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Small research and development activity

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1 Acknowledgments

This study could not have been carried out without the financial support from ACIAR, which AVRDC gratefully acknowledges. Likewise, the dedication and quality contributions of many collaborators in/from Australia, Ethiopia, Malawi, Mozambique, and Tanzania made the study an enjoyable journey.

2 Executive summary

AVRDC – The World Vegetable Center coordinated “A preliminary study to improve income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems” at the request of the Australian Center for International Agricultural Research (ACIAR) under Grant # FSC/2012/001. The study aimed to understand the characteristics of vegetable production systems in Eastern and Southern Africa (ESA), specifically in Ethiopia, Malawi, Mozambique and Tanzania, in order to develop appropriate and effective technological interventions which can maximize returns, generate and increase income to reduce poverty, and contribute to greater food and nutritional security.

The specific objectives were to:

1. analyze the poverty and food insecurity reduction potential of vegetable production in urban, peri-urban and rural agriculture;
2. identify action-research topics with high potential for providing practical and policy advice on to how to promote vegetable production as a poverty and food insecurity reduction strategy;
3. identify research partners to implement these activities and establish the best combination of action-research topics and partners within a coherent research project.

To plan and carry out the assignment, a scoping study team (SST) was assembled by AVRDC and ACIAR. The study consisted of four distinct phases: (i) desk review of documents followed by (ii) supplemental information gathering via electronic mail or on-location visits, (iii) needs assessment and preliminary action plan development via a stakeholder workshop. Thereafter, the SST convened in Canberra from 15-18 July 2012 to report its findings to ACIAR.

The SST was subsequently tasked with the development of a project for "improving income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems", based on four critical knowledge gaps identified during the scoping study, namely:

1. To what extent are current vegetable production practices inappropriate and how can they be improved for increased produce quantity and quality, including safety, in the target countries?
2. To what extent can research improve the availability of improved varieties and seed to vegetable farming communities and how would this increase the supply of vegetables?
3. To what extent can research interventions to promote options for collaborative relationships, postharvest storage, value addition and processing lead to increased value chain efficiency and effectiveness and increased returns to farmers?
4. To what extent can community-immersed best-practice testing hubs help to strengthen the capacity of the national research partners for delivering improved technologies and practices?

Thus, a pre-proposal (Phase I) was submitted in August 2012 and approved in January 2013 following a few rounds of review revisions. The full proposal (Phase II) was submitted in April 2013 after additional on-site consultations with partners in the target countries and was approved in May 2013.

The purpose of the approved project is to improve vegetable variety and seed supply systems, enhance crop management practices and develop value chain effectiveness, and thereby increase market returns for vegetable growers in peri-urban settings in the

target countries.

The specific Objectives are to:

1. Identify, test and promote crop management and crop protection technologies and practices for increased and safer production of vegetables
2. Identify, evaluate and deploy improved varieties and high quality seed of selected vegetable crops
3. Assess the potential and feasibility for value adding and processing, especially looking at technologies for improved postharvest storage and more effective value chain relationships
4. Strengthen national vegetable research and development capacity and linkages

The project will be carried out by AVRDC and the main government and non-government organisations responsible for vegetable research and development in each target country. For Ethiopia, the Ethiopian Institute of Agricultural Research (EIAR) paired with International Development Enterprise (iDE); for Malawi, Africare paired with the Department of Agricultural Research Services (DARS)/Bwumbwe Agricultural Research Station; for Mozambique, Instituto de Investigação Agrária de Moçambique (IIAM) paired with the International Potato Center (CIP). For Tanzania, the Horticultural Research and Training Institute (HORTI) paired with AVRDC). The project will draw from the experience of the Australian Applied Horticultural Research (AHR) on integrated crop management. These organisations have been carefully chosen to ensure they are the most appropriate partners for a successful project. In addition the project will have value chain and human nutrition expertise through consultancy arrangements.

The project is designed to provide significant and rapid impacts at the levels of communities, institutions and policies. At the individual and community level, the testing of promising approaches will generate new knowledge and technologies to increase vegetable productivity, reduce losses and connect growers to markets. The project will train 480 vegetable business professionals in 120 communities as direct beneficiaries. Subsequent efforts to extend successful technologies and management models will further benefit at least 6,000 vegetable farming families through improved livelihood security, food and nutrition security and incomes, with net economic benefits estimated at AU$3.6 - 7.2 million per year. At the institutional level, the project will aim to train at least four graduate students, effectively enhancing the human capacity of the national partners, which will be further strengthened by the taskforce approach for regional networking, coordination and information exchange adopted by the project. At the policy level, field crops research has often been the sole sources of reference for agricultural policies in most of the target countries, yet recent demographic and environmental trends may dictate a different to assuring food and nutrition security. The project will not only improve understanding of factors underlying the vegetable production to consumption continuum (which in turn will provide key information on vegetable diversity, seasonality, production and marketing networks) but also provide complementary data for policymakers. It is thus expected that project findings will help to guide policy formulation as well as research and development projects in the project countries.

3 Introduction

AVRDC – The World Vegetable Center coordinated "A preliminary study to improve income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems" at the request of the Australian Center for International Agricultural Research (ACIAR) under Grant # FSC/2012/001 covering the period from 15 May 2012 to 30 November 2012. This was amended to extend the performance period to 30 June 2013.

The study[1] aimed to understand the characteristics of vegetable production systems in Eastern and Southern Africa (ESA), specifically in Ethiopia, Malawi, Mozambique and Tanzania, in order to develop appropriate and effective technological interventions which can maximize returns, generate and increase income to reduce poverty, and contribute to greater food and nutritional security.

The specific objectives were to:

1. analyze the poverty and food insecurity reduction potential of vegetable production in urban, peri-urban and rural agriculture;
2. identify action-research topics with high potential for providing practical and policy advice on to how to promote vegetable production as a poverty and food insecurity reduction strategy;
3. identify research partners to implement these activities and establish the best combination of action-research topics and partners within a coherent research project.

To plan and carry out the assignment, a scoping study team (SST) was assembled by AVRDC and ACIAR, consisting of the following people:

Name	Agency and position	Discipline and role in project
Abdou Tenkouano	AVRDC, Regional Director for Africa	Plant breeding; project leader
Christopher Ojiewo[2]	AVRDC, Vegetable Breeder	Vegetable breeding and production system; project staff
Victor Afari-Sefa	AVRDC, Agricultural Economist	Agricultural economics and policies; project staff
Gordon Rogers	Applied Horticultural Research, CEO	Vegetable agronomist; consultant for vegetable production agronomy and marketing
Suzie Newman[3]	New South Wales Department of Plant Industries, Research Horticulturalist	Postharvest specialist; consultant for postharvest management and women's work on indigenous vegetables
Benjamin Dent	University of Queensland	Value chain specialist; consultant for vegetable value chains

[1] The terms of reference of the scoping study are detailed in Annex 1.

[2] Dr. Ojiewo departed AVRDC in June 2012 and was replaced by Dr. Fekadu Dinssa Fufa who joined AVRDC in December 2012.

[3] Dr. Newman notified AVRDC and ACIAR in March 2013 that NSW DPI had decided that she could no longer participate in this project because NSW DPI focussed in Asia and the Pacific and was not looking to pursue work in Africa.

The study consisted of four distinct phases: (i) desk review of documents followed by (ii) supplemental information gathering via electronic mail or on-location visits, (iii) needs assessment and preliminary action plan development via a stakeholder workshop, and (iv) development of Phase I and Phase II proposals.

The SST faced a challenge of availability of the people concerned (other commitments made prior to the scoping study), various travel requirements (visa, itineraries) and the need to commit the funds within a short time from the approval of the study proposal. This led to several changes in the study schedule and format.

Thus, the desk review of available documents was run concurrently with information gathering from key informants, since the scoping study proposal already had most of the questions that answers were being sought for. It is proposed that the review, a summary of which is given under Section 4, will assist in developing a questionnaire that would be used for the establishment of a baseline at the inception of the regional project once it is approved.

Supplemental information was sought from different groups of key informants and/or potential partners with knowledge on the countries being targeted for the project or the ESA region as a whole. Two documents extracted from the scoping study proposal, namely, the guidelines of the scoping study (Appendix 1) and potential ideas for a regional project (Appendix 2) were shared with the informants/partners in support of a request for written contributions on gaps, needs, and intervention options.

The first group was made of ACIAR-recommended or suggested experts: Dr. Lusike Wasilwa (Assistant Director of Horticultural and Industrial Crops, Kenya Agriculture Research Institute), Dr. Fidelis Myaka (Director or Research and Development, Tanzania Ministry of Agriculture, Food Security and Cooperatives) and Dr. Mulugetta Mekuria (CIMMYT Representative for Southern Africa Regional Office). Additional contacts were made with Dr. Daniel Karanja (AIV Seed Systems Project Manager) and Dr Roger Day (Deputy Director, Development) of CABI Africa whose plant clinic initiative was mentioned by ACIAR. From this group, a contribution was only received from CABI Africa, which we gratefully acknowledge. This contribution (detailed in Appendix 3) was congruent with the ideas being proposed by AVRDC and ACIAR for the regional project. CABI Africa would be a valuable participant to the project, with experience on plant clinics, an extension-related assistance mechanism to farmers.

The second group was made of established vegetable research and development professionals from the countries being targeted for the project.

Because AVRDC has had extensive work presence in Malawi and Tanzania and given the availability constraints mentioned above, it was agreed that no on-location visits would be carried out for these two countries. Rather, the same request sent to the first group of informants was addressed to key contacts in Malawi and Tanzania. We gratefully acknowledge written responses from Drs Thompson Chilanga and Charles Malidadi (Bvumbwe Agricultural Research Station) for Malawi and from Drs Eugene Agbicodo (Breeding Manager, Rijk Zwaan Afrisem Ltd.), Bob Shuma (Executive Director, Tanzania Seed Trade Association), and Silivesta Samali (Director, Horticultural Research and Training Institute) for Tanzania. These contributions highlighted the following as required pillars for a regional project: (i) variety testing/dissemination and seed systems, (ii) post-harvest, nutrition and demand creation, and (iii) capacity building along the research through development continuum. The Malawi and Tanzania country notes are adjoined to this report as Appendix 4 and Appendix 5, respectively.

AVRDC had had only limited presence or activity in Ethiopia and Mozambique, which meant that information gaps for these countries were relatively important. Therefore, on-location visits were made to Ethiopia (visited by Victor Afari-Sefa and Benjamin Dent) and Mozambique (visited by Christopher Ojiewo and Suzie Newman). Both scoping sub-teams produced detailed reports on their findings (see Appendix 6 for Ethiopia and Appendix 7 for Mozambique). In addition to confirming the pillars highlighted above as essential, these

two reports also identified value chains as a critical element that a regional project should address.

Subsequently, a group of about 15 people representing the four target countries as well as AVRDC and ACIAR took part in a stakeholder consultation meeting that was held from 12-13 June 2012 in Arusha, Tanzania. They had the opportunity to review all received reports as well as oral presentations from each target country, before deliberating on building blocks and collaboration mechanisms for a regional project. This is captured in Section 5 of this report that summarizes the outcome of the stakeholder consultation.

Finally, the SST convened in Canberra from 15-18 July 2012 to report its findings to ACIAR and discuss the next steps for the development of a project for "improving income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems". Consequently, a pre-proposal (Phase I) was submitted in August 2012 and approved in January 2013 after a few rounds of revisions. Additional on-site consultations with partners in the target countries were carried out in March 2013 to develop the full proposal (Phase II), which was submitted on 22 April 2013 and approved on 28 May 2013. The key elements of the project design period, starting with the Canberra meeting and ending with the Phase II approval are outlined in Section 6 of this report.

4 Desk review: Summary of literature

A desk review of key documents on vegetable research and development issues that may have relevance to the target region was carried out. The general picture emerging from these reviews is that the production and marketing of vegetables in most East and Southern African countries is constrained by many factors, particularly: poor quality of the seeds used for production, spatial and time gaps in seed distribution systems, high postharvest losses of marketable produce, high transaction costs along the supply chain due to inadequate infrastructure, lack of appropriate market information systems, low bargaining power of farmers, and ineffective marketing systems and policies to enhance trade within and between countries. It appears that consumer behaviour, which drives production and marketing choices, is of paramount importance in deciding what kinds of interventions along the value chain should be considered.

Consideration 1 - Improving germplasm and seed systems:

In the past the supply system was largely dominated by the public sector, but these have often become non-functional with informal supply systems remaining important as exemplified by a pilot seed demand study in Tanzania (Amaza et al., 2010). The Main sources of information about improved and/or newly released seeds are currently through informal sources (friends and neighbours) as noted by the need to address bottlenecks in variety release procedures, seed laws and policy guidelines in countries such as Tanzania. This has called for need for joint public and private sector partnerships to strengthen demand creation activities and seed commercialization activities by seed companies as exemplified by activities undertaken by innovation platforms set up under AVRDC's Vegetable Breeding and Seed Systems for Poverty Reduction in Africa Project. The major constraints faced by seed suppliers include low market prices for seeds sold and limited access to capital for investment and expansion of operations. There have been several initiatives to build the capacity of both seed company personnel and national agricultural research and extension personnel in vegetable seed production and marketing systems. On supply of improved planting materials, efforts are underway to promote use indigenous vegetables such as amaranth and spider plant as climate resilient crops in humid regions while improved breeding efforts towards abiotic tolerances such as heat and drought in the phase of climate change are planned for drier countries such as Ethiopia (see AVRDC's 2012 proposal submitted to GIZ for funded).

Consideration 2 - Production systems

In analysing the value chains, several production systems related constraints were identified to later affect the quality and value of produce to consumers. These include technical and marketing constraints that affect the production part of the value chains include: serious pests and diseases in field and postharvest, excessive use of pesticides (for local markets) and lack of an organized system of technical assistance and capacity building. It is also recommended that specific studies be undertaken on smallholders' access to irrigation and potential interventions to improve access to enable more smallholders to produce vegetables in the low supply season to spread their production for higher incomes across seasons.

Consideration 3 - Marketing systems

Domestic and regional markets in East and Southern Africa suffer from severe inefficiencies in their value chains. Accessing markets if often difficult for smallholders due to lack of adequate inputs and infrastructure. Smallholder vegetable farmers in East and Southern African countries generally lack access to appropriate market infrastructure and market information for their produce. Even where partly functional market information systems exist, smallholders do not appear to be aware of how to access it or the system is not penetrating into rural areas. Further studies are needed to determine why

smallholders are not accessing existing systems. Market power is often in the hands of wholesalers, supply chains are long, there is little or no product innovation or market information, and small-volume transactions are common. This partly stems from the fact that most linkages between actors along the IVs value chain are spot market relationships, except for the linkage between retailer and supermarket which is a persistent relationship. Results from various value chain studies indicate that middlemen involved in the supply chain are also faced with lack of capital or limited access to credit as the leading limiting factor. Also, climate change constrained some the retailers from selling more indigenous vegetable to consumers. Consequently, domestic supermarkets and international export markets in sub-Saharan Africa handle considerably smaller volumes of vegetables; they do involve smallholders to a greater or lesser extent. It is recommended that highest priority should be given to opportunities to strengthen farmer organization in all relevant interventions to improve vegetable value chains.

Consideration 4 - Postharvest

Poor postharvest management and lack of knowledge of the required technologies, quality standards and food safety protocols severely limit many producers' access to markets. Improper pre-harvest, harvest and post-harvest procedures in sub-Saharan Africa can result in losses of more than 50 percent for perishable vegetable crops e.g. tomatoes and indigenous leafy vegetables. It is recommended that any decisions made to support interventions in the post-harvest management of producer emphasizes on consumer part of vegetable value chains by harmonising interventions in the production aspects of the value chain to capitalise on complementarities. Future Interventions should target building the capacity of smallholders to improve post-harvest management of vegetables. It is also recommended that efforts should be made to work with the government to develop flexible grades, standards and food safety regulations to acknowledge the diversity in the sector.

Consideration 5 - Nutrition and utilization

Consumption of vegetables to address hidden hunger and communicable diseases such as diabetes and hypertension is less than recommended in all countries in sub-Saharan Africa. This has resulted from the historical stigma attached to African indigenous vegetables particular, African indigenous vegetables as they are high in nutritional content compared to globally important vegetables such as tomato. The situation seems to be however changing in some countries due to more positive attitudes toward consuming African indigenous vegetables, and increased knowledge of health-promoting properties of indigenous. This is gradually leading to increased aggregate demand and consumption of vegetables. It is recommended that government and private sector partnerships be facilitated to invest improving the domestic marketing system infrastructure and, hence, consumption of fresh vegetables nationally.

