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HORTICULTURE INNOVATION LAB

UCDAVIS UNIVERSITY OF CALIFORNIA

Developing the Regional Horticulture Innovation Center Lusaka, Zambia

AgriSmart (Zambia)

AgriSmart: Innovative Technology and Research for Sustainable Development

THE UNIVERSITY OF ZAMBIA — SERVICE AND EXCELLENCE

Natural Resources Development College

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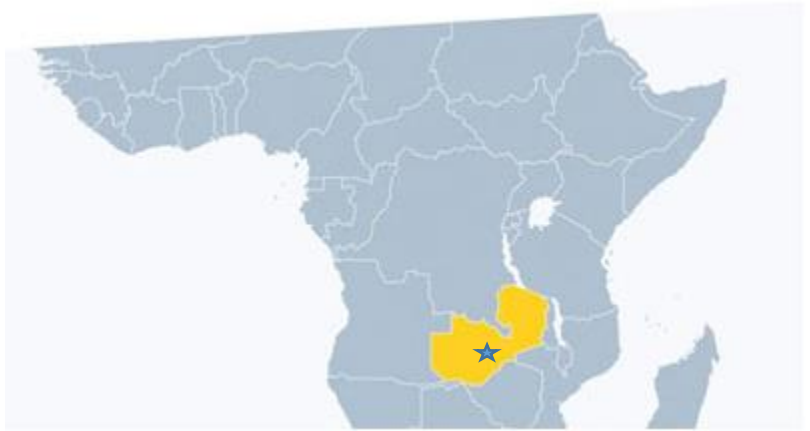
Regional Horticulture Innovation Center Lusaka, Zambia



- Developing a Foundation
  - Establishing public and private partnerships
  - Cross-sector institutional support
  - Intellectual Property (IP)
  - Promote income for small holder farmers
- Strategic planning: filling the gaps in food security
  - International food safety certification
  - Minimum Standards
  - Production and marketing
  - Post-harvest facilities
  - Actual training center where technologies can be demonstrated; growers and industry can come together; where government and development organizations can come together

Public-Private Partnerships

Establishing contracts to connect growers with high-value markets for continual production:

Zambian supermarkets

Consumer packaged goods

Cross-sector institutional research and training support

- Multi-purpose development efforts to institutionalize central demonstration site with regionally active organizations
  - Water sanitation and governance (GIZ & SNV)
  - Dairy innovation center (GIZ & SNV)
  - Horticulture innovation center (World Bank, USAID)
- Collaborative international research projects with Universities
  - UC Davis, Rutgers, Purdue, Princeton, UNZA

Sustainable production for more resilient food production systems: case study of African indigenous vegetables in eastern Africa

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Abstract

African indigenous vegetables are an important crop for providing nutrition, improved health and income security to African populations. Often considered as underutilized crops, these indigenous and naturalized fruits and vegetables generally harvested from wild populations are easy to grow, often require lower inputs than the European and 'western' vegetables, are more adapted to local conditions and environmental stress, and could provide local opportunities for income generation and improving health and nutrition. This paper focuses on the incorporation of African indigenous vegetables as additional crop enterprises to their traditional agronomic ones to provide more resilient food production systems for smallholder farmers in sub-Saharan Africa. This work highlights only a few such indigenous vegetables including amaranth (*Amaranthus* spp.), African nightshade (*Solanum scabrum*, *S. villosum*) and spiderplant (*Cleome gynandra*) while others including African kale (*Brassica carinata*), cowpea (*Vigna unguiculata*) leaves and African eggplant (*S. aethiopicum*), are common staple crops for smallholder farmers and rural populations in eastern Africa. We posit that by strengthening the African Indigenous Vegetables (AIVs) using a market-first approach to overcome constraints along the value chain leading to improved production practices, supply, postharvest handling, distribution and consumer acceptability of AIVs, opportunities for smallholder farmers to become more engaged in the supply chain will emerge. These key ingredients are needed to develop a sustainable and resilient AIV system providing opportunities to smallholders. We suggest that focus is needed first on improving AIV genetic materials, then ensuring systems are put in place for growers to access such materials, coupled with the development of sustainable production and postharvest systems that allow for year-round production as well as seed production/saving techniques. By doing this in parallel and in partnership with industry and the private sector, greater gains can be made in improved market access and building capacity of stakeholders through outreach programs across the AIV value chain while creating awareness of health and nutritional benefits of AIVs which further serve to drive market demand.

