

# EVERYTHING YOU EVER WANTED TO KNOW ABOUT SWEETPOTATO



## TOPIC 2

### The Origin and Importance of Sweetpotato

Reaching Agents of Change Training of Trainers (ToT) manual

October 2018



### Everything You Ever Wanted to Know about Sweetpotato. Topic 2 - The Origin and Importance of Sweetpotato

Reaching Agents of Change ToT Training Manual

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## Topic 2: The Origin and Importance of Sweetpotato

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This team has brought together and shared their many years of experience of working with sweetpotato systems and farmer learning processes across Sub-Saharan Africa to compile this *Everything You Ever Wanted to Know about Sweetpotato* resource. None of this experience would have been gained without the partnership of many sweetpotato farmers and other stakeholders (extensionists, national researchers, traders, transporters, NGO staff, nutritionists, media and donors) across the region. We thank you, and hope that this resource can in return offer you support in your sweetpotato activities.

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This manual was originally produced as part of the Reaching Agents of Change project in 2013 and updated by the Building Nutritious Food Baskets project in 2017/2018 – both projects funded by the Bill & Melinda Gates Foundation.

## Acronyms and Abbreviations

<b>Als</b>	Adequate Intakes
<b>AVRDC</b>	The World Vegetable Centre
<b>BNFB</b>	Building Nutritious Food Baskets
<b>CBO</b>	Community Based Organisation
<b>CIP</b>	International Potato
<b>DAP</b>	Days After Planting
<b>DFE</b>	Dietary Folate Equivalents
<b>DONATA</b>	Dissemination of New Agricultural Technologies in Africa
<b>DVM</b>	Decentralised Vine Multipliers
<b>dwb</b>	Dry Weight Basis
<b>FAO</b>	Food and Agriculture Organisation of the United Nations
<b>FW</b>	Fresh Weight
<b>HH</b>	Household
<b>HKI</b>	Helen Keller International
<b>IBPGR</b>	Bioversity International
<b>IPM</b>	Integrated Pest Management
<b>IPPM</b>	Integrated Pest & Production Management
<b>K</b>	Potassium
<b>LGA</b>	Local Government Areas
<b>M&amp;E</b>	Monitoring and Evaluation
<b>MAP</b>	Months After Planting
<b>m.a.s.l.</b>	Metres Above Sea Level
<b>Mm</b>	Mass Multiplication
<b>MSC</b>	Most Significant Change
<b>N</b>	Nitrogen
<b>NARO</b>	National Agricultural Research Organisation
<b>NGO</b>	Non-Government Organisations
<b>NHV</b>	Negative Horizontal Ventilation
<b>NRI</b>	Natural Resources Institute
<b>OFSP</b>	Orange-fleshed Sweetpotato
<b>P</b>	Phosphorous
<b>PMCA</b>	Participatory Market Chain Approach
<b>PMS</b>	Primary Multiplication Site
<b>PPP</b>	Public Private Partnership
<b>PVC</b>	Polyvinyl Chloride
<b>QDPM</b>	Quality Declared Planting Material



<b>QDS</b>	Quality Declared Seed
<b>RAC</b>	Reaching Agents of Change
<b>RAE</b>	Retinol Activity Equivalents
<b>RCT</b>	Randomised Control Trial
<b>RDA</b>	Recommended Daily Allowances
<b>RE</b>	Retinol Equivalents
<b>REU</b>	Reaching End Users
<b>RH</b>	Relative Humidity
<b>SASHA</b>	Sweetpotato Action for Security and Health in Africa
<b>SMS</b>	Secondary Multiplication Site
<b>SP</b>	Sweetpotato
<b>SPCSV</b>	Sweetpotato Chlorotic Stunt Virus
<b>SPFMV</b>	Sweetpotato Feathery Mottle Virus
<b>SPKP</b>	Sweetpotato Knowledge Portal
<b>SPVD</b>	Sweetpotato Virus Disease
<b>SSA</b>	Sub-Saharan Africa
<b>ToT</b>	Training of Trainers
<b>TMS</b>	Tertiary Multiplication Site
<b>Tshs.</b>	Tanzanian Shillings
<b>TSNI</b>	Towards Sustainable Nutrition Improvement
<b>UNICEF</b>	United Nations Children’s Fund
<b>USD</b>	United States Dollar
<b>Ushs.</b>	Ugandan Shillings
<b>VAD</b>	Vitamin A Deficiency
<b>WAP</b>	Weeks After Planting
<b>WHO</b>	World Health Organisation
<b>WTP</b>	Willingness to Pay

### Foreword

During the past decade, interest in sweetpotato in Sub-Saharan Africa (SSA) has expanded, the number of projects utilizing sweetpotato has increased, and the demand for quality training resources, training development practitioners and farmers has subsequently risen. Sweetpotato scientists at the International Potato Center and national research centres often received these requests and frequently held 1-3 day training sessions, drawing on whatever training materials they had or could quickly pull together.

The Reaching Agents of Change (RAC) project in 2011 changed that situation. Jointly implemented by the International Potato Center (CIP) and Helen Keller International (HKI), RAC sought to empower advocates for orange-fleshed sweetpotato (OFSP) to successfully raise awareness about OFSP and mobilize resources for OFSP projects. RAC also sought to build the capacity of public sector extension and non-governmental organizational personnel to effectively implement those projects to promote the dissemination and appropriate use of vitamin A rich, orange-fleshed sweetpotato. The Building Nutritious Food Basket (BNFB) is a three-year project (November 2015 to October 2018) that followed on from the RAC project. The project is implemented in Nigeria and Tanzania and funded by the Bill & Melinda Gates Foundation. The goal of the project is to accelerate and support scaling up of biofortified crops for food and nutrition security and to help reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops (OFSP, PVA maize, high iron beans and vitamin A cassava) at scale. BNFB develops institutional, community and individual capacities to produce and consume biofortified crops. The objectives of the project are to strengthen the enabling environment for increased investments in biofortified crops and to develop institutional and individual capacities to produce and consume biofortified crops.

RAC/BNFB goal of developing and revising the Training of Trainers (ToT) manual on *Everything You Ever Wanted to Know about Sweetpotato* was to see *sustained* capacity for training senior extension personnel about the latest developments in sweetpotato production and utilization in each of the major sub-regions of SSA: Eastern and Central Africa, Southern Africa, and West Africa. Hence, CIP identified local institutions to work with in Mozambique, Tanzania, and Nigeria to host an annual course entitled: *Everything You Ever Wanted to Know about Sweetpotato*. The course has progressed from initially having CIP scientists working closely with national scientists to implement it, to national scientists and partners independently organising and conducting the course. In subsequent years, institutions in Burkina Faso, Ethiopia, Ghana, Malawi and others have been capacitated in conducting the course.

In developing the course content, a long-time collaborator of CIP, Tanya Stathers of the Natural Resources Institute (NRI), University of Greenwich, worked with CIP Scientists to review the existing training material, added in new knowledge from sweetpotato scientists and practitioners, and designed the course with a heavy emphasis on learning-by-doing. The CIP personnel who contributed to the development of the initial manual include, (Robert Mwanga, Ted Carey, Jan Low, Maria Andrade, Margaret McEwan, Jude Njoku, Sam Namanda, Sammy Agili, Jonathan Mkumbira, Joyce Malinga, Godfrey Mulongo), Adiel Mbabu and HKI nutritionists (Margaret Benjamin, Heather Katcher, Jessica Blankenship) and an HKI gender specialist (Sonii David) as well as NRI colleagues (Richard Gibson, Aurelie Bechoff, Keith Tomlins). Some of the materials were adapted from the DONATA project training materials, the Reaching End Users project and many others. After practitioners had used the course and the manual, a review was held in 2012 and the manual and course were subsequently updated, and a standard set of accompanying Power Point presentations created. In 2017-2018, the Building Nutritious Food Baskets project led a further review of the manual working closely with Tanya Stathers, the above mentioned CIP teams again plus Robert Ackatia-Armah, Kwame Ogera, Srinji Rajendra, Julius Okello, Fred Grant, Joyce Maru, Hilda Munyua and Netsayi Mudege to update the content of topics 3, 4, 5, 12 and 13 which cover: sweetpotato varietal selection; nutrition; seed systems; monitoring, learning and evaluation; and using the 10 and 5 day ToT course.

This manual is designed to potentially serve a wide variety of audiences (nutritionists and agronomists, policymakers, extension workers, community development workers, leaders of farmer organizations, farmers etc.). Not all the materials will be relevant to all audiences, but facilitators can adapt the content to their audience and facilitation best practices. To ensure sustainability and wide reach; a cascading approach in the delivery of training is recommended; where key experts (agriculturalists, nutritionists, health workers, marketing and gender experts) will attend more detailed ToT workshops. The experts trained will then become primary facilitators and drive the agenda for OFSP. This group will in turn deliver shorter version courses and step-down the training to various levels of audiences (secondary and tertiary) – based on needs identified. This trend will continue until the training cascades down to “farmer trainers” who finally train the end users in their communities.