Consideration 6 - Consumer research

Weinberger and Msuya (2004**)** report *Indigenous Vegetables in Tanzania* provided a model of the types of consumer research which should be reviewed in detail, and where necessary supplemented with new research, to understand what different consumers in the target countries value about various vegetables, and hence the drivers of their purchasing and consumption behavior. For example, Weinberger and Msuya looked at consumption differences between men, women and children, and examined the impact of:

- Wealth and ethnicity;
- Vegetables' status;
- Knowledge of preparation, especially to optimize nutritional value;
- Where purchasing takes place, and how frequently;
- Influence of affordability and availability, and

- Those attributes of amaranth, nightshade and African eggplant which drive purchasing/consumption behavior. In particular,
  - Colour, texture, size, taste, presence of seeds, hairiness of stem, degree of slime, thickness of stem;
  - Cooking time, and aroma before and after cooking, and
  - Product origin.

A cluster analysis segmented the market by determining the most prominent combinations of attributes. Responding effectively upstream to these drivers of different segments will increase the value created by the chain and increase demand for the final product. Additionally, isolating the most influential drivers helps target educational interventions to increase demand. Finally, such research forms the foundations of designing micro-level value chain projects, if undertaken.

Weinberger and Msuya's investigation also explored how consumption patterns varied between dry and rainy seasons, when both indigenous and exotic vegetables' availability changed. This is important information for upstream interventions. For example, their analysis found that during the rainy season hardly any households bought indigenous vegetables because they were readily available from either home gardens or gathering outside the homestead. Therefore, when farmers would have most crops to sell, they would find demand at its lowest, strongly suggesting that farmers should focus on exotic crops during the rainy season. Conversely, during the dry season, approximately two-thirds of all households purchased indigenous vegetables at the market, making them a more attractive commercial crop for smallholders, so long as they have access to suitable varieties and other inputs. Finally, the report includes a contingent valuation on willingness to pay, including age, sex, income, education, and shopping venues, which also help to prioritise the opportunities offering the greatest returns to farmers from different consumer segments.

Similarly, Macharia (2012) proposed a consumer segmentation for shoppers in Nairobi, and then exemplifies how the value chain collectively (peri-urban farmers, retailers and other stakeholders) can contribute to, and benefit from, serving the aspirations of those segments for whom their own capabilities and motivations are most suited. Macharia illustrated this as follows:

- Prestigious Shoppers seek high quality products and superior customer service at supermarkets;
- Market Enthusiasts seek better market facilities, product appearance and buyer-seller relationships;
- Ethics Crusaders want greater courtesy and transparency, and
- Safety Sceptics are especially concerned about the quality of irrigation water in peri-urban production, and the levels of chemical usage.

One of his relevant conclusions for this study was the need to build capacity within value chains for group leadership and management to overcome the challenges to the formation and maintenance of long term business partnerships along the chain.

Amaza's (2009) *Analysis of Traditional African Vegetables and Sweet Potato Consumer Demand in Kenya and Tanzania* presented a compelling justification for the need for simultaneous interventions to promote:

- Seed availability;
- Production capacity (skills and volume);
- Logistics – postharvest handling which maintains quality and reduces wastage, and

- Market development (demand: knowledge of benefits and uses; affordability; convenient availability at required quality).

Recommendations in that report that may be relevant to this project include increased consumer knowledge of the nutritional and health benefits derived from TAV; improving grades and standards; value addition, and increasing awareness among both producers and traders of the significance and potential of producing and marketing good quality produce.

The AVRDC (2008) report on the workshop on *African Indigenous Vegetables and urban & peri-urban agriculture policy dialogue* highlighted the risks of ignoring consumer attitudes in designing successful value chain interventions. For example, urban dwellers, especially young people, were reported to find indigenous vegetables "old-fashioned" and "poor man's food". Convenience was also essential to increase vegetable consumption because urban dwellers are busy, so they eat less fresh produce if it takes a lot of effort to prepare, as is the case with many indigenous vegetables, because there is a particular opportunity cost to their preparation for urban working women. Accordingly, increasing the supply of vegetables without reflecting or tackling these barriers would have negligible effect on consumption, and hence there will be no additional value to flow back upstream to farmers.

What Next: Stepping-Up or Hanging-in?

Voley and Buxton (2011) distinguish between interventions to help smallholders to 'step-up' to enter supermarket supply chains, or 'hang-in' to service traditional markets. This distinction provides a useful framework for considering suitable interventions. While some upstream improvements might be the same for both outcomes, some capacity building and post-harvest support may be different, and need to be consistent. For example, the most suitable value chain participants and resources will be affected if the aim, even if long term, is to enable smallholders to have the flexibility to step up to supplying supermarkets. Conversely, where either the emergence of supermarkets is deemed minimal or smallholders are considered very unlikely to compete against larger suppliers, then the interventions should focus on strengthening their participation in supply chains which remain focused on traditional markets.

Vorley et al (2008) identified the key interventions for successful stepping-up as tackling:

- Low and inconsistent production volumes;
- Dispersed/inaccessible production;
- Weak negotiation positions;
- Limited capacity to meet formal market requirements/standards, or affordability of verifying compliance, and
- Poor access to information, technology and finance.

Interventions may also need to facilitate producers to cooperate to compete as a single supplier, and/or for their customers to be responsive to the realities of smallholder production. Depending on the current and future opportunities in each country, the research could explore resolving these issues with a demonstration value chain.

References

Projects reports and documents

Networking to Promote the Sustainable Production and Marketing of Indigenous Vegetables through Urban and Peri-Urban Agriculture in Sub-Saharan Africa (donor: European Union)

Technology Transfer of Promising Vegetable Lines Through Sustainable Seed Production in East Africa (donor: Rockefeller Foundation)

Promotion of Neglected Indigenous Leafy and Legume Vegetable Crops for Nutritional Health in Eastern and Southern Africa (donor: BMZ, Germany)

Improving human nutrition and income through integrated agricultural research on production and marketing of vegetables in Malawi and Mozambique. (in partnership consortium led by Bioversity International, Sub-Saharan Africa Challenge Program)

Vegetable Breeding and Seed Systems for Poverty Reduction in Africa (donor: Bill & Melinda Gates Foundation)

3C: Crops for a Changing Climate - Improving livelihoods and reducing vulnerability to climate change effects of resource-poor farmers through improved access to abiotic stress-resilient and profitable vegetable varieties in sub-Saharan Africa (proposed donor: BMZ, Germany)

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Vorley, B. and Buxton, A. (2011) Under what conditions are value chains effective tools for pro-poor development?, International Institute for Environment and Development, available online: http://pubs.iied.org/pdfs/16029IIED.pdf

Vorley, B., Lundy, M. and MacGregor, J. (2008) Business models that are inclusive of small farmers, International Institute for Environment and Development, available online: http://pubs.iied.org/pdfs/G02340.pdf

Weinberger, K. and J. Msuya (2004) Indigenous vegetables in Tanzania: significance and Prospects. Technical bulletin No. 31. Shanhua: AVRDC

5 Highlights of stakeholder consultations

Consultation with stakeholders were carried out via electronic mail, on-site visits, and a workshop, resulting in the identification of a number of building blocks to consider, and select from as funding permits, for a regional project, as listed hereafter.

Project Goal

To improve the income and nutrition of rural and urban poor households in Eastern and Southern Africa

Project Purpose

To enhance the availability of high yielding (production volumes/new farmers) and nutrient dense exotic (globally important) and traditional (indigenous) African vegetable crop varieties (priority crops) to smallholder farmers and, through enhanced value chain management, to increase the adoption and consumption of both their fresh and processed products for better health, nutrition and improved livelihoods of rural and urban poor households in Eastern and Southern Africa.

Project Objectives:

1. Improve urban and peri-urban vegetable production and thereby improve food and nutritional security and income generation of women and unemployed youth in large towns and cities in the target countries
2. Improve vegetable availability through inclusion in staple food cropping systems, thereby diversifying diets, enhancing food and nutritional security and income generation of the poor rural folk
3. Build the capacity of stakeholders along the rural and urban value chains for more efficient and safer production, postharvest handling and marketing

Potential Thrusts/Activities (Project Pillars}

Project Pillar 1 - Value chain management [To be led by Victor Afari-Sefa & Benjamin Dent]

Key Target 1: Demonstrate the opportunities for increased value chain efficiency and effectiveness (including farmer-market linkages)

- Conduct surveys to evaluate the critical characteristics of marketing models/channels of vegetables in the urban and rural areas in the focus countries.
- Review, and where necessary supplement, existing consumer research in each country to understand the drivers of consumer behaviour (for each segment: what product attributes they value; what deters purchasing; what interventions would increase consumption &/or willingness to pay)
- Work with selected value chains to act as demonstration case studies to implement the outputs of Pillars 2-4 and to build cooperative relationships and information flows.
- Carry out gender analysis to understand the dynamics of gender division of labor and decision making across the different vegetable value chain activities and how this impacts on household income and nutrition in the focus countries.

Project Pillar 2 - Produce quality/management practices (vegetable produce; pre/post-harvest) [To be led by Mohammed Yesuf & Gordon Rogers]

Key Target 2a: Technologies for safe production of vegetables improved and deployed in urban and peri-urban settings in the focus countries

- Develop and disseminate integrated pest management approaches, minimizing the use of pesticides and advocating host plant resistance, cultural methods and biological control options.

- Evaluate existing microbial/pesticide contamination (type and level) in indigenous and introduced vegetables obtained from urban markets in the target (identify ways of minimizing risks associated with the microbial/chemical contaminants)
- Evaluate water quality and recommendation of quality standards for water used in vegetable production in the peri-urban areas of the target countries.
- Evaluate soil quality and the interactions of organic fertilizer applications on changes of physical, chemical and biological soil properties for optimum crop productivity with reduced quantities of inorganic fertilizers.

Key Target 2b: Rural cereal-based production and food systems enriched and diversified with vegetables

- Elucidate vegetable production constraints and opportunities, resource use, technology preferences and market access in cereal-based systems
- Elucidate vegetable input and output markets and value chains in cereal-based production systems
- Characterize vegetable farm-household typologies and system options to reduce risks and enhance profitability in cereal-based production systems
- Develop vegetable intercropping or crop rotation with cereals/staples through intensification and diversification for production risk reduction

Project Pillar 3- Improved varieties and seed systems [To be led by Chris Ojiewo & Paul Kusolwa]

Key Target 3a: High yielding and nutrient-dense elite lines and landraces jointly evaluated and selected with major value chain stakeholders

- Carry out morphological and molecular characterization of existing germplasm
- Evaluate germplasm/varieties/lines for adaptation to major peri-urban agroecologies within the target countries (multilocational trials)
- Analyze elite germplasm for nutrient and antinutrient properties
- Recommend selected lines for official release and/or registration

Key Target 3b: Farmer access to high quality seeds of best varieties of selected vegetables for inclusion in sole and cereal-based systems facilitated

- Assist in developing farmer-led community seed enterprises
- Develop seed production and conservation protocols for best varieties of selected vegetables

Project Pillar 4 - Nutritional education and promotion (part of demand creation/awareness/policy issues) [To be led by Joyce Kinabo & Suzie Newman]

Key Target 4: Technologies for improved postharvest storage, value addition and processing developed and promoted [Nutrition-driven behavioral change]

- Develop promotional materials (recipes/songs/leaflets) which are easy-to-prepare, cost-effective, acceptable and marketable in each target country to enhance consumption.
- Evaluate options for packaging, storage and transportation to enhance the nutritional quality of selected vegetables.
- Develop minimal processing technologies such as antimicrobial-wash using hydrogen peroxide and chlorine for adoption in the region. (postharvest)
- Determine quality standards in order to provide new outlets for vegetable products coming from peri urban farm enterprises. Quality as an intangible characteristic for many consumers is perceived by value, grading, prestige pricing, quality packing and labeling (certification).
- Develop shelf-life enhancing technologies for marketing the selected leafy vegetables in dehydrated forms. Efficient, cost effective drying methods with best nutrient retention (solar drying, forced air drying using biomass fuel, or using dry-beads) will be evaluated. (processing)

- Create awareness through field days, seed fairs, food fairs, national agricultural shows and exhibitions

Project Pillar 5 - Capacity development and enhancement (building)[cross-cutting, to be embedded in other pillars]

Key Target 5: Group & individual training achieved

- Train end users with emphasis on women and youth groups from target households on [i] best postharvest handling and preservation practices (preparation, processing and packaging) of vegetable food products; [ii] best vegetable crop production and protection practices; [iii]best seed harvesting, processing and storage of vegetable varieties; [iv] best practice in value chain management; [v]best vegetable recipes and preparation methods for optimum nutritional quality
- Develop training of trainer programs of extension and private sector personnel on key vegetable value chain technologies and management developed through the project
- Contribute to graduate training and capacity building of key research project personnel
- Build capacities of national research institutes (NARES) in vegetable production, marketing and utilization

Project Partners [Main & Collaborators]

Project Management

	Ethiopia	Malawi	Mozambique	Tanzania
Project Leader [ACIAR-appointed (?)]				AVRDC
Country Team Coordinator	Dr Selamawit (EIAR/MARC)	Dr. Thompson Chilanga[4] (Bvumbe Station)	To be identified (IIAM)	Silivesta Samali (HORTI – Tengeru)

Project Operation (Themes)

	Ethiopia	Malawi	Mozambique	Tanzania
Value Chain [Victor Afari-Sefa & Benjamin Dent]	Outreach: IDE, SNV Research: EIAR/MARC EIAR/RARI	DARS BUNDA College of Agriculture STAM AFRICARE	IIAM World Vision MOZSEED CIP [OFSP] UNAC [Farmer association]	Outreach: TASTA TOSCI TAHA COUNSENUTH TFNC T-MARC Research: HORTI SUA ARI UYOLE SUA
Quality & Safety [Mohamed Yesuf & Gordon Rogers]				
Variety & Seeds [Chris Ojiewo & Paul Kusolwa]				
Postharvest & Nutrition [Joyce Kinabo & Suzie Newman]				
Capacity Building				AVRDC/UC Davis Postharvest Training and Services Center (PTSC) DARSH Industries

[4] Alternative country coordinators: Dr Felicitas Chipungu (Bvumbe Station), Mrs Maggie Mzungu (AFRICARE)

Project Operation (Priority Crops)

	Ethiopia	Malawi	Mozambique	Tanzania
Globally Important (Red=non leafy)	Tomato Broccoli Pepper – Hot	Tomato Onion Cabbage	Tomato Onion Cabbage	Tomato Onion Pepper - Sweet Cabbage
Indigenous and Niche (Red=non leafy)	Amaranth Jute mallow	Amaranth Afr. Egg plant	Amaranth (?) Cowpea (?)	Amaranth African Egg plant African Nightshade

Project Linkages

- SIMLESA – Ethiopia, Malawi, Mozambique, Tanzania (East & Southern Africa)
- CABI Africa Plant Clinic Initiatives – Ethiopia, Malawi, Mozambique, Tanzania (East Africa)
- HortCRSP Postharvest Training and Services Center (PTSC) – East Africa
- USAID Africa RISING – Ethiopia, Malawi, Tanzania
- CIP OFSP – Mozambique
- GIZ Crops for Changing Climate – Ethiopia
- Sasakawa Africa Association – East Africa
- ASARECA – High Value NSC (Sub regional organization)
- IFDC
- BECA/CSIRO Amaranth Project - Tanzania (Kenya)

Project Communication Plan

- Hold annual stakeholder meetings including producers, seed companies, input suppliers, traders, buyers, middlemen, transporters, government regulators and high value market operators (supermarkets, hotels and tourist centers) to discuss, identify and strategize how to develop synergies in market linkages and eliminating bottlenecks (goes to capacity building)
- Organize workshops/ conference on value-addition of indigenous and introduced vegetable crops through low cost processing to enhance the knowledge diffusion and adoption platform.
- Engage other stakeholders such as African Food and Nutrition Forum and Policy makers in governments to evaluate the opportunity - recommendations on conditions necessary for possible technology replication at both national and regional level
- Produce publications (including value chain case reports), policy briefs, dissemination tools/promotional materials

Project Monitoring & Evaluation Plan

- Baseline [Value chain analysis, Capacity assessment]
- Indicators & Milestones [Behavioral change]
- End line

Next Steps

The SST will convene in Canberra from 16-17 July 2012 to present findings of the scoping study to ACIAR. It is expected that a full project proposal will be developed during the remaining period to 30th November 2012 which is the end date of the agreement subtending the scoping study[5]. It was agreed that the SST and the Pillar leaders will form the proposal writing team and that a highly interactive and iterative process will be followed.