Keywords: African indigenous vegetables, traditional vegetables, amaranth, moringa, nightshade, spiderplant, *Amaranthus* spp., *Cleome gynandra*, *Moringa oleifera*, *Solanum scabrum*, *S. villosum*, *S. nigrum*, diversity, health and nutrition, income generation, market-first, science-driven

INTRODUCTION

Sub-Saharan Africa (SSA) is the only major region in the world where poverty is increasing rather than decreasing and where human development indicators are worsening. An estimated 925 million of the world's population are undernourished. Of these, 239 million (representing 26%) are inhabitants of sub-Saharan Africa (FAO, 2010) and

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Strategic Pillars for Success

- Establish strong and proactive government support: **This is now their first formal public: private sector government partnership**!
- Secure land which will not have titling issues for long-term success
- Private partnerships strengthen capacity building potential & bring in resources and technologies and their stakeholder
- Support from multiple organizations ensures access to resources and expertise
- Operating using a business model that fosters economic and scientific growth

REPUBLIC OF ZAMBIA

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LUSAKA - ZAMBIA

DAH/72/7/1

1st December, 2016

The Country Director
AgriSmarl Zambia
Lusaka

RE: ESTABLISHMENT OF A REGIONAL AFRICAN CENTRE FOR HORTICULTURAL INNOVATION IN ZAMBIA AT NATURAL RESOURCE DEVELOPMENT COLLEGE, LUSAKA

I refer to our letter dated 22nd August, 2016 and subsequent meetings and update responses with the Ministry on the above subject matter.

The Ministry fully understands the timeframe for launching and implementing this Innovation Project. In an effort to make progress, the Ministry wishes to state that:

i) The Regional African Center for Horticultural Innovation in Zambia be located at Natural Resource Development College, Lusaka

ii) Natural Resource Development College should immediately make available the land that was previously used by ZEGA for this project, and

iii) A Steering Committee comprising officials from the Ministry, Natural Resource Development College and AgriSmart should be constituted to begin preparing the Memorandum of Understating (MOU) and all the relevant collaboration documents between the Ministry, Natural Resource Development College and AgriSmart,

By copy of this letter, the Principal, Natural Resource Development College is officially informed.

Julius J Shawa
Permanent Secretary
Ministry of Agriculture

CC: The Principal – NRDC Lusaka

Ministries formally and actively Participating:

Ministry of Agriculture

Ministry of Commerce & Trade

Ministry of Finance

Ministry of Water & Livestock

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REPUBLIC OF ZAMBIA

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LUSAKA - ZAMBIA

14th February, 2017

Alfred Chipoya
Chairman: Board of Directors
AgriSmart Zambia
LUSAKA

Dear Mr. Chipoya

RE: **ESTABLISHMENT OF A REGIONAL INNOVATION CENTRE FOR HORTICULTURE AT THE NRDC**

Reference is made to the above subject matter and your letter dated 5th January, 2017.

After consultations with the Permanent Secretary, Ministry of Agriculture, the following officers have been nominated to sit on the Steering Committee and Advisory Board:-

- Director - Department of Agriculture
- Director – Zambia Agriculture Research Institute (ZARI)
- Vice Principal – National Resources Development College (NRDC)
- Head of Horticulture Department (NRDC)

Please note that the Permanent Secretary, Ministry of Agriculture, will sit on the Advisory Board.

