, horticulture, health, and community development 1.2 Train women trainers or women groups and extensionists on preparing, processing, and preserving preferred indigenous vegetables and fruits	<ul style="list-style-type: none"> • Two special skills training courses conducted for district extension officers, crop officers, and three subject matter specialists (nutrition, health, and horticulture)

Chapter 6

Country Project Proposal: Uganda

Background and justification

Uganda's population can be generally characterized as rural and very poor. The vast majority (86%) of Uganda's 22.2 million persons live in rural areas. Low levels of agricultural productivity and the harmful effects of HIV/AIDS have contributed to low life expectation, malnutrition, high levels of child and maternal mortalities, non-sustainable agricultural practices, and food insecurity throughout Uganda.

The infant mortality rate (IMR) is 88 per 1000 live births while the under-five mortality rate (USMR) is 160 per 1000 live births. The maternal mortality ratio (MMR) is estimated to be 500 per 100,000 live births (MFEP 1995).

Life expectancy at birth in 1991 was 48.1 years (50.5 years for females and 45.5 years for males). The average adult literacy rate in 1995 was 62% (50% for females and 74% for males). The average per capita income is estimated at \$300. In 1996/1997, 46% of the population lived below the poverty line and the unemployment rate was 7.4%.

The economy of Uganda is dominated by agriculture, which provides employment to 80% of the rural population (MAAIF/MFPED 2000) and contributes 43% of GDP (MFED 1999). Food crop production dominates the agriculture sector, totaling 60% of the agricultural output. The country is endowed with favorable natural and human resources, which enable it to produce enough food to meet its population needs, except in some areas with chronic insecurity problems. The country has a relatively stable food security situation at the national level. Production and consumption of indigenous foods in Uganda have perceptibly decreased over time.

Most of the food consumed in the households of Uganda is attributed to women who contribute 70 to 80% of the total agricultural labor force and produce 90% of the food crops and 50% of the cash crops (UFNC 2000; MGCD 1997). Women are also responsible for household food processing and preparation activities to take care of children (UFNC 2000). However women are constrained by the lack of control and ownership of resources. Only 7% own land and 30% have access or control over proceeds. Women's productivity is further hampered by general lack of skills and



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appropriate technology due to high levels of illiteracy and poverty, and inadequate flow and access to information (MAAIF/MFPED 2000; UFNC 2000; MGCD 1997).

Gender disparity which itself is inextricably linked to poverty could partly explain the unacceptably high levels of malnutrition prevalent in Uganda, despite being food secure at national level (UNICEF 1994). According to the Uganda Demographic and Health Survey, at the end of the 1980s almost half of the children under five years old were stunted, 25% were underweight, and 3% were wasted (MOH 1989). The follow-up demographic and health survey in the mid 1990s found the situation not much improved and in some cases worsened—stunting at 38%, underweight at 26%, and wasting at 5% (MFEP 1995).

The surveys further indicated that malnutrition contributes 40% of the mortality rates of children below five years of age in Uganda. Considering the high prevalence of HIV/AIDS in Uganda, which itself has a negative impact on food security and nutrition, the situation can become more drastic in the future.

Available data on maternal nutritional status shows that 9% of the mothers of children below 3 years of age in Uganda are wasted, and 2% are stunted (MFEP 1995). The western region has both the highest level of stunted women (5%) and wasted children below 5 years of age (43%) (MFEP 1995). Ironically, the western region has the highest output of milk in Uganda and highest total per capita food available (MFED 1999). Deficiencies in micronutrients, particularly iodine, vitamin A, and iron are common. The total goiter rate is estimated at 60% among schoolchildren. The prevalence of vitamin A deficiency is 54% among the whole population, while iron deficiency anemia is estimated at 50% of pregnant women (Pyle et al. 2000).

In an attempt to address these severe malnutrition problems, the Government of Uganda has formulated a number of policies to guide program implementation. According to the 1995 Constitution of the Republic of Uganda, Principal XXII on Food Security Nutrition calls for: 1) appropriate steps to encourage people to grow and store adequate food; 2) establishment of national food reserves; and 3) promotion of proper nutrition through mass education and other appropriate means to build a healthy state.

Food security and nutrition are therefore constitutional matters that must be implemented by the State. However, most of these policies have not been effectively coordinated or integrated to effect nutrition. Against this background the current project will be executed within the activities of National Strategy for the Advancement of Rural Women in Uganda (NSARWU) in Nyabushozi County, Mbarara District and endeavor to strengthen linkages between nutrition, agriculture, gender, HIV/AIDS, and environmental sustainability.

Malnutrition, food insecurity, and poverty

Uganda produces enough food to satisfy the per capita need of its population (MFED 1999). However, there are regional imbalances in food security. Reasons for such a situation include inadequate food processing and preservation facilities leading to

high post-harvest losses, poor distribution mechanisms, changing patterns of weather conditions, and poor agricultural practices (UFNC 2000). In addition, Uganda lacks an effective mechanism for linking agricultural production to food utilization and nutrition.

The level of poverty in Uganda is going down appreciably (MAAIF/MFPED 2000; MFED 1999), but the incidence of malnutrition has not gone down at an appreciable rate and in some cases it has gone up (MFEP 1995; UFNC 2000). In spite of the high levels of malnutrition in Uganda, most agricultural projects including the newly formulated Plan for Modernization of Agriculture (PMA) lack a clear strategy for nutrition. The central focus in most of these projects is increased agricultural output and marketing rather than nutrition or poverty reduction. There is inadequate attention toward nutrition management and a lack of appreciation of its value in economic development. Furthermore, there is inadequate coordination and strategies to link agriculture, gender, and nutrition in the various development plans.

Objectives

Overall objective

The overall objective is to strengthen linkages between development programs related to poverty eradication, HIV/AIDS, environment, gender, nutrition, and indigenous foods within Kenshunga and Nyakashashara sub-counties of Nyabushozi County in Mbarara District. This region is used as a pilot entry point covering the cattle keeping communities in Uganda. This would serve as a platform for a larger project to ensure that all government and private sector projects consider nutrition as an important component in their activities.