The original version of the manual has also been translated into Swahili, French, Portuguese, and Amharic are available online at <https://www.sweetpotatoknowledge.org/learn-everything-you-ever-wanted-to-know-about-sweetpotato/> with the intension of translating the revised chapters as soon as resources permit. We envision the course to continue to be improved as new knowledge comes in. In this way, we expect the vibrant and knowledgeable sweetpotato community of practice to continue to grow in the coming years. The *Everything You Ever Wanted to Know about Sweetpotato* course will help us to achieve the major objectives of the Sweetpotato Profit and Health Initiative (SPHI). Launched in October 2009, the SPHI seeks to improve the lives of 10 million sub-Saharan African families in 16 countries by 2020 through the diversified use of improved sweetpotato varieties.



Jan W. Low, Leader of the Sweetpotato for Profit and Health Initiative, International Potato Center  
October 2018, 2<sup>nd</sup> edition

## How to Use This Guide

This guide was designed to be used in two ways:

- As self-study material, or
- As a facilitator's guide for classroom training sessions

For each topic we have provided:

- A handbook (this volume)
- A PowerPoint presentation, and
- A handout for classroom training participants

If you plan to deliver this as classroom training, then we would encourage you to read the **Facilitator's Guide** (separate volume) prior to planning your lessons.

## Introduction: The Origin and Importance of Sweetpotato

### Topic Objectives

Upon completing this module, participants should be able to:

- Explain where the sweetpotato comes from and why knowing the origin is important
- Summarise where sweetpotato is produced and how it is used
- List trends affecting sweet potato production and use
- Explain agronomic benefits of sweetpotato for the farmers and health benefits for the consumers
- List and define challenges to sweetpotato production and use and summarise possible solutions to those challenges
- Explain the importance of advocacy for sweetpotato
- List common myths about sweetpotato and state facts contradicting those myths.

### Synopsis

Topic 2 focuses on history, describing the origins and spread of sweetpotato. The topic then presents an overview of the current uses of and production figures for sweetpotato across the world.

## Unit 1 – Where Does Sweetpotato Come From?

### Objectives

By the end of this unit, you should be able to:

- Tell why it is challenging to trace the exact history of crop plant species.
- Name where and when sweetpotato was domesticated.
- Describe where, when, and how sweetpotato spread across the world.

### Key Points

- **Human agency and natural selection both affected the history of the sweetpotato.**
- **Sweetpotato originated in tropical America.**
- **The plant was domesticated about 5,000 years ago.**
- **Beginning in the 13th century, sweetpotato began to spread west throughout the Pacific.**
- **In the 16th century, sweetpotato spread east across the Atlantic to Africa and Spain.**

### Where Does Sweetpotato Come From?

Since agriculture began, farmers have selected, used, exchanged and transported crop species and planting materials over short and long distances, and natural selection has also worked on these plants. As a result, it is difficult to assemble information on the origin and evolution of agricultural crops. Oral and written histories and molecular markers are used to try and trace the origins of different crops.

Sweetpotato (*Ipomoea batatas* (L.) Lam.) did not originate in Africa; it was domesticated at least 5,000 years ago in tropical America. Central America is believed to be the centre of origin of sweetpotato, with it being brought to Africa by Portuguese traders in the 16<sup>th</sup> Century. It was probably introduced on both the east and west coasts of Africa (possibly Angola and Mozambique), and then spread inland. Further introductions from India to East Africa occurred later under British colonial influences. Sweetpotato was already widely grown from Zanzibar to Egypt and used as food and for making beer by the time of the Speke-Grant expedition in the 1860's. The historical spread of sweetpotato from Latin America across the globe is shown in the following table and picture.

Chronological Spread of Sweetpotato Across the World	
8000 BC	<ul style="list-style-type: none"> <li>• Sweetpotato present in Peru</li> </ul>
1000 BC	<ul style="list-style-type: none"> <li>• Sweetpotato started to be cultivated in Peru during the last century BC</li> <li>• It spread and became a staple food all over tropical America, as far as Northern Mexico and on the Caribbean islands</li> </ul>
13th Century AD	<ul style="list-style-type: none"> <li>• Via Peruvian or Polynesian voyages, sweetpotato was taken west to Easter Island and Hawaii</li> </ul>
14th Century AD	<ul style="list-style-type: none"> <li>• Sweetpotato was transported to the Pacific Islands and New Zealand</li> </ul>
Early 16th Century AD	<ul style="list-style-type: none"> <li>• Spanish explorers took sweetpotato from Mexico to the Philippines, and to southern Spain</li> <li>• From the Philippines it was taken to the East Indies and India</li> </ul>

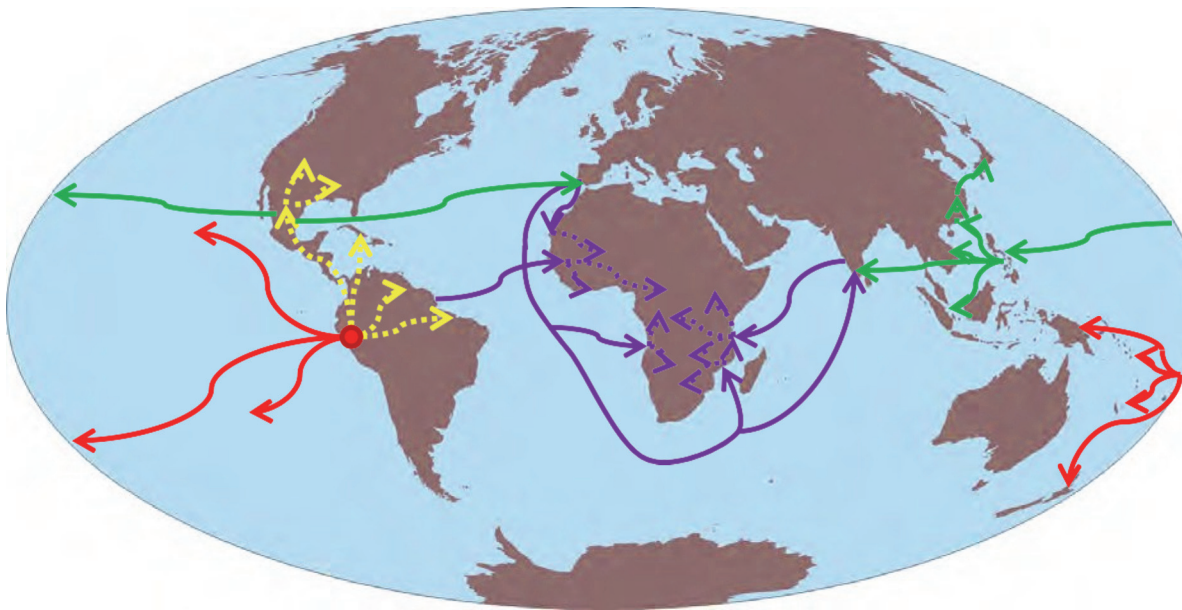


## Topic 2: The Origin and Importance of Sweetpotato

Late 16th Century AD	<ul style="list-style-type: none"><li>• Due to famine in China, sweetpotato was imported as a food security crop, and then spread from the south across the east of the country</li><li>• Portuguese traders and slave traders took sweetpotato to Africa and India</li></ul>
18th Century AD	<ul style="list-style-type: none"><li>• Sweetpotato spread from China to Japan</li></ul>

### Spread of Sweetpotato Cultivation

from Peru to the Pacific islands →, overland across tropical America →, to the Philippines and Spain →, and on to Africa and India →



### Review Questions

1. If you lived in Sub-Saharan Africa in the year 1300 AD, would you have access to sweetpotato?
2. Where did sweetpotato originate?

## Unit 2 – Where Is Sweetpotato Produced and How Is It Used?

### Objectives

By the end of this unit, participants should be able to:

- Describe the family tree and physical properties of the sweetpotato plant.
- Tell whether sweetpotato is considered a root crop or a tuber crop, and why.
- Compare the relative importance of sweetpotato and other food crops in different parts of the world.
- Explain the different uses of sweetpotato in industry, food, and medicine.
- List the ways sweetpotato is processed for food.
- List some of the factors that affect sweetpotato yield in different areas.