[5] *The agreement was subsequently extended to 30 June 2013.*

In developing the full proposal, additional information required from the target countries will be sought[6], including but not limited to:

- Institutional capacity statement (what we do, since when, our resources, our intended contribution)
- Letter of Interest/Support
- Biography/Resume/CV [Background/Profile + key pubs relevant to Project]
- Variety Description/list (cultivated/in development)
- Specific intervention sites

Owing to unforeseen circumstances (e.g. visa), representation from Mozambique at the stakeholder workshop was minimal. Hence it was agreed that follow-up contacts (including a trip) should be considered.

[6] Templates to be developed

6 Project design highlights

Project design effectively started with the visit of the Scoping Study Team (Suzie Newman, Benjamin Dent, Gordon Rogers and Abdou Tenkouano) to Canberra from 15-18 July 2012 to report on the findings of the study and interact with the wider ACIAR constituency.

Ideas emerging from the stakeholder consultations were discussed, both in an open seminar and semi-closed work sessions, and were approved as building blocks for development of a 4-year proposal, in two phases (see Appendix 8 for details). In essence, it was agreed that the project would bridge research and practice by focusing research activities on sites that at the same time serve for educational interventions to empower growers with productivity-enhancing technologies while exploring opportunities to develop effective downstream relationships. Thus, research interventions would take place at Best Practice Hubs (BPHs) embedded within both current and potential (youth) vegetable farmers. The BPHs will be a conduit for a participatory approach to test and fast-track delivery of research-based options for increased production and postharvest strategies, and simultaneously provide young people with the skills required to for profitable self-employment. The BPHs will be centres for crop trials and experimentation that also serve for educational interventions, which will empower vegetable farmers (current and potential) with productivity-enhancing technologies within effective value-chains. The BPH will host inter-related interventions, whereby (i) testing and deployment of varieties and associated technologies to boost the availability of vegetables link to (ii) education on post-harvest strategies and food preparation to boost market access and consumption while (iii) building the capacity of growers as part of the project's exit strategy and legacy. This is illustrated in Figure 1 below. This approach also has a significant communication and awareness raising value as farmers and the local community can see and learn what can be achieved, and as appropriate, sites can have a special focus consistent with local needs.

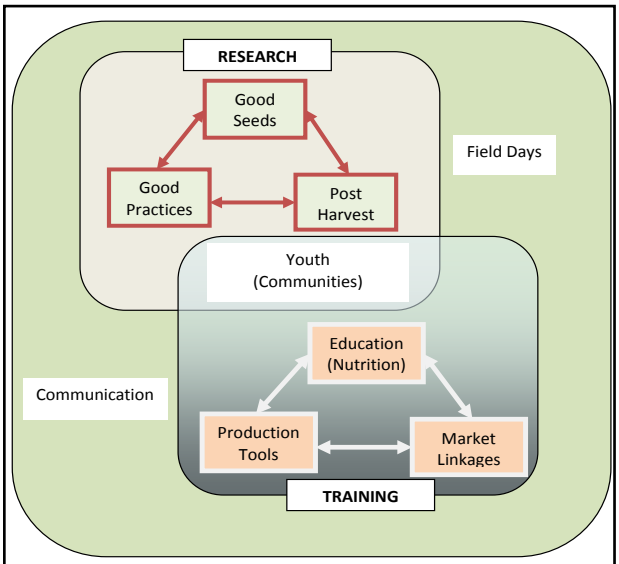

Figure 1. A research model for linking technology testing to capacity building of youth in vegetable production basins.

The Phase I proposal was submitted in August 2012, subsequently revised and re-submitted in October 2012 and January 2013. Approval for proceeding to Phase II was granted in late January 2013.

Additional on-site consultations with partners in the target countries were undertaken in March - April 2013 by an AVRDC team comprising of Abdou Tenkouano and Annelie Öberg. The team met with multidisciplinary groups of scientists in each country for in-depth project design work sessions complemented with field visits to potential project sites. The resulting Phase II proposal was submitted in April 2013 and approved in late May 2013.

The study identified several areas with critical knowledge gaps, leading to the formulation of four key research questions and corresponding research as described hereafter:

Research questions	Research interventions	Key deliverables
1. To what extent are current vegetable production practices inappropriate and how can they be improved for increased produce quantity and quality, including safety, in the target countries?	Assess to what extent current vegetable production practices are inappropriate and how they can be improved for increased produce quantity and quality, including safety, in the production basins supplying the cities.	Safety-promotion integrated crop management options tested and deployed to enhance productivity of vegetables
2. To what extent can research improve the availability of improved varieties and seed to vegetable farming communities and how would this increase the supply of vegetables?	Increase the availability of improved varieties and quality seeds to vegetable farming communities and to assess how this would increase the supply of vegetables.	Nutrition-dense varieties and associated seed systems tested and deployed to boost the availability of vegetables
3. To what extent can research interventions to promote options for collaborative relationships, postharvest storage, value addition and processing lead to increased value chain efficiency and effectiveness and increased returns to farmers?	Investigate available options for post-harvest storage, value addition and processing and propose alternatives that can lead into increased value chain efficiency and effectiveness and increased returns to farmers. Develop, test and revise value chain management training course and materials in each BPH's distinctive local contexts.	Low cost postharvest handling and food preparation options assessed and promoted to increase market access and consumption Training curriculum and materials, including variations to reflect local conditions, for application elsewhere.
4. To what extent can community-immersed best-practice testing hubs help to strengthen the capacity of the national research partners for delivering improved technologies and practices?	Assess the extent that community-immersed best-practice testing hubs can help to strengthen the capacity of the national research partners for delivering improved technologies and practices	Capacity of farmers and youth enhanced to provide possibilities for profitable self-employment Research-to-delivery capacity of the national partners strengthened

Priority crops will be selected by NARS partners on the basis of their potential for generating income and/or improving nutrition. Pending further prioritization at project inception, tentative crops chosen by the national partners are listed in the following table:

Priority crops	Countries (reasons for crops chosen)			
	Ethiopia	Malawi	Mozambique	Tanzania
Tomato	Income (Nutrition)	Income (Nutrition, β-carotene-rich)	Income (Nutrition)	Income (Nutrition)
Onion	Income	Income (Nutrition - leaves)	Income	
African egg plant		Nutrition (income)		Income (Nutrition)
Amaranth		Nutrition (income - seeds)		Nutrition (income)
Ethiopian mustard (kale)	Nutrition (seed systems)	Nutrition		
Sweet pepper			Income (Nutrition)	Income (Nutrition)
African night shade				Nutrition
Bitter gourd			Nutrition (medicinal)	
Broccoli	Nutrition			
French bean				Income
Garlic	Income (medicinal)			
Hot pepper	Nutrition (income)			
Okra		Nutrition (Income)		
Sweet potato			Income (tubers), Nutrition (leaves)	

7 Conclusions and recommendations

7.1 Conclusions

Dietary diversification, malnutrition and poverty are widespread problems in Eastern and Southern Africa (ESA), including the target countries; Ethiopia, Malawi, Mozambique and Tanzania. The lack of efficient channels for the adaptation and dissemination of research-based technologies and knowledge currently limits improvement in the target countries. For vegetables, their knowledge intensive nature means that a disconnect between research and practice can have dramatic consequences along the value chain.

The outcome of this small research activity (scoping study) is a sound project articulated around the set-up of best practices hubs for simultaneously testing and adapting productivity enhancing technologies while building capacity of the youth and awareness of the populations to take advantage of the income generation opportunities and nutrition boosting prospects offered by vegetables.

7.2 Recommendations

Although conceptually simple, this small research activity required a lot of coordination and logistics as well as a fine act of balancing between the expectations of the multiple numbers of partners across four countries, across institutions, and types of interventions. This perhaps is indicative of the complexity of the intended project and the demand for such types of project. Expectedly, context sensitivity and partner priorities in target countries modulated the design of the project. This perhaps suggests that projects of this nature be conceived as modules, either thematic or geographical.

8 References

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Promotion of Neglected Indigenous Leafy and Legume Vegetable Crops for Nutritional Health in Eastern and Southern Africa (donor: BMZ, Germany)

Improving human nutrition and income through integrated agricultural research on production and marketing of vegetables in Malawi and Mozambique. (in partnership consortium led by Bioversity International, Sub-Saharan Africa Challenge Program)

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8.2 List of publications produced by project

None

9 Appendixes

9.1 Appendix 1: General terms of reference

A preliminary study to improve income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems

prepared by

Dr. Abdou Tenkouano, Director, Regional Center for Africa, AVRDC – The World Vegetable Center, P.O. Box 10, Dultuti, Arusha, Tanzania

1 Target Countries:

Ethiopia, Malawi, Mozambique, Tanzania

2 Objectives and deliverables

2.1 Objectives or terms of reference

This scoping study is planned with the aim of understanding the characteristics of vegetable production systems in Eastern and Southern Africa (ESA) to develop appropriate and effective technological interventions (improved varieties, efficient management of water, soil fertility and pests and diseases, appropriate harvesting and delivery) which can:

(i) maximize returns to inputs,
(ii) generate income to reduce poverty, within a context of gender equity, by appropriate market linkages, and
(iii) contribute to greater food and nutritional security, particularly for the most vulnerable (women and children), by increasing access to and consumption of vegetables

With this in mind, the objectives of this scoping study are to:

1. Analyze the poverty and food insecurity reduction potential of vegetable production in urban and peri-urban agriculture (vUPA) and rural agriculture (vRA) - Identify the thematic areas where vUPA and vRA can have a demonstrable economic impact on poverty reduction and assess the depth of knowledge in these areas.
2. Identify action-research topics, with high potential for providing practical and policy advice on to how to promote vegetable production in urban, peri-urban and rural agriculture as a poverty and food insecurity reduction strategy.
3. Identify research partners to implement these activities and establish the best combination of action-research topics and partners within a coherent research project to possibly be funded by ACIAR.

2.2 Activities

The scoping study will consist of (i) desk review, followed by (ii) country visits, leading to (iii) proposal drafting, and subsequent (iv) proposal fine-tuning and validation.

2.2.1 Desk review

This will consist of review of printed or on-line documentation available from various sources, notably AVRDC's reports and publications, Food and Agricultural Organization of the United Nations, national research institutions, regional economic commissions, regional research coordination bodies, and the private sector, among others.

Expected outputs:

- Literature survey summary drafted
- Check-list of questions for focused group discussion or interview with key informants developed

2.2.2 Country visits

As a crucial part of the analytical process, the objectives of the country visits are to:

1. Update and validate findings and research gaps identified by the desk review phase
2. Formulate and prioritize action research themes in each country in relation to the proposed urban poverty and food and nutritional insecurity reduction strategies

The country visits will be short (3 to 4 days per country). The steps intended for these visits are:

1. Analysis of the poverty reduction potential of vUPA and vRA
   a. How important are vUPA and vRA in terms of livelihood (food production for the household and / or cash income generation), labor opportunities, and coverage of the food needs in major cities and rural production basins?
   b. Are vUPA and vRA growing or reducing in/around cities and rural production basins, and what are the key drivers for the observed changes?
   c. Are the political, economic, and social contexts favorable to vUPA and vRA activities?
2. Identification of action-research topics
   a. What action research is currently being undertaken on vUPA and vRA in the ESA region?
   b. Who are the key stakeholders involved in these projects (funding agencies, research institutions, local administration, development organization, private sector)?
   c. What are the main research and policy gaps related to vUPA and vRA in the ESA region?

The scoping study team will conduct focused discussions and, when possible, a stakeholder consultation workshop or roundtable with key informants. Thus, the team will interview key players in the vegetable value chain including producers, business people, processors, consumers and policy makers. The collected information will be compiled and summarized for the report and draft proposal. Questions will be asked that will enable the scoping study team:

- To understand better the production systems involving vegetables, how vegetables fit in agricultural planning at urban, peri-urban and rural levels, the constraints and concerns.
- To know the farmers' requirements and availability of improved seed of both traditional and globally known vegetables.
- To assess existing seed firms or arrangements that deal with multiplication, packaging and distribution of seed of vegetable crops.
- To understand the demand (market) for globally known and traditional vegetables by consumers and processors.
- To have information on the current postharvest vegetable processing and packaging activities including traditional know how/technologies.
- To assess the entrepreneurship skills among vegetable producers, sellers and processors.
- To acquire information on organizations (e.g. NGO's, private or public) that work with various aspects of the vegetable production to consumption chain.
- To determine the level of understanding of nutritional and health benefits of vegetables among consumers and farmers.

- To know who is involved in research and development of globally known and traditional vegetables, what gaps exist and how to better integrate, coordinate or supplement existing efforts.

Expected outputs:

- Scoping study report produced.

2.2.3 Proposal drafting

Following the country visits the scoping team will convene a stakeholder workshop in Arusha with participants from all four target countries. A draft a preliminary project proposal on enhancing vegetable based farming and food systems to improve incomes and nutrition in Eastern and Southern Africa will be developed. The drafted project proposal will be fine-tuned and finalized with the scoping team in Canberra, Australia.

Expected outputs:
Draft project proposal produced.

9.2 Appendix 2: Ideas for a regional project to enhance vegetable-based farming and food systems to improve nutrition and incomes in Eastern and Southern Africa

Proposition 1 (Rationale):

The Eastern and Southern Africa (ESA) region is richly endowed with land and water resources suitable for the production of a diversity of food and vegetable crops, livestock and fish. Yet, despite this immense potential for a diversified production to assure food security and diet diversity, two nutritional problems co-exist, frequently in the same communities and sometimes within the same households, both in urban and rural settings. On the one hand, under-nutrition, including vitamin and mineral deficiencies is high. This is often associated with poor growth of children, and illness, which in turn reduce schooling and ultimately literacy rates and the ability to secure remunerative employment as adults. On the other hand, excessive weight and obesity are on the rise, often associated with type-2 diabetes, joint problems and heart disease, resulting in increased medical costs and lower work output.

The most important forms of malnutrition in ESA countries are the inadequate intake of proteins and deficiencies in vitamins A and C, folate, iodine and zinc. Lack of dietary diversity is a causal factor since cassava, maize and other cereals are their major staples. These crops are high in carbohydrates but low in micronutrients and vitamins. Micronutrient deficiency or “hidden hunger” is prevalent especially in the most vulnerable groups: women and children[7]. This malnutrition can damage cognitive development, lower disease resistance in children, reduce the likelihood of mothers surviving childbirth, and can result in high mortality, especially among the vulnerable populations. In Tanzania for example, at least 3 children out of every 1,000 are born with neural tube defects because of the lack of folic acid (NFFA, 2009)[8]. In addition, 4.2 million children and 4.3 million women are iron deficient (Elisaria, 2009)[9], causing anemia.

Malnutrition hurts the economy. Farmers and women laborers are weakened by inadequate energy and nutrient intake. Their poor health leads to reduced labor productivity and low farm yields. Opportunities for economic growth are also lost, as adults with poor mental development caused by inadequate nutrition during childhood are less able to innovate and respond to new market opportunities.

Vegetables are affordable sources of essential vitamins and micronutrients. Increasing the amount and variety of vegetables in diets can alleviate micronutrient deficiencies. Vegetables are also most appropriate crops for association with the ESA region rural production area dominated by maize. Many maize fields are left fallow during the off-season, where rotation, relay or intercropping with vegetable is mutually beneficial for the farming system. Relay-intercropping with vegetables makes use of residual moisture after maize has been harvested and can be irrigated if required. High farm gate values of vegetables offer opportunity for farmers to gain substantial additional household income and generate employments.

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[7] *http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.htm* (accessed 28 December 2010)

[8] National Food Fortification Alliance (NFFA) 2009. Action Plan Provision of Vitamins and Minerals to the Tanzanian Population through the Enrichment of Staple Foods: Reviewed and adopted by the High Level Forum called by the Government of Tanzania on 10 September 2009. Prepared with the support of Dr Anna Verster and Mr. Quentin Johnson, consultants, World Bank.

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Proposition 2 (Methodology):

Three inter-related efforts are thus proposed as pathways to enhance vegetable-based farming and food systems to improve nutrition and incomes in Eastern and Southern Africa:

Urgent need: Dietary diversity must be restored, and consumption of vegetables increased

Various traditional African vegetables have high nutrient content and are culturally accepted, usually eaten with cassava and maize staples. However, traditional African vegetables have received little research attention. Hence their contribution to local diets and economies is poorly understood, quantified or appreciated, despite their numerous potentially desirable attributes (Pasquini and Young, 2006)[10]. Increased production and consumption of traditional African vegetables in response to the greater demand for food from the growing population is constrained by the low productivity of current cultivars and landraces, lack of good quality seeds, limited knowledge of postharvest and processing technologies and opportunities, and a lack of awareness of the nutritional benefits of fresh and processed products.