Yours Faithfully,

Peter K. Lungu
Director of Agriculture

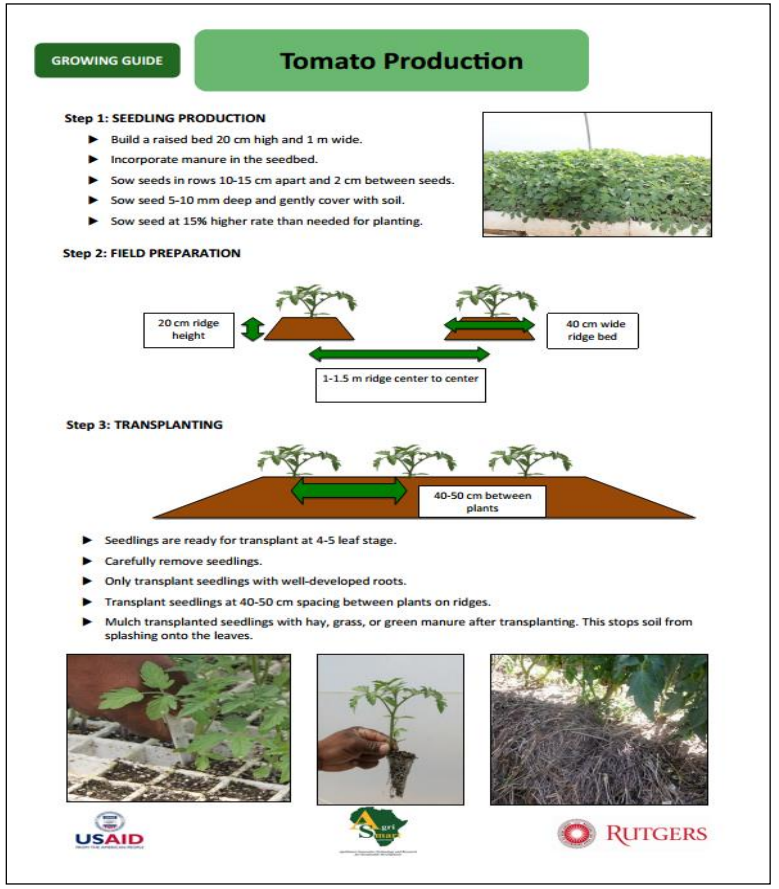
C.C: Mr. Julius J. Shawa
Permanent Secretary
Ministry of Agriculture

Innovation Center Initiatives

- **Production (improved varieties, drought tolerant varieties)**
- **Germplasm (improved varieties by leading breeding programs)**
- **Post-harvest handling (to reduce losses)**
- **Mobile postharvest cleaning and grading lab**
- **Packing and grading (to acceptable minimum standards as demanded by supermarkets)**
- **Food safety (accreditation to export)**
- **Drip irrigation, water collection systyems**
- **Solar irrigation**
- **Solar drying**
- **Solar CoolBot**
- **ShadeBot**
- **Vegetable grafting**
- **Zeolite Drying beads (improve self-harvested seed quality)**
- **Rapid diagnostic *Phytophora* kits**
- **Protected Agriculture (pest exclusion nets**
- **Nutrition (improving household nutrition with focus on African Indigenous Vegetables – AIV**

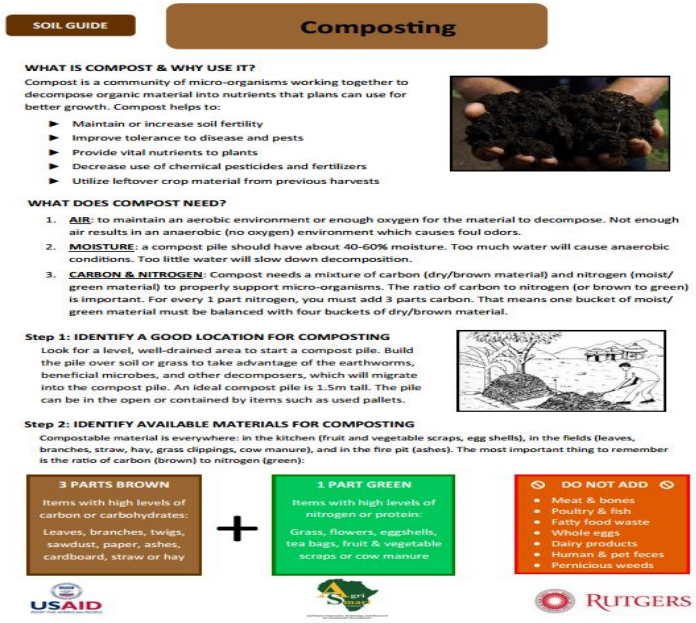
Production and marketing

- Demonstration center and cultivated land to showcase best practice management
- Open-air market farmers can utilize in central Lusaka on major highway



Technology research, training, and adoption

- Develop training manuals
- Crop budgets
- Specification sheets


SOIL GUIDE

Composting

WHAT IS COMPOST & WHY USE IT?

Compost is a community of micro-organisms working together to decompose organic material into nutrients that plans can use for better growth. Compost helps to:

- Maintain or increase soil fertility
- Improve tolerance to disease and pests
- Provide vital nutrients to plants
- Decrease use of chemical pesticides and fertilizers
- Utilize leftover crop material from previous harvests

WHAT DOES COMPOST NEED?