### Key Points

- Sweetpotato is not closely related to either yams or Irish (round) potatoes.
- The many different varieties of sweetpotato are called *cultivars*.
- Sweetpotato is the seventh most important food crop worldwide.
- 95 percent of sweetpotatoes are grown in developing countries.
- Sweetpotato is among the staple foods in many places, but it often must compete with other root and tuber crops.
- Sweetpotato is cooked and preserved in many ways; it is even dried into noodles and fermented for alcohol.
- The industrial uses of the plant include dyes and starch.
- Sweetpotatoes are also used to produce edible vaccines.
- Due to a variety of factors and barriers, the plants have greater or poorer yields in different regions.

### Where Is Sweetpotato Produced and How Is It Used?

Sweetpotato is known scientifically as *Ipomoea batatas*. This important tropical root crop is the starchy root of a vine of the Convolvulaceae family. The morning glory and bindweed plants are also in this family. The round or Irish potato, *Solanum tuberosum*, belongs to the Solanaceae family, and thus is not related to the sweetpotato, and nor is the true yam (*Dioscorea* sp.) which belongs to the Dioscoreaceae family.

Globally there are over 600 species in the genus *Ipomoea*, and 13 of these are in the section *Batatas*. All these 13 species are native to the Americas, with

sweetpotato being the only one which is cultivated and the only one which is hexaploid ( $6x=90$ ). These wild relatives do not naturally cross pollinate with sweetpotato due to the differences in their ploidy (chromosome) level and complex compatibility and sterility systems. Although using biotechnology, researchers are experimenting with the use of wild relatives to try and improve different aspects of sweetpotato. In this manual we use the term sweetpotato variety to denote a group of sweetpotato plants which are genetically distinct and therefore differ in certain characteristics from other groups of sweetpotato plants within the species. When a variety is selected and cultivated it can be called a cultivar.

#### Sweetpotato Classification Details:

Family: Convolvulaceae

Genus: *Ipomoea*

Section: *Batatas*

Species: *Ipomoea batatas* (L.) Lam.

## Topic 2: The Origin and Importance of Sweetpotato



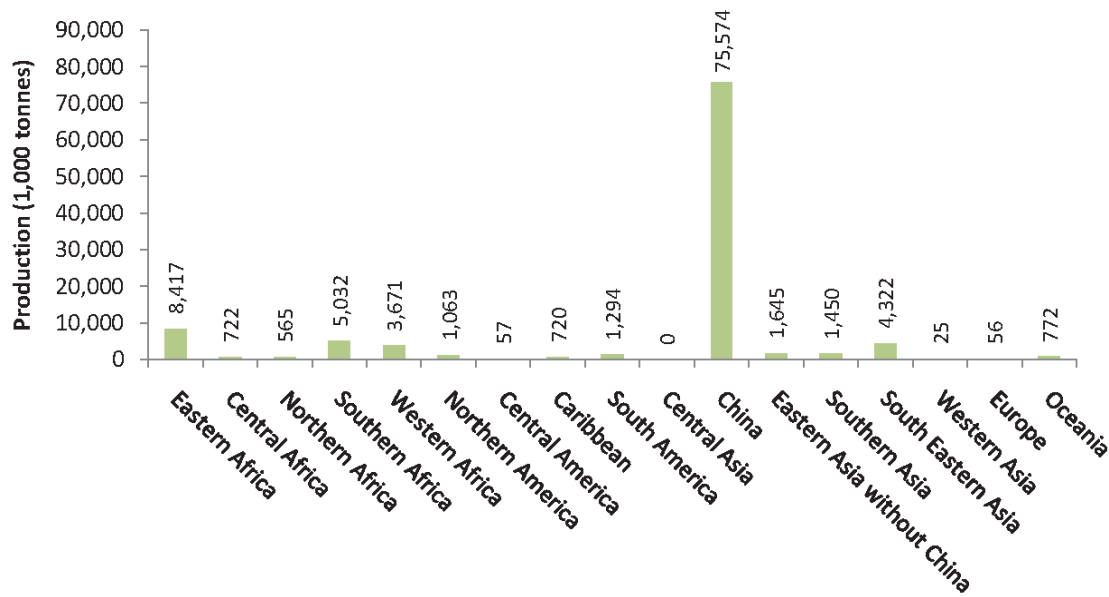
There are numerous varieties of sweetpotato. Most of the roots have an elongated slightly pointed shape to them, and come in a range of sizes, forms and colours. Depending on the variety the outside skin may be white, yellow, red, purple or brown, and the flesh white, yellow, orange or purple. There are a wide range of tastes and textures amongst the different sweetpotato varieties.

There is often confusion as to whether sweetpotato is a root crop or a tuber crop. It is a root crop. In tuber crops, the tuber is in fact a modified stem (stolon or runner), which thickens to become a specialised swollen stem for use as a storage organ. The tuber will thus have all the normal parts of a stem, including nodes and internodes. A round/ Irish potato is a tuber crop; the eyes on its tubers are in fact nodes, each of which have a leaf scar. Internally, the tuber has the typical cell structures of a stem, with pith, vascular zones and cortex. By contrast the enlarged sweetpotato roots (also used as storage organs) have the internal and external cell structures of typical roots, with no nodes, internodes or buds.

Sweetpotato is the seventh most important food crop in the world after wheat, rice, maize, potato, barley and cassava. In 2011, about 8 million hectares of the world's agricultural land were used to grow sweetpotato, and over 95% of the world's sweetpotato output was from developing countries. An overview of sweetpotato production by geographical area is shown in the following figure Overview of Sweetpotato Production Across the World. The data for China has been separated to highlight the comparatively huge scale of sweetpotato production in the country. In Africa, sweetpotato is particularly important in countries surrounding the Great Lakes in East and Central Africa; Malawi, Angola, Mozambique, and Madagascar in Southern Africa, and Nigeria in West Africa (see the figure below).

A comparison of the quantities of the main root and tuber crops grown in various African countries is given in the figure below, Annual Root and Tuber Crop Production. In Nigeria and Ghana where, huge quantities of cassava and yam are produced, sweetpotato is the fourth most important root and tuber crop, after cassava, yam and taro. While in Tanzania, Uganda, Mozambique and Malawi sweetpotato is the second most important root crop after cassava. In Rwanda it comes third after cassava and round/Irish potato. In Burkina Faso more sweetpotato is produced than cassava, but production levels of both are low compared to the other countries.

Overview of Sweetpotato Production Across the World In 2009-2011



Source: FAOSTAT and Eastern Africa includes Malawi National Programme and Ministry of Agriculture data  
 Eastern Africa includes Burundi, Comoros, Ethiopia, Kenya, Mauritius, Réunion, Rwanda, Somalia, Uganda, Tanzania.  
 Central Africa includes Cameroon, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon.  
 Northern Africa includes Egypt, Morocco, Sudan (former). Southern Africa includes South Africa, Swaziland,  
 Madagascar, Malawi, Mozambique, Zambia, Zimbabwe, Angola. Western Africa includes Benin, Burkina  
 Faso, Cape Verde, Côte d'Ivoire, Ghana, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra  
 Leone, Togo.

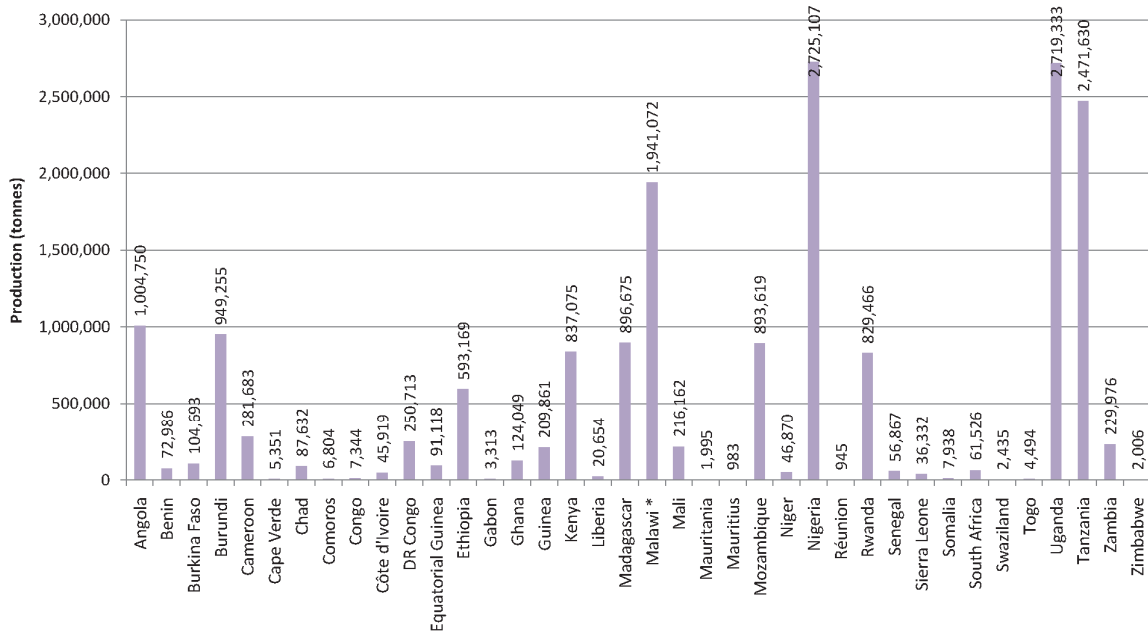
Given the wide cultivation and trade of sweetpotato around the world, it is no surprise to find it used in many different ways as food, animal feed and industrial products.