Specific objectives

- Assess the food and nutrition situation in Kenshunga and Nyakashashara sub-counties of Nyabushozi County
- Develop guidelines to integrate nutrition, agriculture, HIV/AIDS, environment, and gender in the activities of the county
- Sensitize the households in Kenshunga and Nyakashashara sub-counties on the linkage between nutrition, agriculture, environment, AIDS and poverty, and the value of micronutrient-rich foods in their diets
- Improve knowledge, attitudes, and practices on nutrition issues in Kenshunga and Nyakashashara sub-counties and among stakeholders
- Promote micronutrient-rich foods in the farming systems
- Promote sustainable household food processing/preservation technologies and other agriculture-oriented, food security friendly, income generation activities

Expected outputs

A joint baseline survey will be conducted in targeted areas to address research, nutrition, and extension requirements. After the survey is successfully carried out, the following outputs are expected:

- Increased level of knowledge, attitudes, and practices in nutrition
- Improved action plans integrating nutrition, agriculture, gender, HIV/AIDS, and the environment in Kenshunga and Nyakashashara sub-counties
- Increased number of households adopting better nutrition practices
- Integration of nutrition, agriculture, gender, HIV/AIDS, and environment components in the development programs of Kenshunga and Nyakashashara sub-counties
- Improved post-harvest technologies (processing, preservation, storage, and others) at household level for the indigenous foods and milk
- Reduced level of poverty in Kenshunga and Nyakashashara sub-counties
- Awareness in the community on group dynamics and credit management
- Increased number of NGOs/CBOs and policymakers who understand the linkages between poverty eradication, nutrition, agriculture, gender, HIV/AIDS, and environment sustainability in Uganda

Expected impact

Reduced level of malnutrition and thus improved health and economic development in Kenshunga and Nyakashashara sub-counties, Nyabushozi County, and in Uganda as a whole

Sustainability issues

- The project will integrate existing activities of the county and utilize skills of local leaders, CBOs, male groups, female groups, and mixed gender groups.
- The project will work within the national macro-economic policy framework while taking into consideration the peculiar conditions in the target area.
- Relevant stakeholders and the target group will all be involved in designing the framework, training materials, and project implementation.
- The framework and training materials will be available for use in the country whenever needed and even in other countries with similar problems.
- Profitable income generation and nutrition schemes will be initiated and promoted to continue operating even after the project terminates.

Monitoring and evaluation

The already established framework for monitoring and evaluation of development programs in the county will be used. All relevant stakeholders will be actively involved in monitoring and evaluation. Participatory monitoring methods will be adopted. The target community will be facilitated to form food and nutrition teams at village council levels, which would help in monitoring the performance of the project and track trends in the food and nutrition situation in the region. The project core management team would be responsible for linking with relevant stakeholders and organizing the data into usable monitoring and evaluation information for the project. There will be initial internal evaluation of the project before it is initiated. Later, internal evaluation of the project would take place after every year of operation. Finally, at the end of project life (three years) the impact of the project would be assessed. For this purpose, external evaluators, preferably donors, would be invited to the target community at the end of the project.

Some specific indicators used to evaluate the success of this project are listed below:

- Strategy and action plans produced by the project
- National sensitization and advocacy project on linking poverty eradication, nutrition, agriculture, gender, HIV/AIDS, and the environment sustainability in Uganda developed
- Percentage of activities integrating nutrition, agriculture, gender, HIV/AIDS, and the environment
- Percentage of the public who are aware and more knowledgeable about nutrition
- Number of food production units formed on nutrition friendly and viable income generation issues
- Number of families growing and consuming micronutrient-rich foods

Indicators for impact of the project at the household level will be as follows:

- Percentage of households who purchase nutritious foods for consumption
- Percentage of households who take at least three meals of a balanced diet
- Percentage of households aware of the importance of nutrition
- Percentage of households with improved post-harvest technologies
- Percentage of household members, especially women and children, with improved general nutritional status and health
- Percentage of patients getting blood transfusion at Rushere hospital

Project management

As previously mentioned, a core team will be selected from active stakeholders and charged with the responsibility of coordinating the project. The core team will be directly responsible for the administrative matters of the project, including office management. It will be accountable for all project funds, the smooth running of project activities, and coordinating with all relevant stakeholders to achieve project objectives.

Audience

To achieve the above objectives, the main audience will include the major stakeholders in nutrition at national level: the PMA Steering Committee, NARO, Makerere University, NGOs, donor groups, and key government sectors as indicated in the list of stakeholders.

Team members

It should be emphasized that individuals and institutions listed as audience and team members below all support the project's objective of linking programs that address agriculture, nutrition, gender, environment sustainability, and HIV/AIDS. For effectiveness and easy integration, while taking advantage of the established favorable system, action groups will be drawn from the following broad base of members who have already been involved with nutrition issues in one way or another. The action groups will be especially important in designing the intervention framework for the project.

Institution	Specific units
MAAIF	Home Economics/Nutrition Unit, Planning Department
Ministry of Health	Nutrition and Child Health Units
Ministry of Gender and Social Development	Directorate of Gender
Makerere University	Departments of Gender and Women Studies, Food Science, and Agricultural Economics; Child Health Development Center; Public Health Center; Institute of Social Research
National Agricultural Research Organization (KARI)	Secretariat, FOSRI
NGOs	NSARWU
Local leaders	Sub-county

Work plan

Activity	Time frame
Sensitization and advocacy workshops <ul style="list-style-type: none"> • District workshops • Sub-county extension workshops • Selected farmer groups seminars • Reporting 	1st to 2nd Quarter
Baseline survey <ul style="list-style-type: none"> • Preparation of questionnaire • Data collection (Masaka and Mbarara) • Data analysis • Draft report • Feedback seminars • Final report 	2nd to 3rd Quarter
Capacity building <ul style="list-style-type: none"> • Development of training material • Training of Trainers (TOT) • Follow-up (impact) visits • Production of technical materials • Reporting 	3rd to 4th Quarter
Germplasm <ul style="list-style-type: none"> • Introductions • Collections • Evaluation and selection • Multiplication of seed for selection • Micronutrient analysis • TOT germplasm maintenance • Farmers training • Databank formation • Gene pool maintenance 	1st to 4th Quarter
Project administration <ul style="list-style-type: none"> • Vehicles and fuel • Office equipment and supplies • Internet installation and maintenance 	Continuous
Promotion of production <ul style="list-style-type: none"> • Production of extension materials • TOT • Farmers training • Follow-up • Demonstrations • Reporting 	5th to 6th Quarter