Thus, there is urgent need to identify and promote the most productive and nutritious cultivars of the proposed focus vegetable crops to boost their production for increased profitability and consumption for food and nutritional security.

Providing employment: Increasing urban demand for vegetables can be met by addressing urban youth unemployment

As is occurring elsewhere ESA countries have a fast growing population that is essentially young and increasingly migrating to cities. Sadly, many migrants to the cities never find employment, or are unable to raise the capital needed to set themselves up as small-scale entrepreneurs. They may live in unsanitary conditions without proper housing or regular meals with adequate nutrition. High youth unemployment leads to increased crime, prostitution, and the spread of drug abuse and sexually-transmitted diseases.

The ESA urban population will need to be fed; this will have to be done by the smaller and aging proportion of the population remaining in rural areas. While urban and peri-urban production is fast developing as a much needed response to the demand for vegetables of the urban consumer markets, only the affluent in the cities will have access to the high-priced foods and the unemployed youth will remain hungry and threateningly resentful to the rest of the society. With supporting policies, urban and peri-urban vegetable production can be made attractive to the unemployed youth. They can be taught how to produce vegetables on available land in the cities to meet the rising demand for high quality produce for both fresh consumption in the cities and the nascent processing industry. In Tanzania for example, the local tomato processing industry has to resort to importing tomato for processing into paste even though the country has the potential to meet the demands.

Policies can be enacted to focus on gender issues and strengthening the role of young women through training in vegetable production and marketing. Creating community gardens would provide urban farmers with access to cultivable land. However, without adequate production and business skills, investment cannot yield profitable and sustainable returns.

[10] Pasquini, M. W. and E. M. Young. 2006. 'Networking to promote the sustainable production and marketing of indigenous vegetables through urban and peri-urban agriculture in sub-Saharan Africa (IndigenoVeg): I- International conference on indigenous vegetables and legumes. Prospectus for fighting poverty, hunger and malnutrition', Acta Horticulturae 752:41-48

Two-pronged approach: Intensive urban and peri-urban production, and enhancing rural vegetable farming with targeted research and development

Vegetables are one of the crops which are most responsive to inputs, with the highest returns per unit of land, time and labor. Market-oriented vegetable production essentially occurs in urban and peri-urban settings with a focus on globally known crop species such as tomato and chilli pepper, but rural production by small-holders remains the dominant feature for traditional vegetables such as amaranth and African night shade.

In rural settings, the focus should be on crop diversification with enhanced production technologies to boost vegetable production for higher productivity, opening up opportunities to increase household income and improve the households' nutritional status.

In urban and peri-urban settings, a small intensive plot approach is proposed which is cognizant of human and environmental safety, with appropriate market and value chain linkages for a growing cohort of unemployed youth.

In both situations, it is proposed that nutritional deficiencies be addressed by promoting diet diversification via increased consumption of nutrient-rich vegetables in association with food preparation methods that preserve or enhance nutrient content of foods.

Proposition 3 (Linkages):

The proposed research aligns strongly with the priority research areas of the Australian International Food Security Centre (AIFSC) within ACIAR. In particular, it addresses the Food Utilization program (Program 3) through improving nutrition, diversifying diets and (in the larger project proposal) exploring possibilities for food processing. The Food Access program (Program 2) is also addressed, through investigating market linkages and opportunities to generate income. The proposal also aligns strongly with the AIFSC cross-cutting program of Building Resilience in Food Systems (Program 6), allowing communities to respond better to extreme climatic events and other shocks.

A current ACIAR-supported project, SIMLESA (Sustainable intensification of maize-legume cropping systems for food security in Eastern and Southern Africa) aims to increase food security and income at household and regional levels and economic development in Eastern and Southern Africa through improved productivity from more resilient and sustainable maize-based farming systems. The project is operating in Ethiopia, Kenya, Malawi, Mozambique, South Africa, Tanzania, Uganda, and Zimbabwe.

Agriculture development aid has traditionally supported the starchy staple crops, such as rice, maize, wheat, and cassava. An abundance of these crops will only amount to a "Grain Revolution" if the vegetables required to balance the diet are not equally abundant. Consequently, a "Revolution with Greens" is also highly necessary.

The idea is that the project subsequent to the proposed study will synergize SIMLESA by diversifying production and diets through increased integration of vegetables into maize-dominated farming systems with options for postharvest processing that will accrue benefits for the rural households.

A USAID-supported Tanzania Agricultural Productivity Program (TAPP) aims to achieve greater productivity of food crop agriculture in rural areas, whilst the improved road and transport infrastructure will help to connect rural production basins to urban consumer markets. However, this is more difficult to achieve for vegetables because of their highly perishable nature that makes them very difficult to transport over long distances.

The subsequent project is thought to complement TAPP by increasing the productivity of peri-urban and urban vegetable production systems to respond to the transportation related problems in vegetable enterprise. The project will focus on engaging and

empowering unemployed youth to enable them to generate income through vegetable production and related activities.

9.3 Appendix 3: Contribution from CABI Africa

From: Day, Roger (CABI-Africa) [mailto:R.DAY@CABI.ORG]
Sent: Thursday, June 14, 2012 10:11 AM
To: Nadine Kwazi
Cc: 'Abdou Tenkouano'; Karanja, Daniel Kimani (CABI-Africa); Akiri, Morris (CABI)
Subject: RE: ACIAR-identified Key Informants

[-----]

We find the scoping study well thought out, and covering all the major areas. I attach a document with some additional comments which we hope will be useful. As stated therein, we'd be pleased to be invited to the stakeholder workshop.

[-----] we look forward to the results of the scoping study.

Best wishes, Roger

Roger Day
Deputy Director, Development
CABI Africa
United Nations Avenue
P.O. Box 633-00621
Nairobi
Kenya

Telephone: +254 (0)20 7224450
Fax: +254 (0)20 7122150
Email: R.Day@cabi.org
Visit us at: www.cabi.org

From: Karanja, Daniel Kimani (CABI-Africa)
Sent: 07 June 2012 15:34
To: Nadine Kwazi
Cc: 'Abdou Tenkouano'; Day, Roger (CABI-Africa)
Subject: RE: ACIAR-identified Key Informants

Dear Nadine,

Thank you for identifying CABI as a key informant in the current scoping study for development of a regional project on vegetables.

I wish to inform you that Dr Roger Day (Deputy Director, Development) has kindly agreed to compile some ideas/suggestions/advise, on behalf of CABI in Africa. This will be sent to you tomorrow (8th June 2012) as requested.

I noted in one of the attachments (General Terms of Reference)that you were developing a checklist of questions for key informant interview. We would be very grateful if you could kindly send us the checklist if it is available?

Kind regards,

Daniel

Regional Project to Enhance Vegetable-Based Farming and Food Systems to Improve Nutrition and Incomes in Eastern and Southern Africa

CABI Africa, Nairobi
Contacts:
Morris Akiri, Regional Director, m.akiri@cabi.org
Roger Day, Deputy Director, r.day@cabi.org
Daniel Karanja, AIV Seed Systems Project Manager, d.karanja@cabi.org

General comments

We welcome this initiative, and the opportunity to comment. We were in Australia earlier this year, and ACIAR advised us that they were commissioning this study, and that we should link up with AVRDC, so we appreciate AVRDC's invitation to make our inputs. Some specific comments are given below.

We would also be happy to participate in the stakeholder workshop in Arusha at which the scoping study report will be discussed and a preliminary project proposal developed. We have projects in all the 4 countries, we already enjoy good collaboration with AVRDC on a project on African Indigenous Vegetable Seed Enterprises, and would have contributions to make in some of the key areas we highlight below.

Specific comments

Rationale. We fully agree with the rationale for this project. It is in line with NEPAD's Comprehensive Africa Agriculture Programme (CAADP), which envisages a shift in the balance between cereals and fruit/vegetables from 92.5% (cereals) and 7.5% (fruit/vegetables) at present, to 85% (cereals) and 15% (fruit/vegetables), as a result of increased irrigation and water management. In other words fruit/vegetable production is planned to double, so this project would contribute to that. The challenge, as ever, would be to implement a project that had significant and lasting impact, so we suggest a few areas below which would need to be considered.

Demand. Consideration is needed of the consumer demand for vegetables. Your scoping study includes assessing whether vUPA and vRA is increasing or reducing, and what the key drivers are, and this is important. If there is demand (current or latent) that the project can respond to, then it will be easier than if the project is actually seeking to modify demand. So, for example, will the project include public awareness efforts to promote vegetable consumption, or is the demand assumed to be strong enough to focus on supply side issues? I assume that the market being considered is local/national/regional, rather than the high value export markets of Europe and elsewhere?

"Sustainable intensification". Market oriented vegetable production is often more intensive than production for home consumption. This may include irrigation, the use of

high quality seeds, and increased use of fertiliser and pesticides. In such cases the challenge is to achieve the economic goals without causing environmental damage. For example, from our work on crop protection in peri-urban vegetable production, we know that pesticides are misused in various ways. So the project needs to take into account the need for intensification in ways that will not damage the health of the environment, producers, or the consumers.

Food safety. Bearing in mind the previous paragraph, and given that a rationale for vegetable production is improved food quality, it might be necessary to include food safety considerations. Pesticide residues, for example, are quite common on vegetables in the local market, despite the fact that capacity exists to meet the high food safety standards of international markets. As local markets become more sophisticated, food safety issues are likely to become more important, and this links to marketing issues.

Technology uptake. Production for market provides the "pull" for technology uptake, but at the same time, some "push" maybe required. The area of getting new technology adopted is not straightforward, and requires a combination of issues to be addressed. These include extension/communication, policy & regulation, markets, credit, risk management, seed systems (for improved varieties). Some of these are discussed further below. Suffice to say that there are many examples of excellent technologies that are not widely used, because the combination of circumstances makes it not worthwhile for the farmer to do so.

Extension/Communication. Communicating information to different stakeholders, including farmers, is important, but an area that research projects often don't adequately address. We are currently running a B&M Gates Foundation project on communicating soil fertility information to a range of stakeholders, and through that and other work are using various different communication tools, from traditional printed materials, through to mobile phones.

Communicating with farmers (extension) is obviously a key area, and one of the challenges is how it can be done most cost effectively. You mentioned our Plantwise Initiative (www.Plantwise.org), under which plant clinics are being established. A plant health clinic is an extension method by which farmers can receive advice in much the same way that they would receive advice from a human health clinic. In this case it is a plant rather than person that is sick, but the principle is the same. The clinics run for about half a day every 2 weeks, so can be integrated with extension providers' other work. Often they are run by the government extensionists, but NGOs, farmer associations and private sector can all run clinics too. Several features of the approach are beneficial; it is demand-led, it reduces the need for extension to travel to farms, and by recording farmers' problems, it provides a way of keeping in touch with their actual needs. But like all extension methods, plant clinics can't do everything! For example, they can't reach very large numbers – for that, different approaches are required. Plantwise is currently working in 7 countries in Africa, including Tanzania, and we have Malawi, Mozambique and Ethiopia all on our list for planned expansion.

Seed systems. One of the constraints to improved production of many crops including vegetables is the availability of appropriate seed. There is a wide range of issues in seed systems from policy/regulation (national and regional), through to capacity issues of seed bulking, and marketing, to name a few. A significant expansion of vegetable production will need seed systems with the capacity to respond to increasing and changing demand, including for new and improved varieties. This would need to be a component of the project, as your scoping study implies.

9.4 Appendix 4: Malawi country report – Bvumbwe Agricultural Research Station

Poverty reduction potential of vegetable production in urban and peri – urban agriculture and rural agriculture

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From: Thomson Chilanga [mailto:tchilanga@yahoo.co.uk]

Sent: Friday, June 08, 2012 6:36 PM

To: nadine.kwazi@worldveg.org

Subject: Fw: Paper for Arusha meeting

Nadine

Please find attached for your action. I tried with the Ministry but was late for them to allow me to move on. It's just unfortunate that I could not get the mail in time. Try this one next time.

Regards

Thomson

----- Forwarded Message -----

From: Charles Malidadi <charlesmalidadi@yahoo.com>

To: Thomson Chilanga <tchilanga@yahoo.co.uk>

Sent: Friday, 8 June 2012, 8:05

Subject: Paper for Arusha meeting

Sir,

Please find the attached report for Arusha meeting.

Regards,

Charles

MALAWI COUNTRY REPORT – BVUMBWE AGRICULTURAL RESEARCH STATION

POVERTY REDUCTION POTENTIAL OF VEGETABLE PRODUCTION IN URBAN AND PERI – URBAN AGRICULTURE AND RURAL AGRICULTURE

Vegetable production in urban and peri-urban agriculture and rural agriculture (vUPA and vRA) plays important roles to the livelihoods of many people in urban, peri-urban and rural areas. Vegetables can be the only source of income in those areas as most of the people depend solely on agriculture for their livelihood. Vegetable production does not require heavy capital investment unlike other horticultural crops because they are mostly grown on small pieces of land. Vegetable production provides all year round employment to most people living in those areas as the crops the crops all grown throughout the year. The urban areas provide ready markets for vegetables grown in both rural and peri-urban areas. In turn the health status of people living in urban areas has improved because most of the vegetables are nutritious because they contain proteins, vitamins, iron and carbohydrates. The most important vegetables grown in Malawi are tomato, cabbage, onion, mustard, amaranth, green pepper, carrots etc.

uVPA and vRA is growing both cities and rural areas. Of course there are minor differences between those areas because in cities production plots are relatively small while in rural production the plots are bigger. The increase could be attributed to increase in the population in cities, change in the eating habits of people and also campaigns and awareness meetings conducted throughout the country aimed at promotion of both production and utilization. The population increase in rural areas has led to reduced land holding sizes (0.2 ha on average) of smallholder farmers and thereby making farmers who were producing field crops to switch to vegetable production because vegetables require small pieces of land to be produced.

Political, economic environments in Malawi are favourable to vUPA and vRA activities because there is a political will to support research activities by the government. Money lending institutions are also there to provide loans to farmers who would want to venture into vegetable production. The communities are accepting vegetables as part of their daily food.

There have been a number of research activities being conducted. These include

1. Generation of technologies which are high yielding, disease and pests tolerant. This has helped because farmers have now improved their levels of production and also the quality of the harvest has improved
2. Improving the shelf life of vegetables: work is still under way to come up with vegetable crops which have longer shelf life because most farmers do not have refrigeration equipment in the rural areas hence in the past they would incur a lot of postharvest losses because vegetables deteriorate very quickly
3. Value addition technologies; work has been conducted to come up with several products which farmers could make in order to reduce postharvest losses. The technologies include production of puree, paste, vegetable juice and others
4. Research work on indigenous vegetables: there has been a lot of work on indigenous vegetables in terms of their propagation and utilization. Different recipes of indigenous vegetables have been developed and promoted at household level as well as national level.

The key stakeholders involved in the projects are International Centres, such as Bioversity International, Word Vegetable Centre for Africa AVRDC and Forum for Agricultural Research in Africa (FARA), nongovernmental organizations, farmers unions, researchers, extension workers and buyers.

The projects are being funded by AVRDC, FARA and Bioversity International.

Research Gaps

The research gaps would be

a) Coming up with diverse varieties of vegetable crops which are high yielding, disease and pest tolerant in order to give the smallholder farmers a wide choice of alternatives as this will also encourage diversification.

b) Improving the nutritional content of vegetable crops: more work should be conducted to come up with many vegetable crops which are nutritious to help in combating effects of malnutrition in the country.

c) Value addition technologies: more work should also be conducted in coming up with many value additional technologies for vegetable crops as this will help farmers to get better prices on the markets

d) Marketing: there is also a need to do more research on the marketing of vegetables such that all the dynamics should be followed properly when sales of vegetables are conducted as this will help farmers to sell their vegetables without many problems.

9.5 Appendix 5: Tanzania Country Notes

From: tasta tasta [mailto:tasta02@hotmail.com]
Sent: Friday, June 08, 2012 3:43 PM
To: AVRDC NADINE KWAZI; SAMALI NJAU S. HORT -TENGERU; tasta 2 tasta
Cc: AVRDC ABDOU TENKOUANO; bobshuma08@hotmail.com; TASTA PROJ OFFICER THOMAS MINDE HUGO; [Mafsc Tasta P.O.] CLEMENCE KIVUYO
Subject: RE: ACIAR Scoping Study in Eastern and Southern Africa - Arusha

Dear Mr.Samali

It is unfortunate I won't be in the country due to earlier commitments to take emerging entrepreneurs on eye opening visits to Kenya and Uganda in order to prepare them for the ISTA accreditation and trade opportunities within the region. While you are preparing your presentation, kindly take the following on board as private sector priorities.