The fresh roots can be boiled or roasted, and then may be further processed by mashing into puree to use in a range of products including breads, chapatis, cakes, juices, porridge etc. The fresh roots can also be cut into chipped or small pieces and sun-dried and kept as an important food stock to rehydrate and eat during the year or made into flour, breakfast cereals or noodles. In some African countries such as Uganda, Rwanda and Burundi starchy crops are the staple food and 75 - 150 kgs of sweetpotato are consumed per person per year. In countries with maize-based food systems, such as Kenya, Angola, Mozambique and DR Congo sweetpotato is an additional food and only 5 – 50 kgs of it are consumed per person per year.

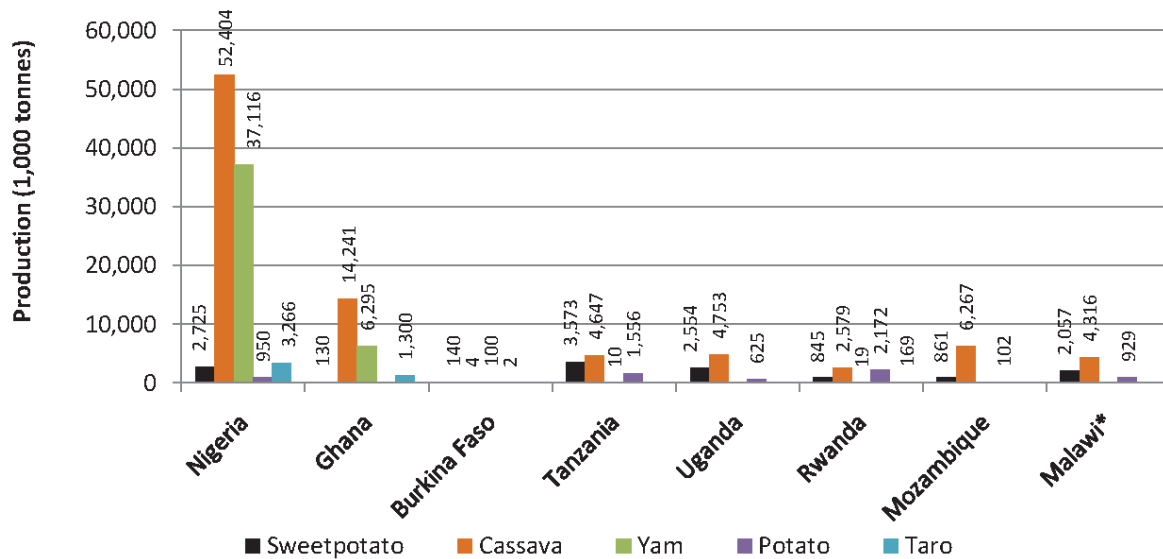
In some countries sweetpotato roots are processed to produce starch, noodles, candy, pink to black cloth dyes and fermented to make alcohol. In China, sweetpotato starch production has become an important cottage industry.

In the US, scientists have developed genetically modified sweetpotato plants containing edible vaccines against hepatitis B and the Norwalk virus. Novel edible vaccines such as these may in future provide cheap forms of health protection.

### Overview of Annual Sweetpotato Production Across Sub-Saharan Africa from 2009-2011



### Annual Root and Tuber Crop Production in Selected African Countries In 2011



Source: FAOSTAT and \*Malawi National Programme and Ministry of Agriculture

Sweetpotato leaves are nutritious and widely eaten as a vegetable dish in many parts of the world.

Sweetpotato is also used as an animal feed in many places; the vines can be fed fresh or made into silage. Raw sweetpotato roots contain an anti-nutritional factor (trypsin inhibitor), which prevents the starch from being easily digested, cooking or chopping and drying can deactivate this factor. In China, 70% of the huge quantities of sweetpotato grown go to animal feed, mainly for pig production. In Asia, the sweetpotato – pig production system is a common and important feature of rural livelihoods. In Africa, sweetpotato is often referred to as the ‘poor person’s crop’ and typically grown on a small scale as a subsistence crop by women, its use as animal feed is usually limited to

## Topic 2: The Origin and Importance of Sweetpotato

the vines. However, things are changing as the area of sweetpotato grown and its degree of commercialisation in Africa increases.

Sweetpotato produces more biomass and nutrients per hectare than any other food crop in the world. It is typically grown without fertilisers or irrigation, can grow from sea level to altitudes of up to 2,500 metres, from temperatures of 15 to 33°C, has flexible planting and harvesting times, needs little care and matures quickly; and has throughout history and across the world played an important role in saving people from famine.

Sweetpotato root yields differ greatly across the world, with Asia averaging 18.5 tons/ha, the USA 16.3 tons/ha, South America 12.2 tons/ha and Africa 4.7 tons/ha. Under excellent management and input use yields of 40-50 tons/hectare are obtained in South Africa. These yield differences reflect many issues including the use of poor quality and virus infected planting materials, the relative status of sweetpotato and other crop management aspects (e.g. planting techniques; spacing; soil fertility, water, pest and disease management). This training course aims to help remove some of these barriers to enable sweetpotato production to increase across Sub-Saharan Africa.

### Review Questions

1. What are the three main uses of sweetpotato?
2. Is sweetpotato a root crop or a tuber crop? How do we know this?
3. Describe different skin and flesh colours of sweetpotatos.



## Unit 3 – What Trends Are Affecting Sweetpotato Production and Use?

### Objectives

By the end of this unit, participants should be able to:

- Give several reasons why root and tuber crops are becoming prevalent in Sub-Saharan Africa.
- Explain why sweetpotato is a healthy, nutritionally valuable food.
- Describe the health benefits of a diet that includes sweetpotato.

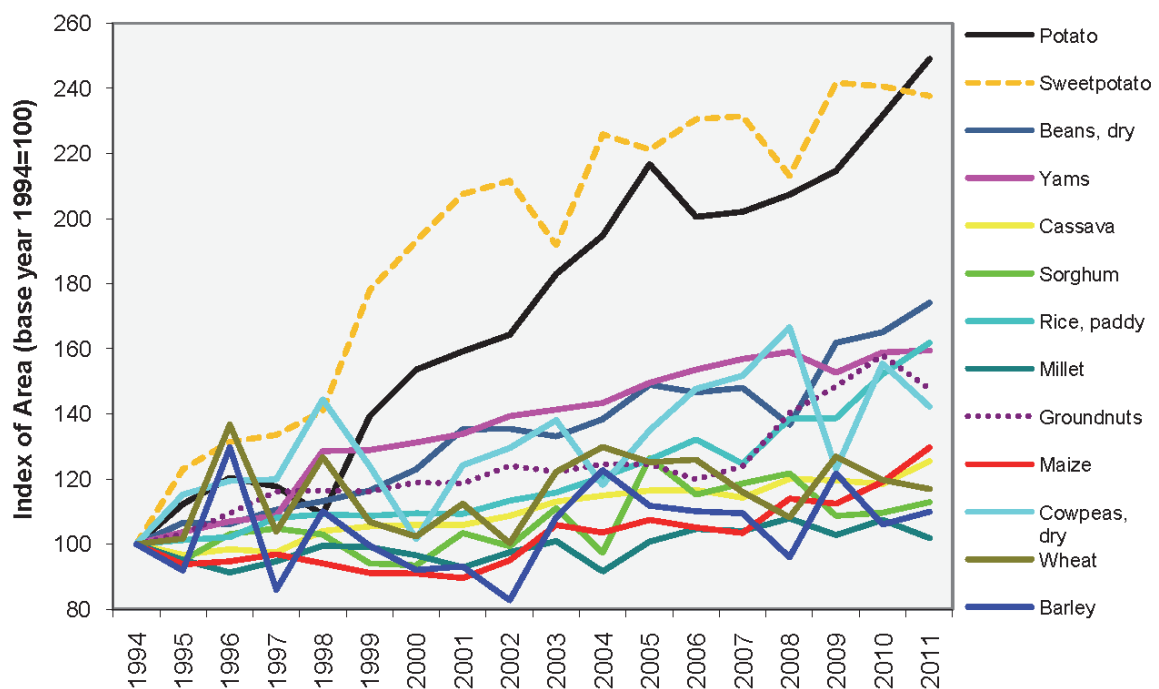
### Key Points

- As Sub-Saharan Africa urbanizes, market-oriented agriculture will continue to drive sweetpotato production.
- Sweetpotato contains many key nutrients and can be eaten by consumers who cannot tolerate grains.
- The beta-carotene in orange-fleshed sweetpotato varieties (OFSP) is crucial to controlling Vitamin A deficiencies. Health problems impacted by Vitamin A include dry eye, which causes blindness and death in children.