Promotion of consumption and processing**6th to 7th Quarter**

- Production of extension material
- Development of recipes
- TOT
- Farmers training
- Acceptability tests
- Training of artisans
- Demonstrations
- Impact evaluation
- Reporting

Monitoring and evaluation**8th Quarter**

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Appendix 1. Documents containing policy guidelines that can have positive impact on nutrition

- Vision 2025 for Uganda
 - The National Gender Policy
 - Poverty Eradication Action Plan
 - The Agricultural Policy
 - The Food and Nutrition Policy
 - The Health Policy
 - The Plan for Modernization of Agriculture (PMA)
 - Uganda National Plan of Action for Nutrition (UNIPA)
 - National Agricultural Advisory Services (NAADS)
 - National Environment Action Plan
 - NARO's Medium Term Plan
 - Tertiary and Higher Institutions of Learning Act
-

Appendix 2. Major stakeholders in nutrition, agriculture, gender, HIV/AIDs, and environment sustainability

- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)-Top Policy Management Committee
 - Ministry of Health
 - Ministry of Finance, Planning and Economic Development
 - Makerere University
 - National Agricultural Research Organization
 - Ministry of Gender and Community Development
 - Ministry of Land, Water and Environment
 - Ministry of Local Government
 - Ministry of Trade, Industry and Tourism
 - Ministry of Education and Sports
 - Uganda Population Secretariat
 - Uganda AIDS Commission
 - Donor groups - UNICEF, FAO, WHO, USAID, DFID, VOCA, GTZ, SIDA
 - NGOs - AMREF, Worldvision, ACCORD, CARE International, COOPIBO
 - District and sub-county planning committees
 - Farmers' groups
-

Chapter 7

Recommendations

Recommendations from Working Groups

Working Group I: Policies that impact on nutrition

Composition of group: Policymakers

Recommendations:

- Include nutrition issues in national priority programs
- Strengthen intersectoral collaboration at regional, national, provincial, and district levels
- Establish communication and collaboration with relevant regional and international institutions and organizations

Working Group II: Planning, management, and implementation of agronomic aspects

Composition of group: Researchers – horticulturists/plant breeders/agronomists

Recommendations:

- Conduct baseline surveys on nutritional status
- Incorporate nutrition issues among priority areas of national development plans
- Strengthen regional collaboration
- Conduct Training of Trainers courses on topics such as production, processing, preservation, seed production, germplasm characterization, and home gardening of indigenous food crops
- Develop improved production and post-harvest technologies for indigenous food crops
- Conduct participatory consumer acceptability tests

Working Group III: Planning, management, and implementation of nutrition activities

Composition of group: Nutrition specialists, including home economists and nurses

Recommendations:

- Conduct nutrition baseline surveys
- Conduct workshops to create awareness on prevailing micronutrient deficiencies and ways to prevent and reduce their prevalence
- Analyze the nutrient content of available indigenous food crops
- Develop capacity to incorporate information technology (IT) programs related to indigenous food crops
- Develop a regional recipebook on the preparation and use of indigenous foods

Working Group IV: Extension services, capacity building, and gender issues

Composition of group: Extension specialists

Recommendations:

- Build teams of agriculturists, nutritionists, and extension officers, such that all project activities are planned and implemented collaboratively
- Compile information on indigenous foods and develop appropriate packages for extension use
- Develop training modules for use at regional, national, and local levels

General recommendations

The participants finalized the country and general work plan for the project and made the following recommendations for further implementation:

- Obtain commitments from governments of participating countries to promote programs on micronutrient-rich food-based approaches to combat malnutrition and consider this as a priority policy
- Identify national coordinators and establish a regional secretariat to strengthen inter-ministerial, in-country, and field level coordination and linkages
- Facilitate better use of available resources in the region through a free exchange of indigenous plant material and sharing of information and expertise; activities such as inter-country workshops, regional databases, and joint websites should be considered

-
- Facilitate interdisciplinary collaboration to maximize the use of the limited amount of information on indigenous foods
 - Joint training programs designed by agricultural experts and nutritionists should be conducted at the regional, national, and community levels
 - Methodologies for impact assessment, monitoring of progress, and evaluation should be developed and applied
 - Identify priority species of annual and perennial micronutrient-rich indigenous foods for each country
 - Conduct surveys to provide baseline information on nutrition status of targeted communities and potential nutritional contributions from indigenous foods; surveys should be conducted through joint planning by multidisciplinary teams
 - Utilize expertise within the regional and international communities and develop mechanisms to facilitate backstopping from potential partners, with FAO and AVRDC taking leading roles
 - Publish and disseminate findings generated from this project in the form of public goods to include joint publications, databases, and training manuals

Chapter 8

Closing Remarks

In her closing remarks, Ms. Aphane expressed her appreciation to the Government of the Republic of Tanzania for hosting the workshop and to all governments of the participating countries for sending representatives to the workshop. She thanked the participants for their valuable contributions. Ms. Aphane emphasized that FAO is committed to working with the participating countries in following-up of activities identified during this workshop.

Dr. S. Tsou remarked that this workshop was very useful and fruitful. He stated that the workshop was a gathering of the best minds to tap the potential of indigenous vegetables in order to improve the nutrition of consumers and the income of vegetable farmers. He exhorted that this workshop initiated by FAO should be built upon with each country performing their specific roles to fulfill the workshop outcomes. He also thanked those who prepared the country proposals during the workshop and mentioned that these proposals will be useful sources of baseline information. He wished all participants much success in their follow-up activities.

Dr. Andrew Mgonja, Director of the Horticultural Research Institute–Tengeru, Tanzania, officially closed the workshop. In his concluding remarks, he commended the organizers for initiating this workshop on indigenous food crops, and said that this was timely and appropriate for the region. He encouraged the participants to strive hard to implement the activities identified in their country proposals and strengthen, as much as possible, intersectoral and international collaboration.