1. Capacity building to local entrepreneurs to expand vegetable production areas. - Currently more companies are being recruited and sharing same women groups to produce seed. We have 50 companies registered among which 15 are local and all wanting to produce vegetable seed as a product in their Business Plans.
2. Capacity building to assist local entrepreneurs develops Business Plans. - Many don't have Long term Plans which can capture the opportunities available by having AVRDC around.
3. Women production groups capacity building - They need more workshops so that we can get opportunities to "listen" to them. Often we have forgotten that. They are all the times only wanted in the farms.
4. Women groups need to find their ways to financial institutions which can help in organizing them then fund them. We need to bring in more of Women Bank and their packages which are tailored on land utility.
5. As we jump to Eastern Africa market opportunities local companies need Quality assurance training not only production. Currently we are working on having "taxes removed from packing materials' but getting Quality packing materials is a headache to the locals. Who can supply them if we had to organize them print in bulk? Send them on tours abroad.
6. Use of available germplasm need experts to assist local entrepreneurs enhance R&D rather capacity building.
7. Use of vegetable is an issue within the country. We need to create more awareness. We have to go to the politicians to ask them preach it including related opportunities for women and youth employments, it means awareness creation. packages. Print more readables. Send them to every school in TZ. Farmers will get them. We use District Education officers.
8. We can have increased production using available germplasm, but establishing "Veg's collection centres" would help farmers and traders link at a point in common and sustainably. Establish those centres if you can.
9. Pricing is an issue for farmers. It either excites them or discourages them. We should strive to send information on local FM radios of the good news in Vegs world of production. Farmers need to hear themselves mentioned or seen in TVs.
10. TASTA would like to participate in preparations of Seed Fairs. Build its capacity, empower them not as spectators.

Thanks. May be one or two from this will help. You have full support from TASTA for the project. Our local entrepreneurs won't survive if they don't have Vegetables in their range of products. Bob Shum - Executive Director

From: Eugene Agbicodo [mailto:e.agbicodo@rijkzwaan.com]

Sent: Thursday, June 07, 2012 7:27 AM

To: Nadine Kwazi

Cc: 'Abdou Tenkouano'

Subject: RE: ACIAR Scoping Study in Eastern and Southern Africa - Arusha

Dear Nadine,

See below my contributions. I will participate in the meeting of 12 to 13 June. However, where the meeting be in Arusha?

Key priorities for enhancing vegetables production and food system in Tanzania

General remarks: according to IFPRI, (2010) malnutrition in Tanzania is very high and the level on vegetables is far behind the required amount by WHO and FAO. Furthermore, the vegetables consumption in urban areas is much higher when compared with rural areas according to the same report. Based on these remarks, priorities will be as followed:

1. Characterize the existing indigenous African vegetables collection
2. Investigate the nutritional values of these indigenous African vegetables
3. Genetic improvement of indigenous vegetables in terms of quality and disease resistances that are of added value to the supply chain
4. Broaden the collection of the indigenous African vegetables
5. Create awareness and importance of vegetable consumption in the urban and rural areas
6. Promote the 9 indigenous vegetables that have been released in 2011 by AVRDC and Horti-Tengeru
7. Bring the available technologies and know-how to the stakeholders by carrying out participatory variety tests and demonstration trials
8. Improvement of market access and develop mechanisms to enhance marketing system
9. Enhancing capacity building training at all level and include practical training, tailor made courses, internship, MSc and in depth studies to breeders, pathologist agronomist, researchers, managers, policy makers, and extension service.

Best regards and greeting to Dr. Tenkouano,

Eugene

Breeding Manager

Rijk Zwaan Afrisem Ltd.

Dolly Estate, USA River

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PO Box 12345 Arusha, Tanzania

www.rijkzwaan.com / www.afrisem.com

From: samali njau [mailto:silivesta@yahoo.com]

Sent: Friday, June 08, 2012 1:32 PM

To: Nadine Kwazi

Subject: Re: ACIAR Scoping Study in Eastern and Southern Africa - Arusha

Nadine,

Some areas of priority.

Samali

Areas for priority

1. Promotion of recent released vegetable varieties
- Sensitization/collaborative campaigns for increased adoption of released vegetables through demonstration plots (on farm), exhibition, field days, shows

2. Germplasm collection, evaluation and improvement

3. Promotion of utilization of AVSs
   - Market survey – information of different methods of utilization – daily consumption for various AIVs.
   - Capacity building on seed production
   - Capacity building on nutritional benefits
   - Seasonality of leaved production hence consider preservation methods
   - Marketing strategies
   - Strengthen linkages: policy school/hotel/rest, middlemen

4. Postharvest handling /value addition

5. Breeding/evaluation of AIVs for resistance to diseases and insect pests

9.6 Appendix 6: Report of an ACIAR sponsored fact finding mission on vegetable supply chain in Ethiopia carried out between May 29-June 1, 2012

Victor Afari-Sefa, AVRDC-The World Vegetable Center, Arusha, Tanzania

Benjamin Dent, ACIAR Consultant (School of Agriculture and Food Sciences, University of Queensland, Australia)

June 04, 2012

1. Summary

A fact finding mission to Ethiopia was undertaken by a representative of AVRDC-The World Vegetable Center and a Consultant of ACIAR from May 29-June 1, 2012 as part of a larger ACIAR sponsored scoping study entitled “A preliminary study to improve income and nutrition in Eastern and Southern Africa by enhancing vegetable based farming and food systems”. The aim of the mission was to get familiar with the stakeholders of the vegetable value chain in the region, identify the most important constrains that can be addressed/improved that contribute to food and nutritional security and economic growth by improving the income generation potential and welfare of vegetable value chain actors and to identify potential local partners to address the issues identified through action research.

The mission findings are synthesized into a brief summary which describe the outcome of the discussions with the key identified institutions operating in the vegetable sector, the major activities of various value chain actors as per interviews conducted to explore their contribution towards the supply chain and identify key constraints to the growth of the industry in Ethiopia.

The mission found that overall, consumption of vegetables is growing, as awareness of their health benefits increases and the cost of meat, which traditionally forms a major component of the Ethiopian diet rises. However, in responding to this opportunity, vegetable value chains face four challenges:

- Accessing inputs, especially quality seeds, agro-chemicals (pesticides and inorganic fertilizers) and water for dry-season production, and advice from extension officers who are largely specialists in cereal production;

- The dominant role of brokers between farmers and wholesalers/retailers, allowing them to exploit farmers' lack of access to marketing information (price, potential demand for both traditional and alternative vegetable types).

2. Vegetables in Ethiopia

Vegetables in Ethiopia are mainly produced from the *Rift valley region* and sold mainly in Addis Ababa the capital or exported to countries such as Djibouti. Very little vegetables are transported and sold in other regional capitals. Smaller quantities are produced in Eastern Ethiopia and some isolated parts of northern Ethiopia. IDE has recently introduced vegetable production in some parts of the Ethiopian Highlands but these are on a small-scale mainly to promote increased household consumption due to the need for irrigation facilities as a pre-requisite for production in this agro-climatic zone. Similar to most other countries, two groups of vegetables could be distinguished in Ethiopia:

- Globally important vegetables. The major ones identified from both farms and the markets and discussions with stakeholders are: chilli, head cabbage, garlic (in the Highlands), onions, tomatoes, carrots, beetroot, lettuce, sweet pepper, cucumber, celery etc.
- Indigenous vegetables: The main indigenous vegetable identified was the local kale. Others such as African eggplant, African nightshade and amaranth are not grown in the country and may be difficult to promote as per existing import permit restrictions.
  Historically, leafy indigenous vegetables in Ethiopia are by perception a poor man's food. This is however changing due to (i) increased awareness of the nutritional benefits of vegetables especially in urban areas, (ii) increased promotion of the health benefits of vegetables in controlling non-communicable diseases, and (iii) increased price of red meat which traditionally forms a major component of the Ethiopian diet.

Additional details of vegetable value chains in Ethiopia are available from value chain studies conducted by IDE and were shared with the team by the IDE Country Director for Ethiopia.

3. Defining the challenge for the proposed research

3.1. There is a knowledge gap:

- Most smallholders do not appreciate the extent of the market opportunity in reliably providing good quality vegetables to the market.
- Individual retailers, including supermarkets, do not have the opportunity to source more directly from farms. Supermarkets' share of the market is expected to grow, but only slowly.
- Neither government officials nor NGOs recognise this gap in the value chain, so they do not intervene to bridge it. IDE has been working to facilitate linkage of its target smallholder beneficiaries to various markets outlets but has not got the capacity to directly provide the infrastructure required at the national level to address bigger picture issues.

3.2. The proposed research could involve:

- Increasing awareness on the nutritional importance of vegetables to increase demand (through IDE, to Government and other NGOs).
- Improving awareness through diverse communication channels on the extent of the existing income generating opportunities from vegetable production and marketing, and the necessary steps to exploit it, including in production, especially identity/availability of critical inputs; and in postharvest, especially handling to ensure quality product delivered to market.

- A more detailed value chain analysis to identify the drivers of vegetable demand, the extent of the opportunity (products and volume) and an assessment of the resources and capacity of Rift Valley smallholders to respond to it. The Rift Valley is likely to be the most plausible initial source of vegetables, to be gradually supplemented by Highland smallholders.
- Strengthening of market information systems as farmers and traders currently rely on brokers for market transactions. IDE has some plans to place personnel in markets to provide updated price information to its farmers but has not yet had funding for this initiative. This could this be worth looking at in the proposed project.
- Devising appropriate outcome measurements (nutritional improvement and poverty reduction) to evaluate the project results through improvement value chain management, as well as using the project as a demonstration to others.
- Identifying specific potential commercial partners (entrepreneurial farmers who are willing to move away from the spot market; receptive retailers etc.)

3.3. The research problems would be:

- How to improve vegetable seed/cultivar quality either by introduction of varieties released in other countries following adaptation trials or by improving existing in-country germplasm as may be applicable. Currently the majority of seeds are imported with smaller quantities being made available to farmers from the Melkassa Agricultural Research Center. The Center assists farmers to multiply seeds and ensure basic testing criteria such as germination percentage etc. but there is no official seed certification body in Ethiopia to give appropriate oversight. Nonetheless majority of farmers are making income from sale of seeds such as chilli, indicating that opportunities exist for farmers to earn income from seed business.
- How to adapt and apply value chain analysis to smallholder horticulture in ESA, and identify the critical interventions to improving production, postharvest activities, value chain management and increasing consumption of nutritious vegetables
- How to communicate these findings effectively to those stakeholders who can affect long term change in this setting.

3.4. The following partners were identified to be very active in the vegetable sector and also have active programs in the Rift valley region during a stakeholder discussion held at the offices of IDE on May 30, 2012:

- IDE. It has the credibility and network in the area to guide the project to success, and already it is involved in facilitating the introduction of irrigation to smallholders for vegetable production. They also have a member of staff (INSERT NAME) who would be an ideal member of team on the ground, both contributing to its success and acting as a capacity building legacy of the project.
- Melkassa Agricultural Research Center - the federal NARES institute that has the mandate to conduct vegetable research. A Horticultural Pathologist and Coordinator of the National Horticultural Research Program is available to collaborate on the project. Principal contact is Dr. Yesuf Mohammed, Horticultural Pathologist and Coordinator, National Horticultural Research Program, Melkassa Agricultural Research Center (MARC) Email: mohanarc@yahoo.com
- Debrezeit Agricultural Research Center the federal NARES institute that has a Vegetable Breeder who has once visited Arusha for a possible collaboration on a previous initiative is at post and willing to collaborate on this proposed project. Major needs for germplasm improvement include control of garlic rootrot and improved local kale varieties. Others include resistance to tomato bacterial wilt and early and late blight resistant tomatoes. Areas of collaboration can include (i) evaluation of AVRDC advanced lines of vegetable crops grown in Ethiopia for possible release in the country following multi-locational trials (ii) already released

AVRDC vegetable varieties in other countries in Africa could be tested for adaptation in collaboration with the responsible NARES institutions and promoted after evaluation. Principal contact is Dr. Getachew Tabor, Vegetable Breeder, Delbrezeit Agricultural Research Center. Email: getachewtf@yahoo.com

- Agricultural Transformation Agency. Its goals are food security, poverty reduction, and human and economic development through three primary focus areas: value chains (though initially cereals and livestock chains, not vegetables), systems, and special initiatives. Accordingly, it is aligned to the objectives of ACIAR project, and should be a key stakeholder in ensuring that the research achieves tangible outcomes. An appropriate contact person is yet to be identified as they were not invited to the meeting. Their named came up during the stakeholder discussions.
- Others: Amhara Regional Agricultural Research Institute and Sasakawa Africa Association. These partners were proposed to participate in the stakeholders meeting organized on May 30, 2012 but were not able to attend as their staff were not available at the time of the visit. It is suggested that follow up discussions be held with them to identify the roles they could play in the proposed research.

4. Findings from visit and interactions with vegetable value chain actors:

i. Production and Farmers

- Time constraints meant we were only able to visit the IDE irrigation project nearest Addis. We concluded that its smallholders were too small (vegetables grown substantially for home-consumption) and as yet too inexperience to be early adopters into a value chain project, plus the logistics would be difficult for so few farmers' participation. However, we were told that smallholders in the Rift Valley had large plots, and were more geared to commercial production. Verifying this should be an early activity within a more thorough value chain analysis within the full project. Farmers generally grow vegetables as sole crops on different parcels of the same piece of land but rotate it with other vegetables or crops.
- Dependence on rain-fed production has limited supply of vegetables, but IDE has been facilitating farmers' investment in irrigation pumps to allow for dry-season production. This has been funded for three year by the Bill and Melinda Gates Foundation.
- Farmers reported problems in supplies of inputs, especially seeds and chemicals, due to limited availability, quality (germinations rates and yield) and price. For example, pesticides were easily available in the rainy season, driven by the substantial demand from cereal farmers, but unavailable in the dry season, when there was no demand from cereal farmers, and the vegetable sector was too small to attract supply. Both chemical Seeds were of variable quality.
- Government extension service focused on field crops, and so poor knowledge of vegetables and dry-season production (usually advise excessive pesticide application).
- Finance can be problematic, so IDE link farmers to micro-financing institutions.
- Market information is also a problem for farmers. IDE would like to pilot a project with someone in the wholesale market texting the price back to farmer to inform their negotiation with brokers.

We asked one farmer about his attitude to contract farming in return for an average price, and he would prefer to take the risk on the spot market (though this may have been due to high price of garlic last year, and this being only his second year in vegetable production).

IDE argued that constraint is demand not farmers' capacity to grow.

Land - all land is state owned, but this is not a constraint on farmer's willingness to invest because they have user-rights.

Labour – family labour is mostly used. One farmer reported that installing irrigation meant his children could work with him rather than be employed looking another villager's cattle.

There is only one significant vegetable processing plant in the Rift Valley, which is reluctant to buy from smallholders because they are opportunist and do not fulfil commitments to supply.

- The project could extend to including some sorting and packaging activity in the Rift Valley by a group of farmers, because:

  - This would be a value adding activity, which would assist in improving rural incomes;

  - It should reduce wastage from damage in transport, and ensure sorting/grading took place earlier in the supply chain, with second grade produce being sent to less demanding outlets, or composted for use on farms (currently, Bambis sorts and packs in-store)

  - It could be an activity undertaken by women, and hence contribute to investigate the gender issues included in the project brief.

ii. Wholesale markets

Though we met a couple of entrepreneurial stall holders, currently the market is too tightly controlled to offer potential. However, the government is forcing a break-up of the main market to create a number of de-centralised markets throughout Addis. This is design to break the control of wholesalers and the standardised offering of retailers at the market, though there are many sellers at the market, the prices, quality and variety of produce are practically the same. Accordingly, opportunities should emerge post-de-centralisation to expand the learnings from this research.

iii. Supermarkets

Currently, only found in Addis Ababa, and not significant in terms of production volumes. However, expected to grow as population expands, though sourcing fresh produce beyond Addis may be a problem because traders currently focus on Addis, which is a convenient overnight delivery from the Rift Valley.

We visited Fantu (chain of 3 stores) and Bambis (1 store only) both serve high end consumers. The Fantu store visited was in the diplomatic quarter, and attracts higher income customers. However, the vegetables were considerably inferior to those seen in the central vegetable market, yet sold for approx 75% more. Fantu stores are 90% supplied by Elfora (an integrated producer/processor/ distributor), the rest coming from the wholesale market. Though the manager reported that neither she nor her shoppers were concerned about the quality or variety of produce, the latter seems unlikely, and could be a topic for consumer research. Fantu had to close a store in another upmarket area recently, so may be receptive to assistance.