### What Trends Are Affecting Sweetpotato Production and Use

Increasingly Sub-Saharan African farmers are responding to the decline in cultivable land size due to increasing population by growing more root and tuber crops (see the figure below) which give higher yields per unit area than grain crops do. Sweetpotato is considered a low labour, low cost and low risk crop which helps families struggling with illness, increasing care requirements and resource losses due to the impacts of HIV/AIDS.

#### Growth in Cultivated Crop Area of The Main African Field Crops From 1994 to 2011



Source: FAOSTAT and Malawi Ministry of Agriculture

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As agriculture becomes more market-oriented in Sub-Saharan Africa, sweetpotato is one of several crops that farmers can produce to obtain cash income in addition to subsistence food security.

Markets for fresh roots and vines do exist, but with a few exceptions (e.g. Uganda) they are not large. However, Africa is rapidly urbanising. Projections show that by 2030 there will be over 759 million African urban dwellers. This urbanisation and the associated food system changes are likely to lead to an increase in demand for fresh roots and value-added sweetpotato-based products; further work on understanding these trends in different countries in the region is required.

Sweetpotato roots are a healthy food: all varieties have high levels of vitamins C and E, several B vitamins, iron, zinc, potassium, and fibre. The orange-fleshed varieties are very high in pro-vitamin A or beta-carotene, which when eaten is converted into vitamin A (retinol) in the intestines and liver. In addition, they have anti-carcinogenic and cardiovascular disease-preventing properties and can be used in products for consumers who are allergic to grain breads and flours. Processed sweetpotato products are projected to increase in the developed world.

In eastern and southern Africa some 3 million children under the age of 5 suffer from dry eye or *Xerophthalmia*, which causes blindness. Due to lack of vitamin A in the diet, many of the affected children die within a few months of becoming blind. In Sub-Saharan Africa, 43 million children under the age of 5 are vitamin A deficient. If incorporated into the diet, the orange fleshed sweetpotato (OFSP) varieties high in beta-carotene can eliminate vitamin A deficiency in children and adults.

### Review Questions

1. What are the agricultural advantages of sweetpotato?
2. What are some of the health benefits of sweetpotato?

## Unit 4 – Why Promote Sweetpotato?

### Objectives

By the end of this unit, participants should be able to:

- Name the major demographics who are growers of sweetpotato in Sub-Saharan Africa.
- Explain how investing in sweetpotato programs can help those impacted by poverty or malnutrition.
- List the opportunities for improvement in sweet potato cultivation and utilization.
- Tell how gender issues and sweetpotato interact.
- Describe CIP's strategies for improved sweetpotato production and utilization.

### Key Points

- **Sweetpotato is already a major food plant in Sub-Saharan Africa, but there are opportunities to improve crop yields and introduce more nutrient dense cultivars.**
- **Sweetpotato cultivation areas overlap with human malnutrition areas. This shows how improved production and utilisation to create nutritional improvements.**
- **Improving sweetpotato production can reduce poverty, generate cash flow, create less food insecurity, and protect ecosystems.**
- **Because women are nutritional decision-makers, programs that focus on them can improve child and maternal health as well as women's income and household nutrition.**
- **CIP's strategies for sweetpotato production and utilization include genetic enhancement, crop and seed management, improving farming, and targeting policies and research.**

### Why Promote Sweetpotato?

Sweetpotato is one of the most widely grown root crops in Sub-Saharan Africa, covering around 3.2 million hectares with an estimated production of 13.4 million tons of roots in 2005. It is a crop that is predominantly grown by resource poor smallholder farmers, particularly women. There are real opportunities to boost the productivity and utilisation of sweetpotato and investing in this will directly benefit the poor through improving their incomes and nutritional status. The overlap between the areas where sweetpotato is already cultivated and areas of human malnutrition (see the two Maps of Africa below) highlights the important opportunities that boosting the production and utilisation of more nutritional sweetpotato varieties would achieve.

Trends suggest sweetpotato production and utilisation will continue to increase in Sub-Saharan Africa and elsewhere. Given the relatively easy production methods, high nutritional value and pro-poor nature of the sweetpotato crop, enhancing its production and utilisation in Sub-Saharan Africa can be seen as a major opportunity for poverty reduction, income generation, food and nutrition security and sustainable ecosystems.

Gender issues are important in sweetpotato improvement efforts in Africa because: a) production resource constraints faced by women producers coupled with their limited access to technologies, education and financial services and lack of decision-making powers contribute to the current low sweetpotato yields; and b) women are the key nutrition decision-makers in most societies, and therefore efforts to promote orange-fleshed sweetpotato for improved child and maternal nutrition must focus on them.

Investing in sweetpotato has great potential for improving women's income and household nutrition and health but as the crop becomes increasingly commercialized, strategies to ensure gender equitable commercialization interventions need to be designed. The gender and diversity issues

important for promoting sweetpotato are explored in detail in Gender and Diversity Aspects.

CIP's strategy for enhancing sweetpotato production and utilisation is described in the adjacent box.

Within Sub-Saharan Africa, CIP focuses its sweetpotato work on the 17 countries which together produce 95% of the sweetpotato grown. These countries and their sweetpotato production quantities, areas and yields are shown in the first Map of Africa found below.

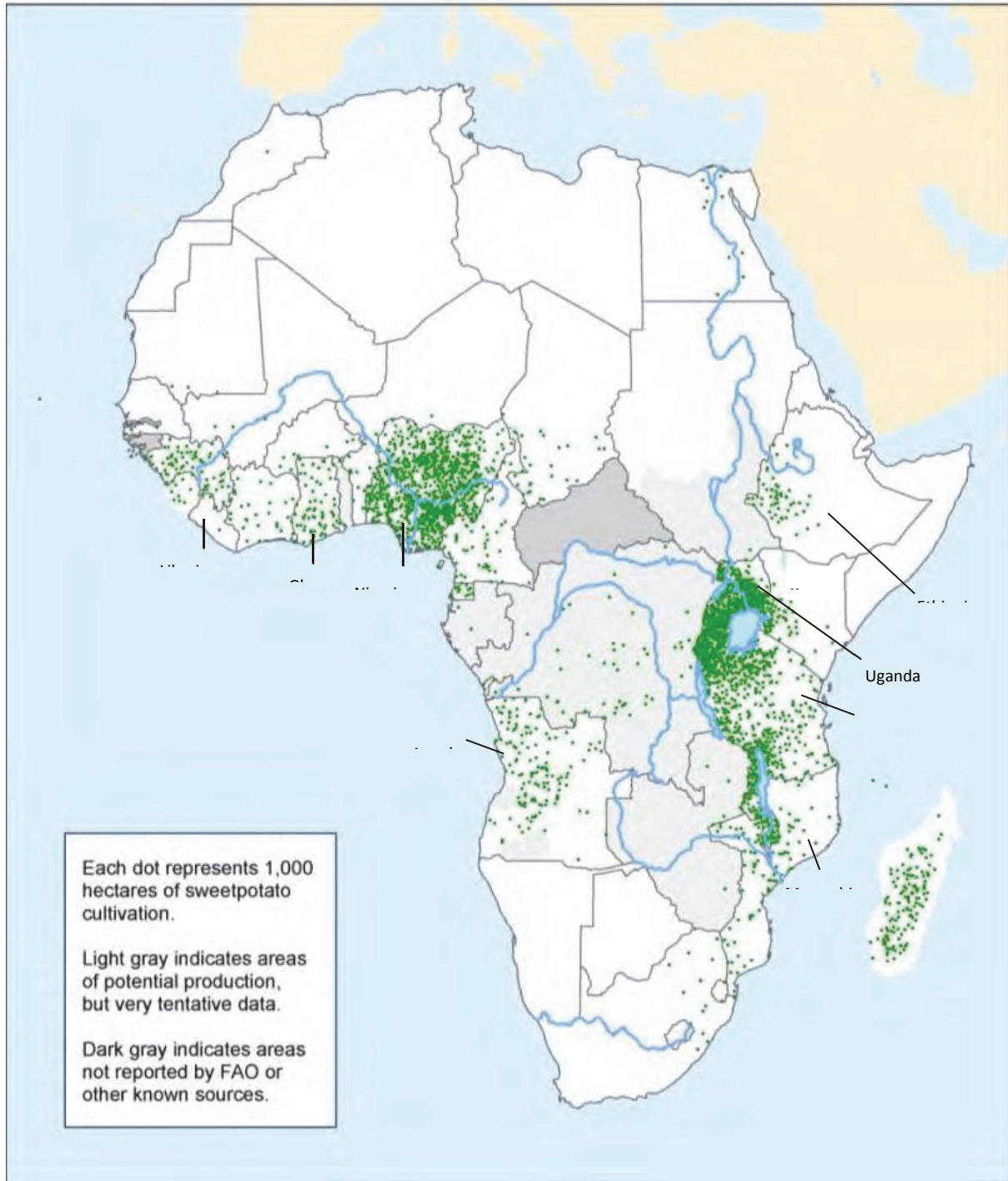
However, enhancing the production and utilisation of sweetpotato in Sub-Saharan Africa is not without challenges see the unit, What Are the Challenges to Sweetpotato Production.