Annex 1

Workshop Program

Monday, March 4

Arrival of participants

Tuesday, March 5

- | | |
|-------------|---|
| 09:00–09:30 | Registration |
| 09:30–10:00 | Welcome address - Dr. M.L. Chadha
Special remarks - Ms. J. Aphane
Opening address - Dr. S. Tsou |
| 10:00–10:30 | Tea/coffee break |
| 10:30–10:40 | Introduction to the workshop - Dr. M. Oluoch |
| 10:40–11:10 | Overall background and rationale for incorporating nutrition considerations into agricultural research - Ms. J. Aphane |
| 11:10–11:40 | AVRDC's present strategy and future plans on promoting utilization of indigenous vegetables to overcome micronutrient deficiency - Dr. S. Tsou |
| 11:40–12:10 | AVRDC-RCA activities on management practices and promotion of indigenous vegetables and their potential role in improving food security and micronutrient status of communities in the region - Dr. M.L. Chadha |
| 12:10–12:30 | Workshop objectives - Ms. J. Aphane |
| 12:30–14:00 | Lunch break |
| 14:00–15:30 | Presentation of country papers - South Africa |
| 15:30–16:00 | Tea/coffee break |
| 16:00–17:30 | Presentation of country papers - Swaziland |

Wednesday, March 6

- | | |
|-------------|---|
| 09:00–10:30 | Presentation of country papers - Tanzania |
| 10:30–11:00 | Tea/coffee break |
| 11:00–12:30 | Presentation of country papers - Uganda |
| 12:30–12:40 | Formation of Working Groups |
| 12:40–14:00 | Lunch break |

14:00–14:15	Briefing on activities of Working Groups - Dr. M. Oluoch
14:15–15:30	Working group sessions
15:30–16:00	Tea/coffee break
16:00–17:30	Working Group sessions - continued

Thursday, March 7

Presentation, discussions, and assimilation of Working Group reports into country papers

09:00–10:20	Working Group I: Policy issues that impact on nutrition
10:20–10:40	Tea/coffee break
10:40–12:10	Working Group II: Planning, management and implementation of agronomic aspects
12:10–13:40	Lunch break
13:40–15:10	Working Group III: Planning, management and implementation of nutrition aspects
15:10–15:30	Tea/coffee break
15:30–16:45	Working Group IV: Extension services, capacity building and gender issues
16:45–17:30	Field visit

Friday, March 8

General discussion and adoption of Working Group reports

9:00–10:30	Adoption of workshop recommendations: <ul style="list-style-type: none">• Endorsement of the concept• Working Group reports• Framework for inter-country collaboration and on implementation of the projects
10:30–11:00	Tea/coffee break
11:00–12:00	Adoption of workshop resolutions: <ul style="list-style-type: none">• Country proposals to FAO• Acknowledgement to government of host country• To governments of participating countries
12:00–12:20	Closing ceremony - Dr. S. Tsou

Annex 2

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Annex 3

Framework for Developing Country Papers

Workshop objectives

The broad objective of the workshop is to devise strategies of reducing micronutrient deficiencies in four African countries through production and promotion of indigenous foods and small animals. Subsequently, participants at this workshop developed project proposals by: reviewing the project concept developed by ESNA and AVRDC-RCA on this subject; adapting the concept to each participating country; and then developing a mechanism for collaborating with other participating countries during the implementation of country projects.

Preparation of country project proposals

Country teams

The four participating countries set up teams of experts to prepare project proposals, which were presented and discussed at the workshop. One participant from each of the following four categories: Policymaker, Researcher – Horticulturist/Plant Breeder/ Agronomist, Nutrition Specialist, and Extension Specialist was selected from each country to attend the workshop. It was recommended that agricultural research be the lead agency in the preparation of the project proposals and the focal point to lead the delegation.

Proposed content of country project proposals

Based on the information presented in the concept note, a project proposal was developed to alleviate micronutrient malnutrition in vulnerable communities in each target country. The central theme of the proposal was the production and promotion of indigenous foods. The project proposals described how the strategy could be implemented in each target country. The proposals were designed for defined localities where micronutrient malnutrition is a problem. It identified key players, structures needed, and the process to follow in order to meet the objectives of the project. The following outline was used in developing the project proposals with a project timeframe of two years.

I. PROJECT SUMMARY

A concise statement summarizing the problems to be addressed by the project, the project objectives, its main outputs and activities, and the final results that are expected by the end of the project as well as the overall budget.

II. BACKGROUND AND JUSTIFICATION

This section identifies and discusses in more detail, the main problems to be addressed by the project and for which assistance is being requested. It needs to clearly demonstrate the capacity building outputs and activities of the project. It should also clearly state what follow-up is expected and how the results and outputs from the project will be utilized to contribute to the long-term and sustainable capacity of the government to address food security and nutrition problems.

II-A. Malnutrition, Food Insecurity and Poverty

A general problem statement that describes nutrition, food insecurity, and poverty conditions in the country, and particularly in the project area. Risk factors that create vulnerability to food insecurity and malnutrition are also described, particularly those that affect the poor. The problem statement should cover the following items based on existing information:

II-B. Food Insecurity and Nutritional Vulnerability in the Project Area

- Nutritional status trends with special reference to micronutrient status and nutrition surveillance activities in the country and particularly in the project area
- Food consumption patterns, dietary diversity and quality
- Food knowledge, attitudes, practices, and perceptions
- Diseases with a major incidence in children and women
- Overview of the food security situation in the country
- Constraints in household production (including food production) and income generation
- National/district/local policies with an impact on food and nutrition
- If or how nutrition issues are considered in national agricultural research plans and development strategies

II-C. Food Availability and Access

- Structure of the agricultural production sector
- Recent trends in national food availability, including commercial food imports and food aid
- Incidence of poverty in rural and urban areas
- Chronic and acute food production and marketing risks
- Food security situation in the project area
- Food production, storage, and processing at the household level

II-D. Acute and Chronic Risk Factors for Food Security

- Demographic and economic trends
- Health trends (including HIV/AIDS pandemic)
- Cyclical and seasonal conditions affecting food production
- Environmental and climatic conditions

II-E. National Policies and Strategies to Address Malnutrition and Food Insecurity