Bambis is a long established, high-end retailer. Its vegetables were better quality and more varied, and traded at approx 300% of the central market price. The owner complained passionately at suppliers' unreliability (availability and quality) and the lack of choice of suppliers, and equally about the potential for Ethiopian farmers to meet her requirements. She appears to be potentially a very willing commercial partner. Promisingly, Bambis offers some more unusual products, including herbs, which may offer

farmers new opportunities (currently the basil is grown in the owner's garden because she cannot source it elsewhere). Notably, the owner was both

- Fussy – she employs staff to sort and re-pack in-store, and charging suppliers for all produce which was not accepted.
- Charitable. Because of the unreliable large suppliers she was forced to use, she had four people she called upon in rotation to supplement supplies, with orders issued in the evening for fulfillment the next day. She provided the cash upfront for these men to buy the produce, and used for instead of one "because they all have families". Therefore, she should be a willing participate in a project to assist smallholders.

Further investigation may reveal additional further partners, such as high end hotels, and more diversity of under-supplied products. In addition exploratory research activity involving integrating smallholders into the value chain can be explored: can vegetable smallholders be integrated into value chains serving small supermarkets (a sector which is growing in many ESA countries)? Through making a concerted effort with a supply chain into BAMBIS and/or FANTU supermarkets, the project will investigate the willingness and capacity of smallholders to commit to reliable, high quality servicing of specific retailers (and possibly hotels too). Even if the experiment fails, it would provide insights into the barriers which exist, and hence whether future focus should be on improving smallholders' returns from supplying traditional markets, rather than upgrading to supermarkets.

iv. Other potential customers

Hotels, universities and hospitals all considered opportunities for the reliable supply of quality vegetables.

Consumers

Not much is known about vegetable consumption. However, vegetables are seen as poor man's food, and so meat is preferred for status reasons, and vegetables' nutritional value is not widely understood. However, trend is changing because:

- Awareness of nutritional value is increasing. Especially in urban areas
- Doctors are advising people to increase vegetable consumption
- Price of meat has risen recently (as grazing area is reduced, production decreases, while population increases), and so vegetables are seen as a more affordable alternative.

Appendix – Summary of IDE report *Ethiopia Value Chain Analysis of Selected Fruits and vegetables in Arba Minch and Chencha woredas*

Supply chain structure

In addition to home consumption, vegetables have four routes to market:

- City markets, primarily Addis Ababa, but also Dire Dawa and Harer;
- Town markets within the region;
- Small local village markets
- Direct, farm-gate sales to immediate community

While about 75% of growers sell at the farm gate, the majority of volume goes to regional town markets via local traders.

Village assemblers/agents of regional traders are buyers for 96% of tomato growers in Arbaminch Zuria, while village retailers are major buyers for 40% of Chencha cabbage growers.

The Gamo-Gofa fruits and Vegetables Marketing Cooperatives Union is rarely used by fruit growers and not at all by vegetable growers. Smallholders' reluctance due to:

- History of unreliable transport because cooperative does not own its own trucks (and is vulnerable to traders persuading truck rental companies not to rent to the union)
- Lower price than private traders (though this is offset by weight cheating prevalent amongst traders, farmers are often unaware of this)
- No credit arrangements

Current arrangements disadvantage farmers because small number of wholesalers for city markets, who prevent competition by informally agreeing with regional traders not to deal with any new traders or wholesalers to prevent new entrants. Limited numbers of regional traders eliminate smallholders' choice over customers, and the traders jointly determine farm gate prices.

Production Constraints

a) Water: inability to access surface or ground water or to harvest rainwater; lack of awareness over water lifting technology; lack of water/time efficient irrigation through drip irrigation or sprinklers
b) Seeds/seedlings: inability to prepare own seeds/seedlings yet limited number of private suppliers; seeds often sold in packs which are too large and too expensive; irregular quality
c) Pest/disease: minimal use of pesticides
d) Soil infertility: erosion and degradation; minimal use of fertilisers
e) Lack of credit facilities: even where available, payment terms often begin within two weeks, which does not suit agricultural cycle.

Market constraints

a) Low prices because of
    a. lack of integration into better markets, due to: low production levels; entry barriers; lack of financial capacity and market knowledge, including price information
    b. lack of marketing cooperatives
    c. price-takers because usually only one buyer
    d. market glut at harvest time, yet lack of storage and processing facilities
b) Wastage due to lack of access to all weather roads; limited village demand and high transport costs to other local markets.

Recommendations (details in Section 9 of report): Improve

- Water management
- Access to improved seeds/seedlings
- Pest disease and disease prevention
- Access to input credit facilities
- Extension support
- Smallholders' participation in better markets
- Access to market price information
- Diversification of production
- Post-harvest crop management facilities
- Consumer demand

9.7 Appendix 7: Scoping study report - Mozambique

Chris Ojiewo, AVRDC - The World Vegetable Center, Arusha, Tanzania

Suzie Newman, NSW Department of Primary Industries, Australia

June 14, 2012

1. Summary

A scoping study was undertaken in Mozambique from the 8th-10th June 2012 as part of ***FSC/2012/001 A preliminary study to improve income and nutrition in eastern and southern Africa by enhancing vegetable-based farming and food systems***. The scoping team met with representatives from CIP, IIAM and Moz seeds who provided an overview on the vegetable industry in Mozambique. They then spent 2 days in the field visiting commercial and peri-urban farms, wholesale markets, retail markets and a supermarket. This brief report details those meetings and visits.

Key challenges facing the vegetable industry in Mozambique:

- Competition from South African produce
- Access to good quality and reasonably priced inputs
- Climatic challenges (high temperatures, humid conditions, low rainfall) and developing efficient production systems to cope with these
- Poor road infrastructure in the Northern and Central regions – making it difficult for farmers to access markets
- High postharvest losses
- Food safety

Research opportunities:

- Value chain and market analysis
- Developing production packages – varieties (drought and heat resistant), agronomy, pest and disease management, irrigation etc.
- Postharvest management and value addition – identify opportunities to reduce postharvest losses and improve quality out-turn

- Food safety
- Evaluate potential for off-season production
- Determine opportunities for semi-commercialising indigenous vegetables

2. Objectives

- To gain an understanding vegetable value chains in Mozambique
- To define the challenge for the proposed research
- To Identify project partners and resources

3. Vegetable production in Mozambique

In 2011/12, the Ministry of Agriculture anticipated that of the 5.5 million hectares currently producing food crops, 156 000 ha (or 3%) were growing vegetables. Likewise of the 16.3 million tonnes of food crops produced, 1.3 million tonnes (or 8%) were vegetables. The major vegetable crops included in the production estimates were potato, tomato and onion. Full details are provided in Appendix 2.

Of the globally important vegetable crops – potato, onion, tomato, cabbage and lettuce seem to be the major crops produced. For indigenous vegetables – amaranth and cowpeas are produced – but further work needs to be done to determine the marketing opportunities for other indigenous vegetables.

4. Meeting with local research partners

A meeting with Elias Munda (CIP), Isabel Cachomba (IIAM), Boaventura Nuvunga (IIAM) and John Makoni (Moz seeds) provided the scoping team with an overview of vegetable production and marketing in Mozambique, background on R&D in Mozambique and insight into what are some of the challenges facing input suppliers, farmers, wholesalers, retailers and consumers. The notes following summarise these discussions.

a. How agricultural research works in Mozambique

- The ACIAR SIMLESA project is a typical example of public and private partnerships where **an Innovation Platform** has been formed comprising all players along the maize and legume value chains
- Agricultural research also seems to revolve around the utilisation of farmers committees and farmers groups encouraging participatory approaches and thereby promoting more rapid adoption of research output/outcomes
- The participatory approach also encourage involvement of seed companies and agro-dealers
- There is a strong presence of international agricultural research institutions such as IRRI, CIP, ILRI, ICRISAT, IITA, IWMI, IFPRI, AGRA, and IFDC, all housed by the National Agricultural Research Institute of Mozambique. PIAT=Platform for innovation, agriculture and technology transfer coordinates the work of CGIAR centers and strengthens the capacity of national institutes.
- PIAT includes biotechnology, soil, tissue culture, nutrition (CIP) laboratories. CIP's nutrition laboratory is primarily use for determining the quality of sweet potato (iron, zn, beta carotene, calcium and proteins through NIRS).
- Lisa Penincela has a Masters in postharvest. Isabel Monjale is a specialist in agroprocessing.
- Calvon Ecole (+258 821810562) is the main person with lots of information on vegetable production.
- Postharvest work done by CIP is geared towards value addition and diversification of use of root crops.

- CIP major work is on variety screening for drought tolerance.
- Other institutions that collaborate and support the national research system include Michigan State University, local universities and the private sector

b. Production system of major vegetable crops

Agricultural production is different between the southern and central/ northern regions

i) Southern areas:

- The southern regions are characterized by relatively lower rainfall totals. It is mainly a livestock production area.
- Most of the vegetable production is done under irrigation. It is bordering S. Africa and relies on vegetable imports from S. Africa to meet the deficit in demand. About 99% onion and 55% tomato is imported from S. Africa at certain times of year.
- High temperatures are a major hindrance to vegetable production in these lowland areas. It is very difficult to grow vegetables in the warmer summer seasons.
- Vegetable production this region is mainly done during cool season but there is no postharvest storage. Therefore there are highs (glut) and lows (deficit) during cool and warm areas respectively, causing large price fluctuations.
- The major vegetables grown in this region include kales, collards, English potato, lettuce, cabbage, tomato, capsicums. Production of vegetables is mainly for the markets given the prime prices they fetch.

ii) Central and Northern regions

- These are the major production areas but are challenged with relatively poorer road infrastructure limiting transportation to the potential prime markets in Maputo and other Southern cities.
- It is easier to import vegetables from South Africa into the Southern region than to transport from the central and Northern region. People in the Southern region who would be a strong market pool for the produce from the south prefer the imports as they say quality of imported produce is better.
- Due to lack of local sources of inputs, cost of local vegetable production is higher than in the neighbouring S. Africa. Nearly 100% of seeds, pesticides and fertilizers are imported. There limited, if any, local seed production of vegetables. As such, prices of inputs are very high for the farmers.
- Tete and Sambezi provinces produce mainly for export to Malawi and Zambia as they are close to these countries logistically than to the capital Maputo. Production in Manica province is mainly for export to Europe (baby corn, etc). Focus is now changing to local markets.
- Tomato prices go up because of high temp and high humidity in summer that lead to high incidence blights.

c. Challenges of seed quality

- Hot and humid conditions make seed storage difficult without huge investments by seed companies for proper storage.
- Locally produced seeds are expected to be more expensive due to high cost of production. There are no tariff barriers on seed imports. As such seed companies find it easier to import, repackage and sell their seeds and it is cheaper to import than to produce seeds locally.
- There is also limited human capacity for local vegetable variety development and quality seed production. Even companies that produce their own seed prefer to contract production in Zimbabwe, package in S. Africa and ship to Mozambique and that is still cheaper than local seed production.

d. Peri-urban vegetable production

- Relative to field crops, adoption of vegetables is much faster and there is very active urban and peri-urban vegetable production in Maputo and its environs.

- The most active production is in the low lying areas where production is mainly by irrigation and more especially done in the cooler months.
- Vegetable production during hot humid summer is a major challenge mainly because of prevalence of diseases and pests, but there are a few farmers who produce with a lot of investment in pesticides and fungicides and with the overall effect of having very high chemical residues in the final produce.
- Farmers spray a lot to control late blight in tomatoes. When the weather does not favour late blight, spraying is done every two weeks irrespective of disease incidence. When the weather is more humid, the frequency increases to weekly and may go up to twice or thrice a week.
- The spraying is done without protective gear. Some pesticides are not up to standards. Mainly entering through S. Africa but coming from China mainly. Some banned chemicals still available in the shelves. Chemical labelling is, however, truthful and proper.
- Pesticide residues are a major problem but there is no testing going on at the moment for produce intended for local market. Global GAP and EURO GAP are being applied by export companies.
- The most common vegetables produced in the peri-urban areas of Maputo belong to the Brassica family including heading cabbage, headless cabbage and lettuce. The other vegetables are onions, tomatoes, sweet peppers, potatoes, garlic and eggplant.
- Vegetable consumption levels in the urban areas are quite high, but mostly exotic vegetables are consumed. Apart from watercress and sweet potato leaves, there are hardly any leafy indigenous vegetables in the local markets.
- The fruit type indigenous vegetables are represented by okra. Cacana (*Mormodica balsamina*) consumption is high in the southern region mainly for its medicinal value. There is not much knowledge of the same in the Northern and central region. People like its bitter taste and associate it with medicinal value.
- Production of indigenous vegetables is reportedly done more in the rural areas, but poor infrastructure limit transportation and marketing in towns. Consequently, the demand for exotic vegetables is higher in the urban centres due to greater familiarity. There are no indigenous vegetables in the supermarkets and hotels.

e. Sources of seeds

- Moz seeds deals with a whole range of seeds: Cabbage, tomato, kale, Chinese cabbage, onions, pumpkin, lettuce, melon, eggplant, water melon, okra, rape (Ethiopian mustard), amaranths, bitter melon (Mormodica balsamida), vegetable cowpea, pumpkin .
- The company has cold storage rooms to keep seeds when the demand is low and avail the seeds in good quality when needed. However, the company either imports 100% of its seeds or produces the seeds outside the country.
- Only Dengo Seed Company has been trying to produce seeds locally, but generally there is no local seed production. There are possibilities for trying local seed production on small-scale basis, but there are fears of diseases occasioned by poor weather.

f. Postharvest handling

- There is no facility for fresh storage in Maputo. Postharvest handling has a lot of influence on production. Vegetables are perishable and must be sold on the same day they are taken to the market or sooner. Farmers, therefore reason that it is better to produce cereals or beans that can be dried and stored to catch better prices during off-season.

g. Technology transfer

- Is mainly through national extension systems.

- Famer Field Schools (FFS) are mainly used to demonstrate agronomic practices
- Extension systems are based in the communities/administrative posts
- National extension officers total between 800-100 in a country with a population of 23M.
- The extension workers are trained in a wide diversity of subjects and crops.
- Extension workers lack means to reach the farmers.
- Farmers' associations are actively working on vegetables in the peri-urban areas and additional technologies that can improve their productivity and profitability will be advantaged.
- Some NGOs, and seed companies are involved in extension work, but with the focus of improving their own product quality.
- The high consumption of vegetables is mainly associated with the Portuguese culture where each meal must have a vegetable side dish. It is not because people know the benefits of vegetables.
- Also in the rural areas, meats are only consumed during special occasions of celebrations. The rest of the time vegetable consumption is more common.

h. Current research

National Agricultural Research Institute is currently working on projects geared towards improving food and nutritional security with 3 components covering a wide diversity of crops

- Introduction and testing of new varieties (production systems, irrigation etc.)
- postharvest handling
- socioeconomics

There are also projects on home gardens, indigenous vegetable production techniques, postharvest handling and variety evaluation for nutritional value and finally a project on school feeding with diet diversification with vegetables.