1. AIR: to maintain an aerobic environment or enough oxygen for the material to decompose. Not enough air results in an anaerobic (no oxygen) environment which causes foul odors.
2. MOISTURE: a compost pile should have about 40-60% moisture. Too much water will cause anaerobic conditions. Too little water will slow down decomposition.
3. CARBON & NITROGEN: Compost needs a mixture of carbon (dry/brown material) and nitrogen (moist/ green material) to properly support micro-organisms. The ratio of carbon to nitrogen (or brown to green) is important. For every 1 part nitrogen, you must add 3 parts carbon. That means one bucket of moist/ green material must be balanced with four buckets of dry/brown material.

Step 1: IDENTIFY A GOOD LOCATION FOR COMPOSTING

Look for a level, well-drained area to start a compost pile. Build the pile over soil or grass to take advantage of the earthworms, beneficial microbes, and other decomposers, which will migrate into the compost pile. An ideal compost pile is 1.5m tall. The pile can be in the open or contained by items such as used pallets.

Step 2: IDENTIFY AVAILABLE MATERIALS FOR COMPOSTING

Compostable material is everywhere: in the kitchen (fruit and vegetable scraps, egg shells), in the fields (leaves, branches, straw, hay, grass clippings, cow manure), and in the fire pit (ashes). The most important thing to remember is the ratio of carbon (brown) to nitrogen (green):

3 PARTS BROWN	+	1 PART GREEN	DO NOT ADD
Items with high levels of carbon or carbohydrates: Leaves, branches, twigs, sawdust, paper, ashes, cardboard, straw or hay		Items with high levels of nitrogen or protein: Grass, flowers, eggshells, tea bags, fruit & vegetable scraps or cow manure	• Meat & bones • Poultry & fish • Fatty food waste • Whole eggs • Dairy products • Human & pet feces • Pernicious weeds

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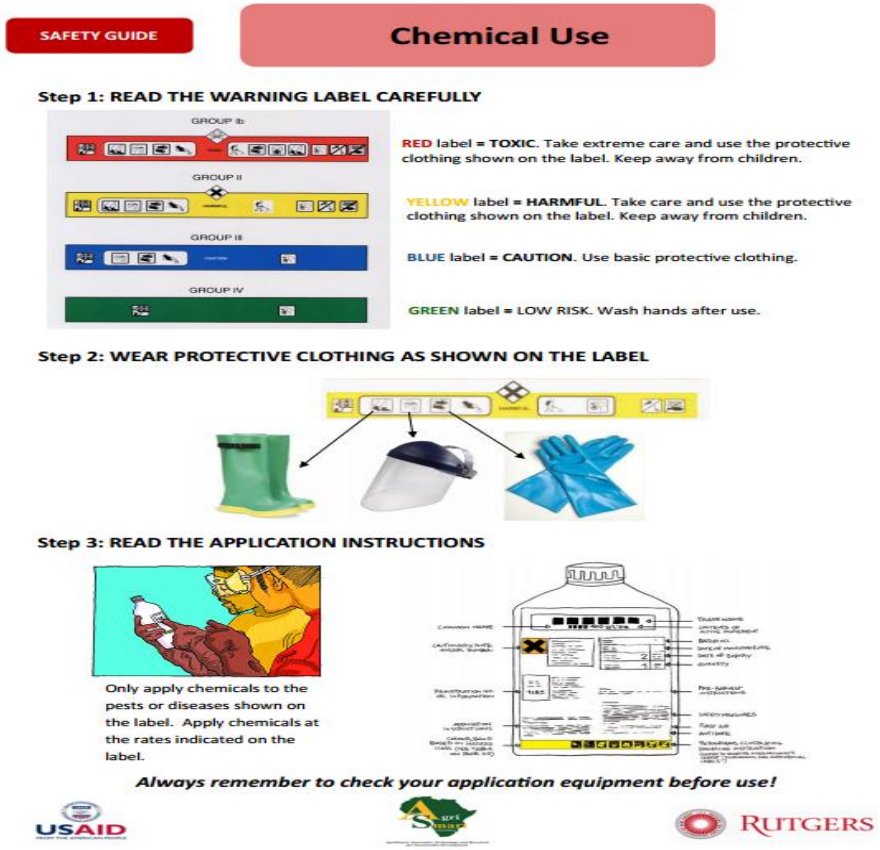
SAFETY GUIDE

Chemical Use

Step 1: READ THE WARNING LABEL CAREFULLY

GROUP Ib

GROUP II

GROUP III

GROUP IV

RED label = **TOXIC**. Take extreme care and use the protective clothing shown on the label. Keep away from children.