This section highlights constraints and opportunities that exist in the policy and institutional environment at national and sub-national levels for the development and implementation of community-based food and nutrition programs. This is an essential part of the total problem statement, as it may typically address gaps or constraints in the policy and institutional environment in preparation for the implementation of a project in support of community-based food and nutrition activities. Items that may be covered, as relevant, may include the following:

II-F. Political Commitment, Policy Orientation and Normative Conditions

- Policy priorities and levels of social investment (health, nutrition, education), including poverty reduction and agricultural development strategies
- Relevant legislation, standards, and norms (food safety)
- Decentralization process and current status of local autonomy in decision making and resource mobilization and allocation (i.e. extent of community mobilization and self-reliance)
- Democratization process and opportunities for socio-political and economic participation
- Women's status and gender orientation of policies and programs

II-G. Institutional Constraints

- Institutional partnerships: government, private sector, and civil society
- Technical and management capacity of relevant institutions and organizations
- Structures of relevant institutions and organizations, and their efficiency
- Existence of intersectoral coordination and planning institutions/mechanisms at national and sub-national (project area levels), and their effectiveness

III. OBJECTIVES OF THE ASSISTANCE

This section states, in brief and specific terms, the objectives that are to be reached by the end of the project, or shortly thereafter, as a result of project activities. Objectives are defined as the specific aim(s), i.e. improved results or changed status expected at the completion of the project, which is/are the direct consequence of the successful production of project outputs and their utilization by project beneficiaries. The statement should be drafted wherever possible in terms permitting subsequent verification of project accomplishments. Examples include adoption of project-developed improved technologies by beneficiaries, or staff capable of carrying out specific functions as a result of training by the project. Objectives may be presented as overall and intermediate objectives.

IV. PROJECT OUTPUTS (RESULTS)

This section is a simple and concise listing of the specific outputs expected from the project. To the extent possible, the outputs are to be specified in quantitative terms. Outputs are the specific products to be produced, which in combination will achieve

the project's objectives. The outputs must be verifiable in quantity, quality and time, be consistent with the objectives of the project, and form the basis for a detailed work plan.

V. WORK PLAN

A detailed project work plan listing activities and specifying which outputs are to be produced by which stage of the project period (timelines) should be prepared under this section.

VI. CAPACITY BUILDING

This section describes how TCP assistance will improve the capacities of local institutions and community-based organizations. Information from this section will be used to undertake assessments of community-based food and nutrition programs, implement constructive actions to improve the effectiveness and sustainability of those programs, undertake participatory needs assessments making better use of available information, engage in participatory planning, and assist communities with the formulation of community-based food and nutrition actions. Community capacity to formulate, implement, and monitor food security and nutrition actions should increase the household capacity to implement actions that improve access and utilization of food resources. The utilization of international and national experts in building capacity at institutional/community level should be detailed as well.

VII. REPORTING

Periodic progress reports as well as back-to-office and mission reports are produced to monitor the delivery of project outputs and the utilization of project inputs. This reporting system makes it possible to introduce modifications in project implementation based on a careful assessment of unforeseen factors and provides the basis for decisions about project extensions and budget revisions.

VIII. GOVERNMENT CONTRIBUTION AND SUPPORTING ARRANGEMENTS

This section clearly sets out: 1) human, technical and material resources to be contributed by the government, whether in monetary terms or in-kind; and 2) designation of government responsibility for arranging for duty-free customs clearance, full access to laboratories and their test results, as well as access to the field, as needed. Resources to be provided may include:

- National project director
- Technical staff from specific government institutions at national, provincial/department, and district/municipal levels
- Community level workers from service delivery institutions
- Facilities for training activities; office space for project staff
- Transportation for government staff for district and village visits
- Other issues

Annex 4

Working Groups

The proposed structure for the workshop consisted of plenary sessions and specialized working group sessions. Based on the objectives and expected outputs of the workshop, as well as the range of specialization of the participants regarding the initiative, the following working groups were proposed. The groups discussed issues relevant to their areas of assignment and made recommendations that were presented and discussed at plenary sessions in order to achieve consensus. In this way, the workshop outputs were fully integrated.

Terms of Reference (TOR) were proposed for presentation to the working groups. These TOR would be critically examined and modified by the group accordingly after listening to the country presentations and in the context of the objectives of the workshop.

Working Group I: Policy issues that impact on nutrition

Composition of working group: Policymakers

Terms of Reference:

1. Study the concept presented in the background document and make recommendations for improvement and endorsement of the document
2. Define the key policy issues necessary for enhancing the production and consumption of indigenous crops to improve the food security and nutritional status of vulnerable communities
3. Use the concept presented in the background document as a basis to formulate procedures for developing policies targeted at enhancing the production and consumption of indigenous foods to improve the food security and nutritional status of resource poor, rural families and communities
4. Discuss and propose strategies for incorporating the above policies into national development plans
5. Formulate policies and describe mechanisms (e.g. intersectoral committee networks) for establishing linkages and collaboration among relevant partners and stakeholders in agriculture and nutrition
6. Identify possible local, regional, and international collaborators and donors for the project

7. Identify related national or regional programs such as poverty alleviation programs, FAO's special program for food security, HIV/AIDS programs, and recommend strategies for linking the project to these activities, such that it can benefit from the synergy and existing funding
8. Propose a mechanism for international collaboration among participating countries on information and skills sharing
9. Present the report of the working group to the plenary session

Working Group II: Planning, management, and implementation of agronomic aspects

Composition of group: Researchers – Horticulturists/Breeders/Agronomists

Terms of Reference:

1. Study the concept presented in the background document and make recommendations for improvement and endorsement of the document
2. Elaborate the status of indigenous crops in the region with regard to their relevance for improving the food security and nutritional status of rural communities
3. Identify partners and stakeholders at local, regional, national, and international levels that can contribute in research and development (agronomic) of indigenous food crops so as to benefit the needs of nutritionally vulnerable communities
4. Define activities that need to be carried out with involvement of relevant partners and beneficiaries, such as baseline studies, research experiments, and nutrient analyses, and draw a database of available expertise for these activities
5. Discuss and recommend mechanisms for collaboration and linkages between partners and stakeholders that will promote the production of indigenous crops in the project area
6. Draft a 2-year plan and budget for a schedule of activities and synchronize the plan with other project activities
7. Elaborate a mechanism and indicators for effective implementation, monitoring and evaluation of project activities
8. Propose a mechanism for international collaboration among participating countries on information and skills sharing
9. Recommend ways in which agricultural research can play a role in endorsing or mainstreaming indigenous crops, such that they can contribute significantly to the local diets