There is an ongoing weekly monitoring of prices of vegetables by the national research institute to maintain market information

i. Points of impact for research intervention

1) To agro-input Dealers

- feasibility study on the viability of local seed production; the technical, logistical, environmental and policy obstacles that must be overcome
- Determination or estimation of vegetable seed demand; currently there is no data and seed companies have no idea/prediction of how much seed will be demanded the following year.
- Breeding of vegetables for production during the hot humid conditions. A countrywide or a focused disease survey is necessary first to map out the major diseases and the causative agents before deciding the particular varieties to introduce for the southern, central and northern regions and targeting different seasons.
- demand creation strategies for indigenous vegetables backed with credible scientific and research data on their nutritional and medicinal value as well as relative production costs and market prices to enhance and speed up commercialization from home gardens with surplus for markets to actual market gardening

2) To vegetable producers (farmers)

- improved access inputs, especially high quality seed of well adapted varieties
- improved knowledge of proper input application such as optimum seed rates, fertilizer rates and proper application of pesticides

- support farmers organization to improve their group dynamics, operations and efficiency
- Test new varieties for adaptability under local conditions e.g. adapting to temperatures and diseases.
- introduction of low input agriculture through good crop husbandry/less inputs high outputs/ high productivity (use of farmyard manure, use of biopesticides to control insect pests, crop rotation and other integrated crop production and protection techniques)
- breeding and introduction of heat and drought tolerant and high yielding vegetable cultivars
- Introduction of alternative drought escape vegetable crops in a systems approach where vegetables are intercropped/sequential cropped with legumes and cereals to benefit from short rains or residual moisture
- explore opportunities for off-season production through water harvesting and irrigation or use of boreholes

3) To wholesalers/retailers

- information on various production areas of different crops so that they can identify the sources of supplies
- possibilities of contract farming to ensure constant supply and stable prices in the markets
- possibilities of value addition through grading/ packaging/sorting/ weighing/labelling
- Supermarkets not common source of vegetables for the masses. Many people go to the informal markets for vegetables. Most super markets are stocked with S. African produce and visited by middle to high class members of the population. Possibilities of persuading the supermarket chains to source vegetables locally are possible if quality and some value addition can be assured.
- incidentally, there are no big concerns about food safety in the local markets

4) To consumers

- Research that can reduce chemical residues in vegetables would come in handy, but also information on just how much of the chemical residues are found in the vegetables is critical and fundamental.
- data on the nutritional value of vegetables as well as nutrient enhancing recipes for local vegetables will improve consumption especially of indigenous vegetables
- research that would result in more stable local supply and thereby stable market prices will be handy too
- postharvest handling approaches that prolong shelf life and reduce food spoilage

5. Findings from the field visit and interactions with vegetable value chain actors

i. Production and farmers

a. Commercial farming systems – Boane District (x km from Maputo)

- We visited a commercial farm in Boane District owned by Mr Barboza (contact details not included). The farm is 360 ha, with 50 ha of potatoes and 25 ha under other horticultural crops. The farm had substantial areas of potatoes, cabbage,

onions, tomatoes, capsicum and garlic. The farm employs 140 workers including 1 agronomist.

- Much of the seed is supplied by Pannar Seed Company including some for large scale demonstration purposes. The farm is currently undertaking some tomato varietal comparisons of *Rio Fuego* (OP), *Glamstock* (Hybrid) and *Qwanto* (Hybrid). When asked about key quality attributes – yield, fruit size, disease resistance and shelf life (a good shelf life was considered 15-20 days) – were the key criteria. Varietal spread was also considered important with these varieties having a 15 day interval between varieties.
- Given his relationship with Pannar and other seed suppliers he is able to source good quality seed, getting a 95% germination rate. He also sells seedlings to other farmers – a profitable side business.
- Typical yields for some of the crops were: potato 32-33 tonnes/ha, sometimes as high as 42 tonnes/ha; onion 18-20 tonnes/ha and cabbage 80 tonnes/ha.
- Produce was being directly sold into Zimpeto wholesale market with buyers coming to the farm to collect the product (sometimes there can be a queue of vehicles at the farm, with some frequent buyers having a preferred status). Interestingly he used to have a contract with Shoprite (one of the major supermarkets) but given that they took 90 days to pay, he decided to return to the wholesale market. He sells at 10% below the wholesale market price. Given the scale of his production – if he is not happy with the price buyers are offering him at the farm-gate, then he can opt to truck his product directly to the wholesale market and potentially undercut the price. So he has quite a lot of power in the relationship with his buyers.
- Prices fluctuate with season and market demand – with a price premium paid for off-season production. For example capsicum typically sells for 5-6 MT/kg but at present is selling for 35 MT/kg. Last week he sold 1500 kg within an hour. Tomato can sell for 2 MT/kg – 20 MT/kg, garlic 150 MT/kg and cabbage 3-10 MT/kg.
- Off-season production (eg. tomatoes Nov-Jan) is more lucrative but difficult growing conditions result in more problems with pests resulting in excessive chemical use to minimise this risk (a prevention spray program was being employed rather than IPM or similar).
- Whilst this farm is not part of our target demographic, it does illustrate the commercial potential that smaller commercially orientated farmers can aspire to.

b. Peri-urban farms – Zona verde – Matola

- We visited several smallholders (farmers typically have around 0.3 ha in peri-urban Maputo) in Matola (?).These sites clearly demonstrated the potential for year-round peri-urban agriculture where there is access to water (in the case of the farmers we visited they had access to good quality bore water). These farmers were producing lettuce and cabbage from March-September and amaranth and cowpea during the summer months (October – February).
- Some of the farmers were working together in a semi-cooperative arrangement. This enabled them to spread some of the risk. One of the challenges these farmers faced was the high cost (500 MT/100g for leafy lettuce and 1080 MT/100g for headed lettuce) and low quality of seed. To address the cost issue, one of the groups who had means would purchase the seed, produce seedlings and then sell them onto other farmers. This enabled farmers to purchase as many as they required.
- Collectors from different retail markets come to the farm to purchase the produce. Price varied with market with the collectors from the more distant markets paying a higher price. A typical plot was 3m x 1m with farmers getting 500 MT/plot for headed curly lettuce, 450 MT/plot for curly leafy lettuce and 350 MT/plot for cabbage. They agreed to purchase a certain number of plots and cash is

exchanged. The buyer then harvests the crop (and this may be done at several times) with the risk for the crop passing to the buyer.

- The farmers faced challenges of oversupply in July-August, when collectors did not come to the farm. They also found September-October difficult production times with limited financial resources to purchase chemicals they had problems with controlling diseases. Limited pesticide application was taking place in these crops.
- Driving around Maputo there seemed to be large areas of peri-urban vegetable production (similar to the farms visited above) and this area would certainly be an excellent focus for the project.

ii. Wholesale market

- Maputo has one central wholesale market – **Mecado Zimpeto**. The market operates 7 days a week from 6am – 5pm, closing early on Sundays (12pm).
- At this time of year, much of the produce particularly potatoes, onions, carrots, cabbages and capsicum was being imported from South Africa. Whilst the market is located less than 100 km from the border with South Africa, much of the produce is being trucked from distant South African locations. Some product differentiation was evident, with imported potatoes being washed whilst the local product was unwashed. That said the re-use of packaging materials (10kg waxed paper bags) by local producers meant that there was also the potential for some confusion between the local and imported product. At one of the potato stands we visited both local and South African produce was being sold at 200MT/10 kg for grade 1, 180 MT/10 kg for grade 2 and 170 MT/10 kg for grade 3. Grading was primarily done on a size basis. From July to December the market is primarily stocked with local product with limited supply from South Africa during this time. Stall owners we spoke to said that buyers preferred the local product due to its longer shelf life.
- Most of the buyers are retailers from the local wet markets, but there are also buyers from South Africa. One of the potato wholesalers indicated that he was selling 900 bags/day (10 kg bags). Trucks could park up in the market and sell their produce from the truck with most wholesalers having small stands in front of their trucks showing their wares. Trucks would remain in the market until they sold their load.
- Whilst a lot of produce is sold by the bag or crate – some smaller scale traders were also selling by the heap (eg. carrots). Heaps of product (eg carrots) sold for a set price (eg 10 MT/heap) but the quality of the produce varied with the heap enabling buyers to choose smaller heaps with large good quality carrots or larger heaps with smaller, poorer quality carrots.
- Tomatoes were being sold in reusable 20kg plastic crates – both local and imported product. The trader we spoke too indicated there was currently an over-supply in the market with tomatoes currently selling for 50 MT/crate. During off-season production, prices can get as high as 800 MT/crate (December- February). Tomato quality seemed quite poor with the fruit being quite soft and some soft rots evident.
- A range of packaging materials were evident in this market ranging from none or traditional extended bags for cabbages through to plastic reusable crates for tomatoes and waxed paper bags for potatoes. It would seem that South African produce is generally well packaged (apart from cabbage) whereas the local product is either packed in reused bags or using large canvas sacks or bags. In some areas of the market shade was provided either through the use of tarpaulins or by the sides of the trucks but most of the produce was in full sun.
- From the array of produce on offer it would seem that potatoes, onions, cabbages and tomatoes are the major crops (at this time of year) with most of these products being of South African origin. Competition from South African produce is a major

issue for Mozambique vegetable farmers but also indicates that there is an opportunity for local producers to meet this demand.

iii. Retailers

a. Wet markets

- We visited **Mercado Centrado** right in the heart of Maputo. Once again a diversity of fresh produce was on offer with much of it sourced from South Africa. Within the market there appeared to be a mix of retailers and farmer-direct retailers (where a particular farm business had a stand in the market). It was difficult to get much information in this market due to stallholders being busy or in some cases stall holders seemed to be workers rather than business owners with limited knowledge about the business. It is likely that some information would be available from the Ministry of Trade and Industry and the Ministry of Agriculture who through their Agricultural Market Information System collect regular price information on certain crops. However to understand this value chain fully it will be necessary to undertake interviews with business owners in this and other local markets.

b. Supermarkets

- We visited **Pick and Pay**, one of the major supermarkets in Maputo. Once again much of the vegetables for sale were of South African origin with very little in the way of local product. Imported product included an array of high quality ready to eat salad packs – indicating the maintenance of a cold chain from farm to market. Within Pick and Pay much of the fresh produce was sold by **Envest** – a fresh produce company that rented space from Pick and Pay to sell their product. They were also producing (locally) some value-added product including julian carrots, mixed vegetable mixes (eg broccoli and cauliflower), and wrapped products (lettuce and broccoli). However the vegetables in these packs were predominantly imported.

6. Appendices

a. Meeting participants (8th June 2012) and contact details

Participant	Position	Organisation	Email	Telephone
Elias Munda	Agronomist	CIP	eliasmunda@yahoo.com	+258 826650495
Isabel Cachomba	Socio-economist	IIAM	icachomba@yahoo.com	+258 823583195/ +258 849321030
Boaventura Nuvunga	Biologist/Plant Pathologist	IIAM	bnuvunga@gmail.com	+258 8823235240
John Makoni	General Manager	Moz seeds	johnmalkoni@mozfoods.com	+258 823511958
We also met with Dr Maria Isabel Andrade on the evening of the 10th June 2012				
Dr Maria Isabel Andrade	Sweet potato specialist	CIP		

b. Ministry of Agriculture Production Plan for 2011/2012 agricultural season

Agricultural seasons	**Production for Agricultural season 2010/11**		**Production Plan for agricultural season 2011/12**			
Food crops	Area (ha)	Production (ton)	Area (ha)	Expected yield (ton/ha)	Production (ton)	Growth rate (%)
Maize	1,812,717	2,178,842	1,946,000	1.2	2,335,200	7.2
Sorghum	670,096	409,745	691,956	0.6	415,174	1.3
Millet	113,642	51,602	113,650	0.5	52,739	2.2
Rice	238,778	271,402	256,998	1.2	308,912	13.8
Wheat	15,622	20,350	17,627	1.3	17,653	12.6
Cereals (sub-total)	**2,850,855**	**2,931,941**	**3,026,231**		**3,129,678**	**6.9**
Beans (Phaseollus vulgaris and cowpeas)	543,324	273,034	585,358	0.5	292,679	7.2
Groundnuts	372,964	165,373	349,864	0.5	174,932	5.8
Legumes (sub-total)	**916,288**	**438,407**	**935,222**		**467,611**	**6.7**
Soybean	17,727	19,500	19,057	1.1	20,963	7.5
Sunflower	28,674	18,638	25,159	0.8	20,127	7.1
Oilseed crops (sub-total)	**46,401**	**38,138**	**44,216**		**41,090**	**7.6**
Cassava	1,293,568	10,093,619	1,291,923	8.8	11,368,922	**12.6**
Potato	15,344	189,944	15,900	12.8	203,520	7.1
Tomato	13,921	195,000	15,734	14.0	220,276	13.0
Onions	8,000	80,000	8,505	10.0	85,050	6.3
Other vegetables	107,642	700,000	115,456	6.5	750,464	7.2
Total	**3,822,974**	**14,667,049**	**5,453,187**		**16,266,611**	**8.4**

Institutional capacity of the Mozambique Institute of Agricultural Research (IIAM) for horticulture Research

1. Number of IIAM Researchers that work (or available to work) in horticulture research:

Discipline/Working area	**IIAM-Headquarters**	**CZS**	**CZC**	**CZ Northeast**	**CZ Northwest**	**Total**
Breeding	2	2	0	0	0	4
Entomology	2	0	0	0	1	3
Plant Pathology	2	1	0	0	1	4
Virology	1	1	0	0	0	2
Post-harvest	2	0	0	0	0	2
Agronomy	5	2	1	1	1	10
Water and nutrient management	2	2	1	1	1	7

CZS- South Regional Centre (with headquarters in Chókwè);

CZC- Central Regional Centre (Sussundenga);

CZ Ne- Northeast Regional Centre (Nampula);

CZNw- Northwest Regional Centre (Lichinga).

2. Existing IIAM and other MINAG Laboratories that can be used to support horticulture research:

Laboratory	Institution	Location	Current situation
Entomology*	MINAG- Plant Protection Services	Maputo	There is a big Insect collection. Requires rehabilitation and acquisition of standard equipment for an Entomology Laboratory.
Plant Pathology*	MINAG- Plant Protection Services	Maputo	The building is located at the Plant Quarantine Station and is currently under rehabilitation including the glasshouses. Most laboratory equipment is obsolete and requires major repair or replacement.
Biotechnology**	IIAM headquarters	Maputo	The laboratory is equipped with tissue culture facilities and DNA extraction and diagnosis of virus disease. More support is needed for acquisition of laboratory materials and chemicals.
Soil Fertility	IIAM headquarters and Northwest Zonal Centre	Maputo & Nampula	This Laboratory is equipped for soil fertility analysis, leaf analysis and water quality analysis.

*The Faculty of Agronomy and Forestry Engineering of the Eduardo Mondlane University also have Laboratory facilities;

** The Faculty of Veterinary of the Eduardo Mondlane University has a Molecular Biology Laboratory, which can be used.

9.8 Appendix 8: Highlights of Scoping Study Team Visit to Canberra (15-18 July 2012)

Team Members: Gordon Rodgers (AHR), Suzie Newman (NSW-DPI), Benjamin Dent (UQ), Abdou Tenkouano (AVRDC)

Resource Persons (ACIAR): Les Baxter (Research Program Manager-Horticulture), John Dixon (links with SIMLESA), Debbie Templeton (Agricultural Economist - Impact Assessment)

Part A - Canberra Agenda

Sunday 15th July	Scoping Study Team meet over dinner
Monday 16th July	Scoping Study Team meet ACIAR AM- Team Meeting Early Afternoon – Les Baxter arrives (discussion regarding key findings) Mid Afternoon – Team gives a 30 minute Powerpoint presentation to ACIAR staff Late Afternoon – Continue Discussions Evening – Dinner (with Les Baxter and Team)
Tuesday 17th July	Full day project design workshop Expected outputs: 1. Agree on the major components of the full project 2. Identify geographic locations 3. Identify partners 4. Allocate responsibilities 5. Map out the project strategy 6. Discuss Impact Pathways 7. Project management 8. Identify draft objectives 9. Have preliminary discussions about the budget 10. Special requirements for the Food Security Centre Evening – dinner
Wednesday 18th	Team departs with assignment of writing a preliminary proposal for submission to In-House Review of 30th August - so we need to document at ACIAR by the 23rd August.

Part B - Drafting Notes for Phase I Proposal

Project summary

Drafting note: keep short. Like an abstract

Justification

Drafting note: Reference scoping study report, especially in justification, research strategy and methodology, and then include Exec Summary as appendix to proposal

Why? Base on SRA, include points on:

- Nutrition (exotic and indigenous vegetables)
- Poverty
- Gender engagement
- Rural contribution to GDP
- Urban youth (displacement and unemployment)
- Income generation and diversification

Insert: Size and value of production systems

Insert: What is proposed (summary)

Partner country and Australian research and development issues and priorities

Alignment with priorities of ACIAR (including SIMLESA) and Australia International Food Security Centre; and country priorities (including ref to stakeholder meeting to ensure alignment)

Research and/or development strategy and relationship to other ACIAR investments and other donor activities

Enter text

Objectives

Aim

To maximize returns, generate and increase income to reduce poverty, and contribute to greater food and nutritional security in peri-urban and cereal-based cropping systems in ESA through developing appropriate and effective technological and educational interventions.

Objectives

1. To demonstrate the opportunities for increased value chain efficiency and effectiveness (including farmer-market linkages).
2. To develop technologies for safe production of vegetables improved and deployed in urban and peri-urban.
3. To explore the potential of vegetables to enrich and diversify rural cereal-based production and food systems.
4. To evaluate and select high yielding and nutrient-dense elite lines and landraces jointly evaluated and selected with major value chain stakeholders and to ensure farmer access to high quality seeds of best varieties of selected vegetables.
5. To develop and promote technologies for improved postharvest storage, value addition and processing developed and promoted.
6. To develop and implement individual and group training and capacity building

activities.