### Towards Poverty Reduction, Food and Nutrition Security and Sustainable Ecosystems Through Enhancing Sweetpotato Production

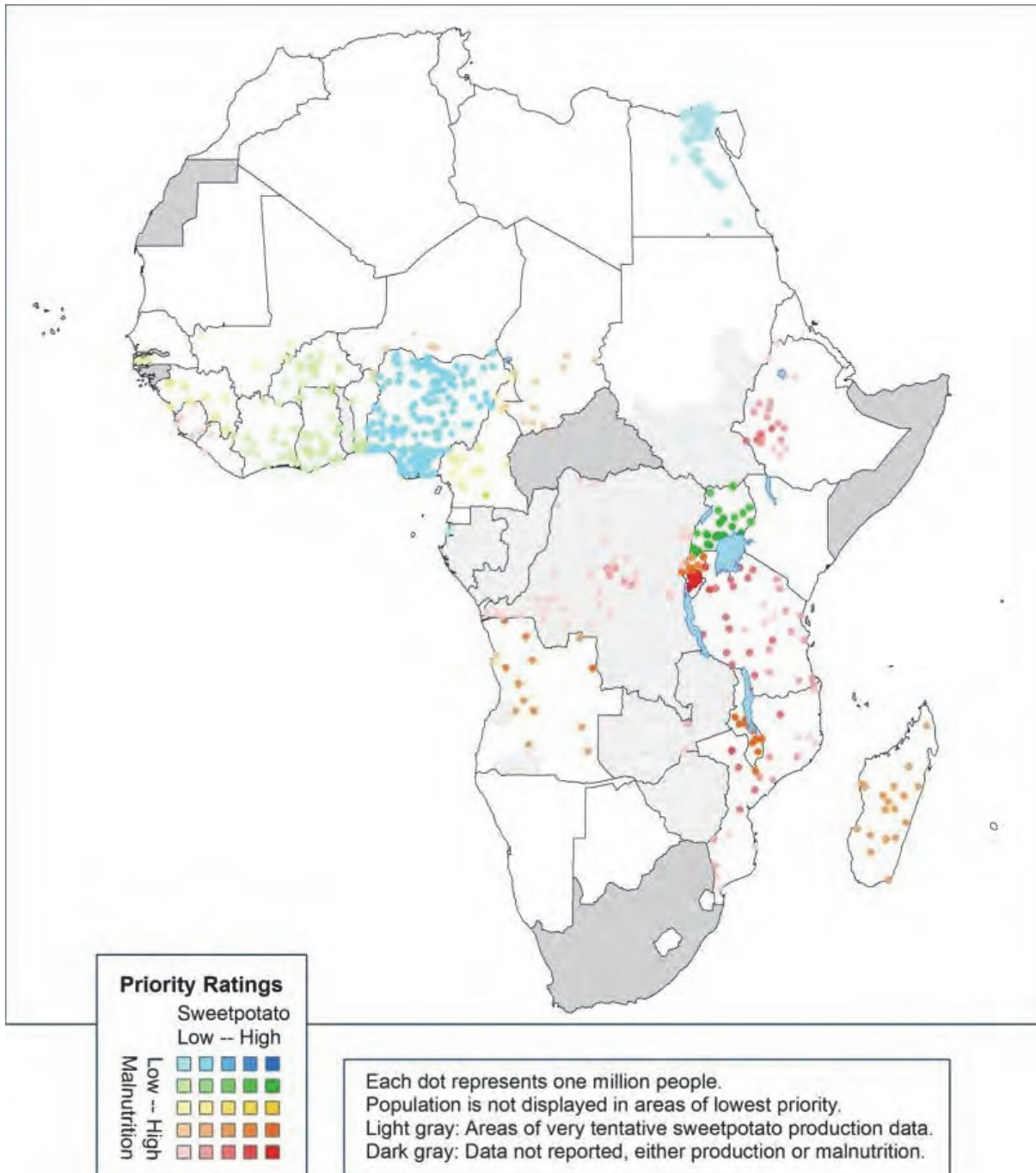
- To Collect, Conserve and Characterize Sweetpotato Germplasm
- To Add Value to That Germplasm Through Genetic Enhancement and Crop Improvement
- To Improve Productivity Through Crop Protection, Crop Management and Better Seed
- To Reduce Vulnerability in A Changing World Through Sustainable Intensification of Sweetpotato Systems
- To Strengthen the Positive and Reduce the Negative Impacts of Food and Farming on Human Health
- To Identify and Target Priorities and Provide Policy Relevant Research
- To Support Sweetpotato Sector Development

*CIP'S STRATEGY*

Map of Africa Showing Density of Sweetpotato Cultivation



Map of Africa Showing Incidence of Malnutrition and Sweetpotato Production





**Sweetpotato Production and Area Cultivated, Population Density and Estimated Yields For the 17 Major Producing Countries in Sub-Saharan African (SSA)**

Sub-region	Country	Average 2009-2011					Estimated Yield (Tons/ha)
		Sweetpotato Production ('000 Metric tons)	% of the total Sweetpotato Grown in SSA	Sweetpotato Production per Capita (kgs/person)	Population density in 2011 (persons/ sq km)	Area (1,000 has)	
	Uganda	2,719	14.4	78.8	173	587	4.6
	Tanzania	2,472	13.1	53.5	52	642	3.8
	Rwanda	829	4.4	75.8	444	114	7.3
	Burundi	949	5.0	110.7	334	138	6.9
	Kenya	837	4.4	20.1	73	74	11.3
	Ethiopia	593	3.1	7.0	85	67	8.8
	DR Congo	251	1.3	3.7	30	49	5.1
<b>East &amp; Central Africa</b>		<b>8,651</b>	<b>45.9</b>			<b>1,671</b>	<b>5.2</b>
	Malawi	1,941	10.3	126.2	163	178	10.9
	Madagascar	897	4.8	42.1	37	122	7.3
	Angola	1,005	5.3	51.2	16	155	6.5
	Mozambique	894	4.7	37.3	30	123	7.3
	Zambia	230	1.2	17.1	18	14	16.9
	South Africa	62	0.3	1.2	42	19	3.2
<b>Southern Africa</b>		<b>5,028</b>	<b>26.7</b>			<b>610</b>	<b>8.2</b>
	Nigeria	2,725	14.5	16.8	178	943	2.9
	Ghana	124	0.7	5.0	110	74	1.7
	Burkina Faso	105	0.6	6.2	62	8	13.8
	Benin	73	0.4	8.0	82	16	4.5
<b>West Africa</b>		<b>3,027</b>	<b>16.1</b>			<b>1,041</b>	<b>2.9</b>
<b>All 17 countries</b>		<b>16,705</b>	<b>89</b>			<b>3,323</b>	<b>5.0</b>

Source: Updated version of table in Low, 2008 using FAOSTAT and Malawi National programme and Min of Ag.

**Review Questions**

1. As one of the most widely grown root crops in Sub-Saharan Africa, about how much ground is used to grow the crop?
2. What benefits could be seen by enhancing sweetpotato production and utilisation in Sub-Saharan Africa?
3. Why is a focus on women important to household nutrition?

## Unit 5 – What Are the Challenges to Sweetpotato Production and Utilisation?

### Objectives

By the end of this unit, participants should be able to:

- List the 5 major challenges to sweetpotato production and utilization in Sub-Saharan Africa.
- Describe those challenges and their implications.
- Tell why these challenges matter.
- List some solutions to the 5 challenges.