10. Formulate strategies for effective collaboration and research-extension linkages between partners in extension and rural development for programs that focus attention on the nutrition problems of vulnerable groups
11. Present the report of the working group to the plenary session

Working Group III: Planning, management and implementation of nutrition activities

Composition of group: Nutrition specialists

Terms of Reference:

1. Study the concept presented in the background document and make recommendations for improvement and endorsement of the document
2. Elaborate the status of indigenous foods in the region with regard to their relevance for alleviating vitamins A and C, and iron, as well as suggest ways of improving the food security and nutritional status of rural communities
3. Identify partners and stakeholders at local, regional, national, and international levels that can contribute in food research and promote the consumption of indigenous foods to benefit the needs of nutritionally vulnerable communities
4. Define activities that need to be carried out with involvement of relevant partners and beneficiaries, such as baseline studies, research experiments, and nutrient analyses, and draw a database of available expertise for these activities
5. Discuss and recommend mechanisms for collaboration and linkages between partners and stakeholders that will promote consumption of indigenous crops in the project area
6. Draft a 2-year plan and budget for a schedule of activities and synchronize the plan with other project activities
7. Elaborate mechanisms for effective implementation, monitoring and evaluation of project activities
8. Formulate strategies for effective collaboration and research-extension linkages between partners in extension and rural development for programs, which focus attention on the nutrition problems of vulnerable groups
9. Propose a mechanism for international collaboration among participating countries on information and skills sharing
10. Recommend ways in which consumption of indigenous foods can be facilitated and popularized, such that they can contribute significantly to the local diets

11. Present the report of the working group to the plenary session

Working Group IV: Extension services, capacity building, and gender issues

Composition of group: Extension specialists

Terms of Reference:

1. Study the concept presented in the background document and make recommendations for improvement and endorsement of the document
2. Identify needs (e.g. training or information) and propose strategies to strengthen the participation of local extension services in the implementation of the project
3. Elaborate the major issues in agricultural and nutrition extension that are vital for promoting the production and consumption of indigenous crops
4. Identify the areas of agricultural and nutrition extension management and education which will facilitate implementation of the project
5. Formulate mechanisms for local capacity building to achieve the critical mass of local human capital needed for effective promotion of production and consumption of indigenous crops in the project area
6. Discuss and recommend effective communication instruments and protocols for disseminating information on research and nutrition for improving the food security and nutritional status of farm families in the project area
7. Define and elaborate the critical gender issues to be addressed in planning and implementing the project
8. Formulate strategies for effective collaboration and research-extension linkages between partners in extension and rural development for programs, which focus attention on the nutrition problems of vulnerable groups
9. Elaborate mechanisms for effective implementation, monitoring and evaluation of project activities
10. Propose a mechanism for international collaboration among participating countries on information and skills sharing
11. Present the report of the working group to the plenary session

Annex 5

Logical Framework for the Project

Planning period: 2002-2004

Overall goal

Improving the nutritional status and health of vulnerable communities in South Africa, Swaziland, Tanzania, and Uganda through food-based approaches to meet the recommended intakes of vitamins A and C, and iron across all seasons

Household level

Promoting production and consumption of micronutrient-rich indigenous foods at the community level

NARES level

Enhancing collection, evaluation, and dissemination of quality planting materials and appropriate technologies of micronutrient-rich indigenous foods

Outputs	Activities	Indicators
<i>Component I. Policy issues that impact on nutrition</i>		
1 Promotion of activities with reference to national priorities	1.1 Strengthen inter-ministerial coordination 1.2 Strengthen field level interaction (multidisciplinary teams) 1.3 Incorporate micronutrient deficiency policy in country development plans 1.4 Incorporate food-based nutrition strategy and policies as a priority in national plans 1.5 Develop in-country networks to strengthen collaboration 1.6 Coordination at national level	<ul style="list-style-type: none"> • Joint meetings organized • Monitoring reports prepared • Joint meetings and tours at field level organized • Policy on micronutrient deficiency incorporated in all four countries • National plans/strategies addressing nutrition issues (e.g. agriculture/nutrition/health curriculum) prepared • Joint national planning and monitoring workshops organized • Steering Committee formed with research as the leading agency

Outputs	Activities	Indicators
	<p>1.7 Encourage methodologies to assess higher level of impact such as: learning abilities of children, resistance to infections including HIV/AIDS, and capacity of income generation in order to develop food-based strategies for national/regional programs</p> <p>1.8 Identify potential collaborators at local level</p>	<ul style="list-style-type: none"> ● Impact assessment reports prepared ● Collaboration with NARS, private sector, NGOs, CBOs, and parastatals initiated
2 Strengthening of regional collaboration	<p>2.1 Free exchange of planting material/germplasm and information among participating countries</p> <p>2.2 Joint training courses (special skills) for participating countries</p> <p>2.3 Exchange of expertise/resource persons</p> <p>2.4 Technical backstopping by FAO and AVRDC</p> <p>2.5 Joint manual/booklet to be developed for nutrient analysis</p> <p>2.6 Coordination at regional level</p>	<ul style="list-style-type: none"> ● List of prioritized indigenous foods prepared (agreements signed, exchange of reports, bulletins and newsletters) ● Priority training courses identified ● Training materials jointly developed ● List of experts available ● Follow-up trips from AVRDC/FAO ● Plan of analysis for nutrient contents developed with sharing of responsibilities ● Coordination Committee formed with AVRDC as the Secretariat
3 Communication with outside partners	<p>3.1 Inter-country workshops and site visits to model communities with invited potential partners</p> <p>3.2 Identify potential collaborators at regional level</p>	<ul style="list-style-type: none"> ● Reports and proceedings produced ● Collaboration with ASARECA, SACCAR, FAO, AVRDC, GTZ, EU, IFAD, DFID, ICRAF, CIDA, DANIDA, USAID, SIDA, JICA, UNICEF, and CRHCS enhanced