Research strategies (based on)

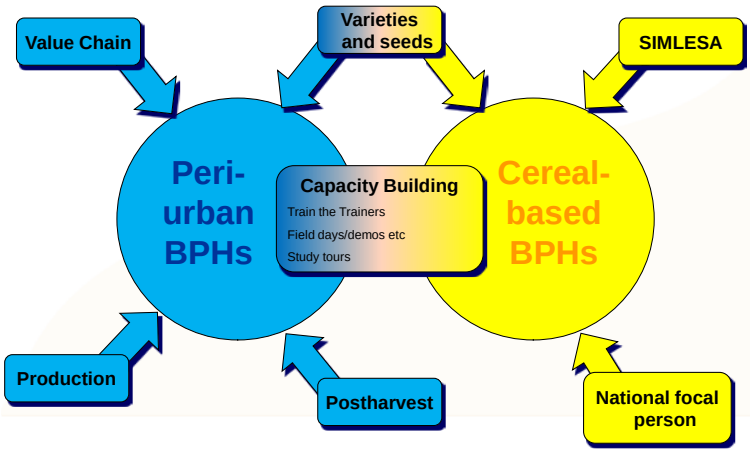
1. Value chain analysis and subsequent management improvements exemplified through Best Practice Hubs.
2. Feeder technologies breeding/genetics/seed
3. Technologies/food safety
4. Capacity building
5. Peri-urban flowing to cereal-based

Best Practice Hub strategy

- Proof of concept, so need to bring decision-makers (govt, donors etc)
- Scalability
- Training groups of 20 who will subsequently influence within their communities

Insert Diagram linking Peri-urban BPH and cereal based cropping BPH (initial version shown below)

Research Strategy: Linking Peri-urban to Cereal-based BPHs



Research Questions

The scoping study identified the following research questions:

1. Can increased value chain efficiency and effectiveness be achieved through improved farmer-market linkages?

2. What are the improved technologies necessary for safe production of vegetables in urban and peri-urban settings in the focus countries?
3. To what extent can cereal-based production systems in ESA be enriched and diversified with vegetable inter-cropping?
4. What are the genetic constraints to food and nutritional security in commercial vegetable production, and how can these be addressed?
5. How do we ensure availability of high quality seeds of superior varieties of selected vegetables for inclusion in sole and cereal-based systems facilitated
6. How can postharvest storage, value addition and processing be developed and

promoted in peri-urban?

7. What are the capacity building and training needs required to achieve and sustain increased farmer income and contribute to greater food and nutritional security

Governance

Overall governance

- Project initiation meeting
- Mid-term review
- Final review

Annual meeting of partners to monitor deliverables and improve working practices.

Possible more frequent in-country meetings.

Planned impacts and adoption pathways

Explanation of terms:

Input = BPH

Output = deliverable (capacity built)

Outcome = use of deliverable (capacity used beyond bounds of project)

Impact = result of use, beyond spatial or time boundary of project (eg more vegetables grown; health; wealth; urban social stability)

Impact pathways need to include:

- Barriers and how to overcome them, eg through BPHs
- Numbers of people/farms etc reached
- Prime audiences (farmers; policy makers etc

Will need to report during project:

- Number of smallholders who have accessed new technologies leading to increased yields and incomes; and disaggregated by gender. Needs robust data and attribution.

Scientific impacts

Drafting note: New knowledge and science. Or say its adaptive research and applying it to new situation, and most impacts will be community level

Capacity impacts

Drafting note: Ensure quantified and explicit, eg number of participants in training

Community impacts

Drafting note, include the following if not mentioned above:

- Currently, consumption of vegetables is x% below FOA recommended guidelines.
- Caused by:
  - Cultural factors: consumers' perception of vegetables as poor man's food
  - Production capacity: (potential) farmers' lack of understanding of market opportunities; skills/knowledge; land;

Peri-urban BPHs – see sections below

Cereal-based BPHs: Impacts will be derived from SIMLESA project.

Economic impacts

Drafting note: include that AVRDC will provide seeds for participants at BPH

Peri-urban BPHs' direct impacts

- Increased vegetable production: based on 700 participants (20 people, 4 times a year, 2-3 years over 4 locations) = capacity to cultivate 50 extra hectares/year = 3000t of vegetables.
- Income generated for per participant: (can be based on Arusha project involving egg plant production)

Peri-urban BPHs' impacts via participants' communities

- Knowledge transfer to participants' households (but knowledge will be deployed on the same plot, so may have smaller further impact))

- Maximum adaption rate within participants' communities: 500-600 people in their communities. Note that participants' will have been selected by communities, and therefore will have above average influence. Calculate maximum adoption rate from experience in West Africa, and any culturally-specific studies as well as those specific to peri-urban communities. Timescale for adoption is maximum achieved by 3 years after project.

- 700 participants each in communities of 500 people, means 350,000 potential people to be influenced. At adaption rate of 20%, this means 70,000 people are actually influenced.

Current situation:

Vegetable production in the peri-urban areas in Malawi, Tanzania, Ethiopian and Mozambique is generally suboptimal, as reflected by

- Low productivity
- Injudicious use of chemicals
- High postharvest losses
- Poor quality

In addition, consumption of vegetables by both the farmers and poor urban consumers is around 50% of the daily intake recommended by the FAO [insert source]. Low intake levels are due to poor availability of quality producers and a cultural stigma that devalues indigenous produce.

This project will target peri-urban areas around Maputo (Mozambique), Dar es Salam (Tanzania), the Highlands of Ethiopia and Lilongwe (Malawi). The commodities that will be the focus of the research and capacity building activities are [**insert** globally important and indigenous vegetables – noting project will look at vegetables with potential for smallholders, including unmet demand, not necessarily currently the highest produced vegetables].

The target group consists of around 350,000 households across the four target areas. The size of the target group is based on the assumption that the BPHs will train 700 women and men nominated by their communities. Each community comprises at least 500 households who could grow vegetables.

Each peri-urban smallholders' plot is around [?0.2ha] per household, averaged across the four target areas. Therefore, the target area is 70,000ha. Assuming yield will increase by around 50t/ha, then the maximum increase in production could be 350,000tonnes. Based

on current prices, if it is assumed that the average price each farmer receives is 50c/kg of product (average Mozambique farm-gate price for tomatoes, cabbage and pepper) then each household would be $500/year better off in terms of total revenue. Assuming increased production costs of 20c/kg, the net household profit is $300/year. This equates to a total profit of $105m/year ($300/households across 350000 households). While this assumes a 100% adoption rate, which is not plausible, even if adoption is only 20%, the economic benefits will be $21m/year.

Social impacts

Peri-urban BPHs' types of participants:

- Existing farmers growing vegetables sub-optimally (productivity low; quality low; postharvest losses; low price; limited diversity) for home-consumption and for sale.
- Young people: land available for more vegetable farming but they do not see the potential for vegetable production.

Drafting note:

- Health benefits
- Social capital
- Reduced social unrest

Environmental impacts

Enter text

Communication and dissemination activities

Enter text

Operations

Methodology

1. Adapt from Burkina Faso proposal as below:

This project is intended to be carried out in Burkina Faso and Mali[11]. Project interventions will include analysis, education and promotion of production and nutrition; improved vegetable production systems to overcome drought and low plant productivity; socio-economic studies to analyze constraints to vegetable production and marketing; and postharvest loss reduction. Following consultation with local stakeholders and socio-economic and gender analyses, the project research will link local dietary needs and preferences with vegetable production research, post-harvest technology and local market development to improve long term community nutrition and income.

The project will utilize the African Market Garden (AMG) approach, developed by AVDRC (The World Vegetable Centre) and ICRISAT (International Crops Research Institute of the Semi-Arid Tropics) and the Enhanced Homestead Food Production (EHFP) concept developed by Hellen Keller International. Both approaches are based on simple input technology to grow indigenous and highly nutritious food or vegetable crops throughout the year. Indigenous vegetables can be grown year round under conditions of high temperatures and require fewer inputs of pesticide and fertilizer than commercial species. Simple, affordable micro-irrigation systems, high quality seeds to grow heat tolerant vegetables, and best management practices including mulching to improve water conservation, use of integrated pest management, and more effective use of organic and

[11] *Replace by Ethiopia, Malawi, Mozambique and Tanzania*

chemical fertilizers will be introduced, tested and promoted to increase yields and reduce negative environmental and health impacts. Such technologies and management will increase food production and improve the resilience of rural communities to a changing climate. Post-harvest handling methods, including cleaning and storage as well as food processing methods such as solar-powered dryers, will be adapted to help preserve the food produced in this project and allow nutritious food to be available throughout the year. Marketing of vegetables produced in excess of farm needs will be facilitated through the use of cell phones to connect producers with buyers and reduce or better plan the transportation requirements and increase the return on production. Socio-economic and gender analysis will be carried out to identify technology adoption benefits and economic and ecological viability of each of the interventions. Research will be carried out both at demonstration sites and on local farms.

The nutritional part of the project will focus on women and the family. Vegetables grown on the research plots, both fresh and processed, will be prepared and used in educational events to encourage their incorporation into daily diets and promote the importance of their health benefits, particularly to women and children. These events will be held regularly in the communities where the research is taking place for families involved in the study. Feedback from women attending these events will be incorporated into vegetable selection and post-harvest technology as the research progresses.

It is proposed that the above interventions will take place in the training centers earlier mentioned. Thus, the key tenets of the centers would include (1) water capture and use efficiency, (2) gender equity, (3) youth and peri-urban horticulture, (4) market linkages, (5) nutrition security and health within a (6) variety breeding and seed delivery system.

Each center will serve as a model for demonstrating new varieties and showcasing best practices and will operate as a hands-on school that will provide vegetable farming and trading business education to successive cohorts of trainees selected among the youth and women. Women are key operators of the vegetable value chain, being involved in bulk purchase of fresh produce and their subsequent transfer to retailers who often are women themselves, ensuring that income generated along the chain directly benefits their households, particularly the children. Ensuring that they channel a significant proportion of the traded produce into household diet would be a major thrust of the project. In this regard, each center will document and disseminate information on traditional recipes and downstream processing of vegetables. The centers will help to raise awareness and encourage training in preparation and cooking techniques that enhance the nutritional value of vegetable-derived recipes. This would be complemented by field days, covered by broadcasting media, which would allow the project to reach a larger audience, beyond those not directly participating in the training networks, and create greater awareness to elicit and inflate nutrition-conscious demand for vegetables.

Curricula will be developed on good agricultural practices for increased production and processing of vegetables, with an element of seed production and maintenance at community level (focusing on good practices for drying/storing to maintain viability), small plot management with efficient water use, composting/use of scarce residues, integration with livestock, harvesting and processing. Graduation will be carried out on a rotation basis in each center, with graduates receiving seed kits from the project. The project will encourage and leverage sponsorship of graduates by NGOs or development partners of the Government to provide further support to the graduates for establishing their own vegetable production and trade business.

Upstream of the delivery and capacity building leg of the project, variety breeding and seed system research will be required, particularly for tomato, okra, African eggplant and traditional leafy vegetables.

2. Add paragraphs on:

Site selection for peri-urban locations, based on:

Site selection will be by field assessment against criteria of market, channel, infrastructure, production and other including (access to research centres, seed companies and opinion formers, like government officials and donors). Initial assessment highlights Maputo, Lilongwe, Dar es Salam and Highland area of Ethiopia

Proof of Concept

Training of Groups of 20

Scalability

Simlesa

Activities and outputs/milestones

Activities

Objective 1

- Conduct surveys to evaluate the critical characteristics of marketing models/channels of vegetables in the urban and rural areas in the focus countries.
- Review, and where necessary supplement, existing consumer research in each country to understand the drivers of consumer behaviour (for each segment: what product attributes they value; what deters purchasing; what interventions would increase consumption &/or willingness to pay)
- Work with selected value chains to act as demonstration case studies to implement the outputs of Pillars 2-4 and to build cooperative relationships and information flows.
- Carry out gender analysis to understand the dynamics of gender division of labor and decision making across the different vegetable value chain activities and how this impacts on household income and nutrition in the focus countries.

Objective 2

- Develop and disseminate integrated pest management approaches, minimizing the use of pesticides and advocating host plant resistance, cultural methods and biological control options.
- Evaluate existing microbial/pesticide contamination (type and level) in indigenous and introduced vegetables obtained from urban markets in the target (identify ways of minimizing risks associated with the microbial/chemical contaminants)
- Evaluate water quality and recommendation of quality standards for water used in vegetable production in the peri-urban areas of the target countries.
- Evaluate soil quality and the interactions of organic fertilizer applications on changes of physical, chemical and biological soil properties for optimum crop productivity with reduced quantities of inorganic fertilizers.

Objective 3

- Elucidate vegetable production constraints and opportunities, resource use, technology preferences and market access in cereal-based systems
- Elucidate vegetable input and output markets and value chains in cereal-based production systems
- Characterize vegetable farm-household typologies and system options to reduce risks and enhance profitability in cereal-based production systems
- Develop vegetable intercropping or crop rotation with cereals/staples through

intensification and diversification for production risk reduction

Objective 4

- Evaluate germplasm/varieties/lines for adaptation to major peri-urban agroecologies within the target countries (multilocational trials)
- Analyze elite germplasm for nutrient and antinutrient properties
- Recommend selected lines for official release and/or registration
- Assist in developing farmer-led community seed enterprises
- Develop seed production and conservation protocols for best varieties of selected vegetables
- Engage seed companies

Objective 5

- Evaluate options for packaging, storage and transportation to enhance the nutritional quality of selected vegetables.
- Develop minimal processing technologies such as postharvest sanitizers for adoption in the region.
- Determine quality standards in order to provide new outlets for vegetable products coming from peri urban farm enterprises. Quality as an intangible characteristic for many consumers is perceived by value, grading, prestige pricing, quality packing and labeling.
- Develop shelf-life enhancing technologies for marketing the selected leafy vegetables in dehydrated forms. Efficient, cost effective drying methods with best nutrient retention (solar drying, forced air drying using biomass fuel, or using dry-beads) will be evaluated.

Objective 6

- Train end users with emphasis on women and youth groups from target households on [i] best postharvest handling and preservation practices (preparation, processing and packaging) of vegetable food products; [ii] best vegetable crop production and protection practices; [iii]best seed harvesting, processing and storage of vegetable varieties; [iv] best practice in value chain management; [v]best vegetable recipes and preparation methods for optimum nutritional quality
- Develop training of trainer programs of extension and private sector personnel on key vegetable value chain technologies and management developed through the project
- Contribute to graduate training and capacity building of key research project personnel
- Build capacities of national research institutes (NARES) in vegetable production, marketing and utilization
- Develop promotional materials (recipes/songs/leaflets) which are easy-to-prepare, cost-effective, acceptable and marketable in each target country to enhance consumption.
- Create awareness through field days, seed fairs, food fairs, national agricultural shows and exhibitions

Outputs

Objective 1

- Analysed survey data used for prioritising market channels for Best Practice Hubs
- Documented drivers of consumer behaviour
- Work with Best Practice Hubs to implement efficient and effective value chain management
- Gender analysis used to develop understanding of division of labour and decision-making in vegetable value chains.

Objective 2

- Development of Best Practice Hubs in peri-urban production systems which promote the
- Identify strategies for mitigation of microbial/pesticides contamination

Objective 3

- Development of Best Practice Hubs within cereal-based cropping systems within the Simlesa framework.

Objective 4

- Recommended varieties with adaptation to major peri-urban agro-ecologies and superior nutritional properties.
- Seed production and conservation protocols.
- Development of farmer-led community seed enterprises

Objective 5

- Options for packaging, storage and transportation
- Minimal processing technologies
- Quality standards
- Shelf-life enhancing technologies

Objective 6

- Integrate into design and operation of Best Practice Hubs
- Train the trainer programs
- Contribute to graduate training
- Build institutional capacity in national research institutes (NARES) in vegetable production, marketing and utilization
- Develop promotional events and materials which are easy-to-prepare, cost-effective, acceptable and marketable in each target country to enhance consumption
- Create awareness through field days, seed fairs, food fairs, national agricultural shows and exhibitions

Part C - Project Development Timelines

Phase 1: Pre-Proposal

15 August: AVRDC to Baxter (AIFSC) (Draft 1 --- Draft 2)

22 August: Baxter to ACIAR for Review (Draft 2)

30 August: In House Review

Phase 2: Full Proposal

1 September: AVRDC gets back comments from Les

15 October: Full proposal due to Baxter (Draft 1) for External Review (after all parties are ok)

1 November: Address comments from external reviewers

15 November: In House Review (John Dixon, Melissa Wood)

1 December: Ready to Go (Contract Signed – Inception workshop in early December).