### Key Points

- **The five challenges to maximum production and utilization of sweetpotato in Sub-Saharan Africa are lack of access to “clean” planting material, lack of improved varieties, sweetpotato weevils, lack of knowledge and poor practices, and underdeveloped markets and potential products.**
- **Solutions include new techniques, new varieties, pest management, adoption of better practices, and promotion of the benefits of sweetpotato to consumers.**

### What Are the Challenges to Sweetpotato Production and Utilisation?

The 5 major challenges to sweetpotato production and utilisation in Sub-Saharan Africa are:

*1. Lack of access to virus- and pest-free “clean” planting material.*

Many sweetpotato plants in Sub-Saharan Africa are infested with virus diseases. Use of clean healthy planting materials could bring instant yield gains of 30-60%. However, maintenance of planting materials during the prolonged dry season is a challenge, and results in delayed planting while sufficient planting materials are replicated. New vine conservation techniques, more drought tolerant varieties, small-scale dry season irrigation, and use of the triple S root sprouting method can help provide significant quantities of planting materials at the beginning of the rains. Insect pests are attracted to vine multiplication plots during the dry season, and therefore appropriate pest management strategies are needed to ensure pest- and virus-free planting materials can be locally supplied.

*2. Lack of improved varieties adapted to local environments that meet consumer preferences.*

Improved sweetpotato varieties are projected to offer yield gains of ~20% compared to healthy local landraces. In addition to yield, quality traits such as higher micronutrient content, dry matter content, sugar content, and taste which can improve the market demand and nutritional value of sweetpotato can also be selected for through breeding.

*3. Damage due to sweetpotato weevils, particularly in drier production zones.*

Sweetpotato weevils are the most important pests of sweetpotato in Africa and worldwide, and production losses may often reach 60% to 100%. Effective management of this pest could also extend the in-ground storage period in drier areas, reducing seasonality and improving food security. Whilst IPM strategies exist, these could be enhanced through further research and dissemination.

*4. Insufficient knowledge and poor agronomic practices.*

Adoption of better agronomic practices (site selection, planting techniques, spacing, weed control, and soil fertility management) could substantially increase yields by as much as 60%.

### 5. *Poor development of products and potential markets.*

Research in Mozambique and Kenya has demonstrated that farmers will substantially invest in labour and/or purchase input-demanding technologies *only* when there is a market to absorb surplus root production. Bulky products like sweetpotato roots are relatively expensive to transport, and good post-harvest care is essential to assure reasonable shelf-life. In many parts of Asia sweetpotato roots are used as animal feed and processed into starch and other processed products. In Sub-Saharan Africa, the value-added use of sweetpotato is still in its infancy and further work is needed to improve product quality and market chain efficiencies. Promotion of its nutritional benefits, especially of orange-fleshed sweetpotato (OFSP) varieties is needed to increase awareness and stimulate demand.

An overview of the agronomic characteristics and constraints of sweetpotato compared to the other root and tuber crops, cassava, potato and yam is shown in the prior Map of Africa.

## Review Questions

1. What are some of the major challenges for sweetpotato production and utilisation?
2. What are some of the solutions to those challenges?

## Unit 6 – Advocating for Orange-Fleshed Sweetpotato

### Objectives

By the end of this unit, participants should be able to:

- Explain why advocacy is needed.
- Define advocacy.
- Describe the difference between advocacy and promotion.
- Explain who can be an orange-fleshed sweetpotato (OFSP) advocate.
- Point to resources that people can use to learn how to do advocacy.

### Key Points

- Advocacy is needed to inform people how sweetpotato can help fulfil their needs.
- **OFSP advocacy means using information about sweetpotato to influence the behaviour of consumers and policy makers.**
- **Advocacy for OFSP is a key tool in addressing vitamin A deficiency.**
- **One of OFSP advocacy's main foci should be increasing investments by relevant stakeholders.**

### Advocating for Orange-Fleshed Sweetpotato

Orange-fleshed sweetpotato (OFSP) is still relatively new in most parts of Sub-Saharan Africa and therefore advocacy is needed to help people understand what it is and how it can be useful as a sustainable and low cost biofortification tool in the fight to reduce vitamin A deficiency across the region.

Advocacy is defined as efforts based on the strategic use of information to influence decision-makers and the wider public about specific issues or problems. Advocacy is not the same as promotion which is about raising awareness in a general sense. A key focus for OFSP advocacy should be increasing investments in OFSP by relevant stakeholders (government at all levels, NGOs, private sector, donors) and policy reform to achieve widespread dissemination and utilisation of orange-fleshed sweetpotato and the integration of biofortification as part of a holistic approach to addressing vitamin A deficiency.

Anyone can be an OFSP advocate including individuals, organizations and the media. There is a large literature on 'how to do advocacy' (see for example [www.unicef.org/evaluation/files/Advocacy\\_Toolkit.pdf](http://www.unicef.org/evaluation/files/Advocacy_Toolkit.pdf)). The Reaching Agents of Change (RAC) Project has developed an OFSP advocacy toolkit consisting of factsheets, flyers, videos and PowerPoint presentations (see <http://sweetpotatoknowledge.org/sweetpotato-introduction/ofsp-advocacy-toolkit>). For full details on how to register, use the sweetpotato knowledge portal online resource (see Appendix 2.1).

### Review Questions

1. How is advocacy different from promotion?
2. Why is advocacy needed to help the people of Sub-Saharan Africa understand what orange-fleshed sweetpotato (OFSP) is and how it can be useful?

## Unit 7 – Debunking the Myths Around Sweetpotato: What Are the Facts?

### Objectives

By the end of this unit, participants should be able to:

- Name 5 prevalent myths around sweetpotato.
- Tell why the 5 myths about sweetpotato are wrong.
- Explain the truth behind these 5 myths.

### Key Points

- **Sweetpotato may taste sweet, but it does not contribute to diabetes. In fact, it is a lower glycemic (GI) food that can help control diabetes.**
- **Sweet tasting foods do not affect male fertility. Sweetpotato is actually good for fertility.**
- **Sweet potato leaves are edible and nutritious.**
- **The vitamin A in sweetpotato helps avoid nutritional deficiencies that can lead to conditions that cause blindness, night blindness, or other eye problems. However, it cannot cure blindness.**
- **OFSP (orange-fleshed sweetpotato) is not a GMO, but due to natural and cultivation selection, sweetpotato comes in many varieties with different characteristics and benefits.**

### Debunking the Myths Around Sweetpotato: What Are the Facts?

Many inaccurate beliefs around sweetpotato affect demand for it. A few common sweetpotato myths and the relevant facts are shown below.

**Myth: Eating sweetpotato or foods containing sweetpotato causes diabetes**

**Fact: Sweetpotato is often a recommended food for diabetics**

**Fact:** Type 2 diabetes (a condition where the body does not produce enough insulin or insulin is not working properly, with resultant high blood sugar), the most common type of diabetes, is not caused by eating sweet foods. However, a poor diet especially one full of certain types of sugar, increases the probability of getting the disease. Risk factors for developing type 2 diabetes include hypertension, high blood triglyceride (fat) levels, a high-fat diet, high alcohol intake, a sedentary lifestyle (little exercise), and being overweight or obese.

Contrary to this myth, sweetpotato is often a recommended food for diabetics since it has a lower glycemic index (GI) than many other starchy foods. This is due in part to its high fibre content. Low GI foods release glucose slowly into the bloodstream which helps to control blood sugar (glucose) level. Many diets promote sweetpotato as a fat-burning food and it is at the top of many Best Foods to Eat lists.

**Myth: Eating sweetpotato is good for women and children, but causes male infertility**

**Fact: Sweetpotato may actually enhance sperm motility**

**Fact:** Sweet tasting foods do NOT have a negative effect on male fertility. In fact, vitamin A found in OFSP and other foods is important for preventing sluggish sperm; OFSP is also high in folic acid – a B vitamin with antioxidant properties that is crucial for keeping sperm free of chromosomal abnormalities. Adequate folate intake (folate is the form of folic acid that naturally occurs in the body) is also important for women before and during pregnancy. OFSP, packed with vitamins A, C, E and folate, is the perfect fertility food for men and a healthy food that can be enjoyed by the whole family.

**Myth: Sweetpotato leaves are not good for human consumption**

**Fact: Sweetpotato leaf is highly nutritious**

**Fact:** Sweetpotato leaves are eaten in many parts of Africa. They are rich in nutrients and functional compounds including complex carbohydrates, protein, amino acids, soluble and insoluble dietary fibre, omega-3 fatty acids, vitamins and minerals (vitamin A, folate, vitamin C, calcium, magnesium, phosphorous), antioxidants, and other bioactive compounds. Young leaves (less than three months) are tender and preferred to mature leaves. To get the maximum benefit, do not overcook leaves.