YELLOW label = **HARMFUL**. Take care and use the protective clothing shown on the label. Keep away from children.

BLUE label = **CAUTION**. Use basic protective clothing.

GREEN label = LOW RISK. Wash hands after use.

Step 2: WEAR PROTECTIVE CLOTHING AS SHOWN ON THE LABEL

Step 3: READ THE APPLICATION INSTRUCTIONS

Only apply chemicals to the pests or diseases shown on the label. Apply chemicals at the rates indicated on the label.

Always remember to check your application equipment before use!

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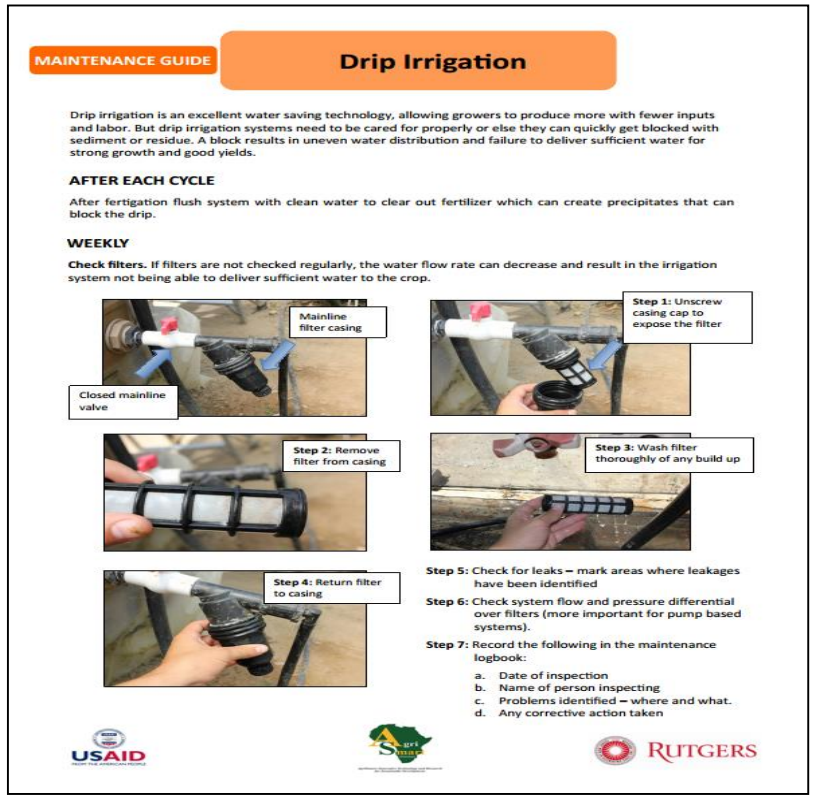
Irrigation and water management

Providing best-practice management and technology to improve dry-season productivity



MAINTENANCE GUIDE

Drip Irrigation

Drip irrigation is an excellent water saving technology, allowing growers to produce more with fewer inputs and labor. But drip irrigation systems need to be cared for properly or else they can quickly get blocked with sediment or residue. A block results in uneven water distribution and failure to deliver sufficient water for strong growth and good yields.

AFTER EACH CYCLE

After fertigation flush system with clean water to clear out fertilizer which can create precipitates that can block the drip.

WEEKLY

Check filters. If filters are not checked regularly, the water flow rate can decrease and result in the irrigation system not being able to deliver sufficient water to the crop.

Mainline filter casing

Closed mainline valve

Step 1: Unscrew casing cap to expose the filter

Step 2: Remove filter from casing

Step 3: Wash filter thoroughly of any build up

Step 4: Return filter to casing

Step 5: Check for leaks – mark areas where leakages have been identified

Step 6: Check system flow and pressure differential over filters (more important for pump based systems).

Step 7: Record the following in the maintenance logbook:

a. Date of inspection
b. Name of person inspecting
c. Problems identified – where and what.
d. Any corrective action taken

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Post-harvest facilities

- Best-practice post-harvest facilities for training and providing access to high-value market opportunities for farmers
- Cleaning
- Packaging
- Cold Storage

Thank You

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