Outputs	Activities	Indicators
Component II. Planning, management, and implementation of agronomic aspects		
1 Baseline survey conducted in targeted areas	1.1 Conduct a baseline survey in targeted areas 1.2 Identify the used species in the targeted areas 1.3 Identify training needs on production skills of indigenous vegetables	<ul style="list-style-type: none"> • Comparative nutritional study data available • Comparative survey data on the contribution of indigenous crops • Baseline survey report • Training needs assessment report compiled
2 Courses conducted on special skills for Training of Trainers	2.1 Collect indigenous knowledge on production, processing, preservation and storage 2.2 Compile a report and feedback meeting where collection was done 2.3 Compile training courses for TOT 2.4 Conduct training courses in the following priority areas: seed production; IPM; processing, preservation, and storage; germplasm characterization; nursery management; post-harvest handling; home gardening 2.5 Develop training modules for TOT in priority areas at different levels 2.6 Follow-up visits for TOT to assess impact 2.7 Document impact on training	<ul style="list-style-type: none"> • Indigenous knowledge documented • Training courses attended at AVRDC • Reports on TOT and training modules • Impact assessment reports • At least one course conducted in each country within 2 years • Training module for each course produced • 10% of target communities applying the technologies • 20% of the trained trainers applying the skills obtained during the training

Outputs	Activities	Indicators
3 Germplasm of indigenous food species collected, identified, evaluated, selected, and conserved	3.1 Collect germplasm from targeted areas 3.2 Evaluate and characterize the germplasm on-station and on-farm 3.3 Document germplasm collected 3.4 Improve on conservation protocols 3.5 Train farmers in on-farm seed production and protocols 3.6 Develop the protocols for on-farm seed multiplication and preservation 3.7 Develop conservation protocols for the TOT	<ul style="list-style-type: none"> • At least one collection mission per country by the end of Year 1 • At least five priority species evaluated and characterized by the end of Year 2 • At least documentary evidence available per country on collected germplasm • Conservation protocol improved and disseminated to at least 50% of targeted users by the end of Year 1 • At least 50% of the farmers aware of the importance of germplasm maintenance by the end of Year 1
4 Production and post-harvest technologies developed and improved	4.1 Adapt recommended package of practices 4.2 Improve on locally available production practices 4.3 Improve post-harvest handling technologies for freshly produced products 4.4 Increase the yield of indigenous foods selected by research and the farmers 4.5 Conduct trials on the different cultivation practices of these crops	<ul style="list-style-type: none"> • Recommended package of practices adapted • At least two new production practices adapted • At least five on-farm trials are conducted on different production technologies • Informal multi-locational trials initiated

Outputs	Activities	Indicators
5 Production and post-harvest technologies manual produced	5.1 Collect information from baseline report on indigenous knowledge 5.2 Collect, record, and exchange information	<ul style="list-style-type: none"> ● Production and post-harvest technologies manual of three priority crops produced by end of Year 2 ● 50% of the stakeholders (TOT) aware of the existence of that information
6 Participatory consumer acceptability tests conducted	6.1 Testing methodology developed jointly with agronomists, nutritionists, and extension specialists	<ul style="list-style-type: none"> ● At least one consumer acceptability test conducted for each variety before it is released ● A list of accepted species produced by end of Year 2
7 Seeds of selected materials multiplied and made available	7.1 On-station multiplication of base seed of promising material 7.2 On-farm multiplication of quality seed 7.3 Improve seed production systems 7.4 Evaluate and improve on seed storage technologies 7.5 Encourage small-scale entrepreneurs for seed production	<ul style="list-style-type: none"> ● Quality seed of promising materials recommended by the end of Year 2 ● On-farm seed storage technology evaluated and recommended by the end of Year 2
Component III. Planning, management, and implementation of nutrition aspects		
1 Increased consumption of micronutrient-rich indigenous foods	1.1 Conduct food and nutrition baseline surveys 1.2 Conduct workshops to create awareness on micronutrient-rich foods 1.3 Develop and disseminate nutrition education materials on micronutrient-rich indigenous foods	<ul style="list-style-type: none"> ● Survey reports for all selected communities within the first half of Year 1 ● Workshop conducted for all selected communities within the first half of Year 1 ● Nutrition education materials developed

Outputs	Activities	Indicators
	1.4 Develop and disseminate recipes of available micronutrient-rich indigenous foods 1.5 Conduct nutrition education on the utilization of micronutrient-rich indigenous foods at community level	<ul style="list-style-type: none"> • Recipes on available micronutrient-rich indigenous foods published • Training courses and demonstrations on utilization of indigenous foods conducted
2 Nutrient content of indigenous foods analyzed	2.1 Establish basic facilities for nutrition analysis of indigenous foods in each participating country 2.2 Train laboratory technicians 2.3 Conduct analysis of micronutrient content of indigenous foods 2.4 Compile and disseminate nutrient composition tables of indigenous foods	<ul style="list-style-type: none"> • Analysis activities initiated • Training courses conducted • Trained people • Analysis reports from all four countries • Nutrition composition tables for all four countries available and used
3 Increased knowledge on nutritional value and benefits of indigenous foods at community level	3.1 Organize nutrition education courses on micronutrient-rich indigenous foods in communities 3.2 Disseminate information on micronutrient-rich indigenous foods through mass media	<ul style="list-style-type: none"> • Training sessions conducted for targeted communities • Information messages developed and distributed
4 Increased knowledge on processing and preparation of indigenous foods	4.1 Demonstrate preparation and processing of micronutrient-rich indigenous foods 4.2 Train artisans and carpenters within the community in the construction of solar driers 4.3 Conduct training on the uses of solar driers to minimize nutrient loss and increase shelf life	<ul style="list-style-type: none"> • Demonstration strategies established and tested • Dryers designed and commercialized in the first six months • Training courses designed in Year 1 • Training courses conducted for 50% of targeted community in Year 2