**Myth: OFSP can improve your eyesight and reverse blindness**

**Fact: Sweetpotato contains vitamins that can prevent nutritional deficiencies, but it cannot reverse blindness**

**Fact:** Children and pregnant women who do not have enough vitamin A in their diet may suffer from night blindness (difficulty or inability to see in dim light). In children, this can progress to conditions that damage the eye such as Bitot spots (foamy white patches on the white part of the eye) and Xerophthalmia (dryness of the cornea and conjunctiva) which can eventually lead to irreversible blindness.

Vitamin A in OFSP and other foods promotes good vision and helps prevent problems but cannot reverse blindness once it has occurred.



**Myth: OFSP is a genetically modified crop**

**Fact: Sweetpotato has many varieties but none are GMO**

**Fact:** Sweetpotato is a genetically rich and diverse crop, and all its different flesh colours (white, cream, yellow, orange, and purple) are found in nature. Some varieties produce roots and vines, and others produce only vines and leaves. Over 5,000 different sweetpotato varieties are kept in the gene bank of the International Potato Centre to preserve its biodiversity and serve the world's breeding programmes. OFSP has not been genetically modified to increase its pro-vitamin A content.

### Review Questions

1. Why is sweetpotato actually a recommended food for diabetics?
2. Does sweetpotato make men more or less fertile?
3. Are sweetpotato leaves good for human consumption?

## Activities

### Activity 2.1 Stakeholder Presentations

#### *Objectives*

The purpose of this activity is to take the facts and be able to present them to stakeholders in a positive and informative way.

#### *Time*

1 hour

#### *Materials*

- Flip chart
- Pens

#### *Suggested Steps*

1. Divide everyone into groups
2. Have each group create a short presentation for different stakeholder groups on the benefits of OFSP as a solution to vitamin A insufficiency
3. The different stakeholder groups could include an international donor, a local NGO focusing on maternal and child nutrition, and the government ministry of agriculture

## Answers to Review Questions

### Unit 1

1. If you lived in Sub-Saharan Africa in the year 1300 AD, would you have access to sweetpotato?
  - *No, because sweetpotato only made it to Africa and India in the late 16th century, when it was brought over by Portuguese traders.*
2. Where did sweetpotato originate?
  - *In Central America at least 5000 years ago.*

### Unit 2

1. What are the three main uses of sweetpotato?
  - *It is used in many different ways as food, animal feed and industrial products.*
2. Is sweetpotato a root crop or a tuber crop? How do we know this?
  - *It is a root crop, because tuber crops have true stems, containing nodes and internodes, whereas sweetpotatoes have the internal and external cell structures of typical roots, with no nodes, internodes or buds.*
3. Describe different skin and flesh colours of sweetpotatoes.
  - *Outside skin may be white, yellow, red, purple or brown. Flesh may be white, yellow, orange or purple.*

### Unit 3

1. What are the agricultural advantages of sweetpotato?
  - *High yield. Low labour requirement, low cost, low risk.*
2. What are some of the health benefits of sweetpotato?
  - *High nutrition (Vitamins A, C, E, B, Iron, Zinc, Potassium, Fiber); alternative to flour for consumers who cannot tolerate grains; disease preventing properties (anti-carcinogenic, cardiovascular); fights childhood blindness (Xerophthalmia).*

### Unit 4

1. As one of the most widely grown root crops in Sub-Saharan Africa, about how much ground is used to grow the crop?
  - *Around 3.2 million hectares (a 2005 figure).*
2. What benefits could be seen by enhancing sweetpotato production and utilisation in Sub-Saharan Africa?
  - *Poverty reduction, income generation, food and nutrition security, and sustainable ecosystems.*
3. Why is a focus on women important to household nutrition?
  - *Because women are the key nutrition decision-makers in most societies.*

### Unit 5

1. What are some of the major challenges for sweetpotato production and utilisation?
  - *Challenges:*
    - *Lack of access to “clean” planting material,*
    - *Lack of improved varieties,*
    - *Sweetpotato weevils,*
    - *Lack of knowledge and poor practices,*
    - *Underdeveloped markets and potential products.*
2. What are some of the solutions to those challenges?
  - *Solutions:*

## Topic 2: The Origin and Importance of Sweetpotato

- Conservation techniques, Drought tolerant, Triple S root sprouting method, Pest management;
- Improved varieties, Selective breeding;
- Management research;
- Improving Site, Planting techniques, Weed control, Soil;
- Market research, Market chain efficiency, Promoting benefits.

### Unit 6

1. How is advocacy different from promotion?
  - Promotion is about raising awareness in a general sense. A key focus for advocacy should be increasing investments in OFSP by relevant stakeholders and policy reform.
2. Why is advocacy needed to help the people of Sub-Saharan Africa understand what orange-fleshed sweetpotato (OFSP) is and how it can be useful?
  - Because OFSP is still relatively new in most parts of SSA.

### Unit 7

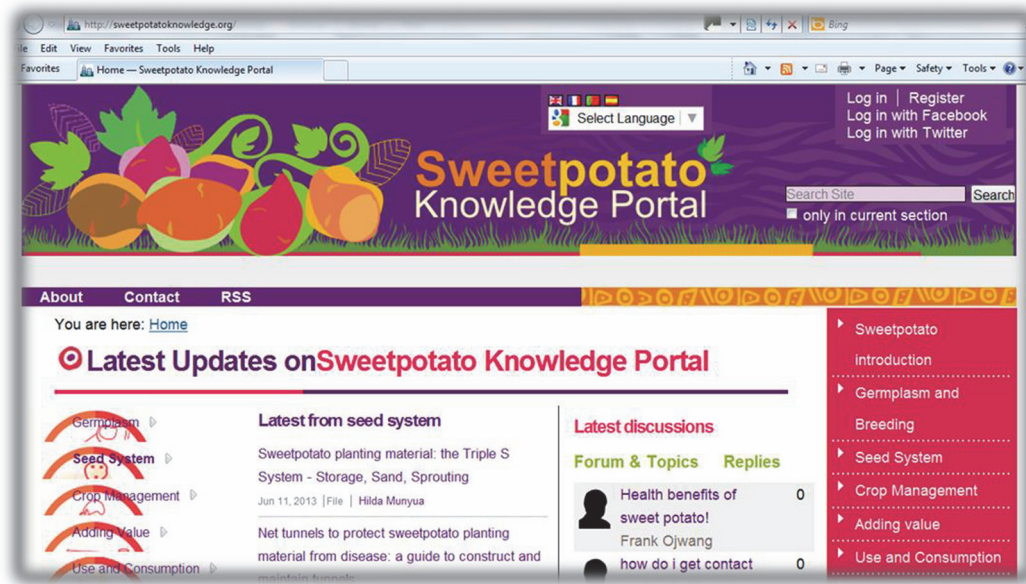
1. Why is sweetpotato actually a recommended food for diabetics?
  - It is a low glycemic index (GI) food. Low GI foods release glucose slowly into the bloodstream, which helps to control blood sugar (glucose) levels.
2. Does sweetpotato make men more or less fertile?
  - More: Sweetpotato may actually enhance sperm motility.
3. Are sweetpotato leaves good for human consumption?
  - Yes, they are highly nutritious. To get the maximum benefit, do not overcook leaves.

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## Appendix 2

### Appendix 2.1 How to Use the Sweetpotato Knowledge Portal Online Resource



The Sweetpotato Knowledge Portal (SPKP) is a collaborative online platform that provides an arena where sweetpotato actors meet virtually, share and exchange information and knowledge. The goal of the SPKP is to improve access to technical, scientific, local and development knowledge on sweetpotato in order to improve the nutrition and food security of the people of Africa. The SPKP is supported by the International Potato Centre (CIP), through the Sweetpotato Action for Security and Health in Africa (SASHA), with funding from the Bill and Melinda Gates Foundation. Membership (by registration) to the Portal is open to all sweetpotato stakeholders and members can upload new knowledge and information resources they possess. The SPKP was initially developed to help sweetpotato scientists but membership is now open to all stakeholders. Members are encouraged to upload their outputs on the portal because publishing content on the portal increases the impact of the work. The policy of the SPKP recognizes authors but encourages information and knowledge to be considered as public goods. Training facilitators are encouraged to become members and collaborate with other experts. [Click here to register as a member](http://www.sweetpotatoknowledge.org/register) or paste the following URL into your browser <http://www.sweetpotatoknowledge.org/register>

#### Members have permission to:

- To add, edit and publish sweetpotato-related content on the portal.
- Create a project 'private section' where only you and the people you designate can see the content (useful for content such as calendars, budgets, reports).
- Establish contact with other members, collaborators or partners.
- Join discussion forums.
- Access content that is published on the portal.

#### Non-members can only:

- Search for information that is published on the portal.
- Leave comments for the author(s) or the discussion forum.

**The International Potato Center** (known by its Spanish acronym CIP) is a research-for-development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change and the preservation of our Earth's fragile biodiversity and natural resources.  
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