Outputs	Activities	Indicators
	4.4 Assess impacts of solar drier approach	<ul style="list-style-type: none"> ● Assessed report available at the end of Year 2
5 Improved capacity of nutrition extension workers in the use of indigenous micronutrient-rich food	5.1 Develop materials for extension workers on micronutrient-rich foods 5.2 Train nutrition extension workers on micronutrient-rich foods 5.3 Conduct consumer acceptability tests	<ul style="list-style-type: none"> ● Training material available ● Training courses developed and conducted ● People trained ● Knowledge on indigenous foods evaluated ● Acceptability testing trials conducted using methodology recommended
6 Improved technology opportunities and skills for using micronutrient-rich foods through utilization of information technology (IT)	6.1 Upgrade equipment 6.2 Develop capacity of the use of IT for different levels 6.3 Develop regional databank on micronutrient-rich foods 6.4 Networking	<ul style="list-style-type: none"> ● Equipment available ● Training courses attended ● Skills and knowledge on IT evaluated and improved ● Databank established and used
7 A book for the four countries on recipes of micronutrient-rich foods	7.1 Participate in developing recipebook	<ul style="list-style-type: none"> ● Recipebook available
Component IV. Extension services, capacity building, and gender issues		
1 Develop team efforts of agriculturalists and nutritionists	1.1 Joint planning for project design and proposal development 1.2 Joint monitoring of progress in agriculture and nutrition practices 1.3 Interdisciplinary testing of approaches of interactions of community in developing and testing at community level	<ul style="list-style-type: none"> ● Plan prepared ● Monitoring tools are in place

Outputs	Activities	Indicators
	<p>1.4 Consider gender issues in development of effective extension strategies</p>	
<p>2 Information resources on micronutrient-rich indigenous foods are improved and made available for extension use</p>	<p>2.1 Gather indigenous knowledge and plant materials and make it available among participating stakeholders</p> <p>2.2 Improve communication between research (scientific community) and extensionists to address farm needs</p> <p>2.3 Encourage participation of extensionists</p> <p>2.4 Develop information base on micronutrient-rich indigenous foods for extension purposes</p>	
<p>3 Mechanisms of capacity building is developed and improved</p>	<p>3.1 Conduct joint training courses for trainers at regional levels</p> <p>3.2 Develop training modules</p> <p>3.3 Conduct jointly training of extensionists at community level by agriculturalists and nutritionists</p> <p>3.4 Update skills of using modern communication tools</p>	

Annex 6**Acronyms**

ACCORD	Australian Centre for Co-operative Research and Development	EU	European Union
AIDS	Acquired Immunodeficiency Syndrome	FAO	Food and Agriculture Organization of the United Nations
AIV	African indigenous vegetables	FOSRI	Food Science and Technology Research Institute
AMREF	African Medical & Research Foundation	GDP	gross domestic product
ARC	Agricultural Research Centre (Roodeplaat, South Africa)	GoSA	Government of South Africa
ARI	Agricultural Research Institute (Tumbi, Tanzania)	GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa	HASHI	Hifadhi Ardhi Shinyanga
AVRDC-RCA	Asian Vegetable Research and Development Center-Regional Center for Africa	HIV/AIDS	Human Immunodeficiency Virus/Acquired Immuno-deficiency Syndrome
CBO	community-based organization	HORTI	Horticulture Research Institute (Tengeru, Tanzania)
CIDA	Canadian International Development Agency	ICN	International Conference on Nutrition
CORAF	Le Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles	ICRAF	The International Centre for Research in Agroforestry
CRHCS	Commonwealth Regional Health Community Secretariat	IDA	iron deficiency anemia
DALDO	District Agriculture and Livestock Development Officer	IDD	iodine deficiency disorders
DANIDA	Danish Agency for Development Assistance	IDRC	International Development Research Centre
DFID	Department for International Development	IMR	infant mortality rate
DOH(T)	Department of Health (Tanzania)	IPGRI	International Plant Genetic Resources Institute
ECD	early child development	IPUF	Indigenous Plants Use Forum
ESNA	Nutrition Planning, Assessment and Evaluation Service	IT	information technology
		JICA	Japanese International Cooperation Agency
		KARI	Kawanda Agriculture Research Institute
		LGA	local government authority
		MAAIF	Ministry of Agriculture, Animal Industry and Fisheries (Uganda)

MATI	Ministry of Agriculture Training Institute (Tanzania)	RRA	rapid rural appraisal
MFEP	Ministry of Finance and Economic Planning (Uganda)	SA	South Africa
MFPEd	Ministry of Finance, Planning and Economic Development (Uganda)	SACCAR	Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training
MGCD	Ministry of Gender and Community Development (Uganda)	SADC	Southern African Development Community
MINMEC	Minister Members of the Executive Council (South Africa)	SANCRA	Second Southern African New Crop Research Association
MMR	maternal mortality rate	SIDA	Swedish International Development Cooperation Agency
MOAC	Ministry of Agriculture and Cooperatives (Swaziland)	SSA	sub-Saharan Africa
MRC	Medical Research Council (Tanzania)	TCP	Technical Cooperation Programme (FAO)
NAADS	National Agriculture Advisor Services (Uganda)	TDHS	Tanzania Demographic and Health Survey
NARO	National Agricultural Research Organisation (Tanzania)	TGR	total goiter rate
NARS	national agricultural research system	TOR	terms of reference
NEWU	National Early Warning Unit (Swaziland)	TOSCA	Tanzania Official Seed Certification Agency
NGO	non-government organization	TOT	Training of Trainers
NRI	Natural Resources Institute (of South Africa)	UDHS	Uganda Demographic and Health Survey
NSARWU	National Strategy for the Advancement of Rural Women in Uganda	UFNC	Uganda Food and Nutrition Council
PDA	Provincial Department of Agriculture (South Africa)	UNAIDS	United Nations Programme on HIV/AIDS
PDH	Provincial Department of Health (South Africa)	UNICEF	United Nations Childrens' Fund
PEM	protein-energy malnutrition	UNIPA	Uganda National Plan of Action for Nutrition
PMA	Plan for Modernization of Agriculture (Uganda)	USMR	under-five mortality rate
QDS	Qualified Declared Seed (Tanzania)	VAD	vitamin A deficiency
RCA	Regional Center for Africa (AVRDC)	VOCA	Volunteers in Overseas Cooperative Assistance
		VOPI	Vegetable and Ornamental Plant Institute (South Africa)
		WHO	World Health Organization