



45  
Anniversary  
2016

45

INTERNATIONAL  
**POTATO**  
CENTER

CIP 45<sup>th</sup> Anniversary  
Celebration







MODERATOR **Sol María  
Carreño**

Sol María Carreño Carvalho (1965) has been a lawyer since 1990. A graduate of Pontificia Universidad Católica del Perú ["Catholic University"], she practiced law in the private sector up to 2004 in the areas of labor, insurance and banking. She also taught constitutional law at Pontificia Universidad Católica in 1998, and in the field of communications at Universidad de Ciencias Aplicadas ["University of Applied Sciences"] in 2004 and 2005. At the same time, she ventured into the world of communications, working since 1993 in America Televisión, Peru's most widely viewed channel. She began as a newscaster for the morning news program, and went on to host programs and conduct interviews until 2003, when she began hosting Cuarto Poder [Fourth Power], a weekly political program that analyzes Peruvian current affairs. She has been hosting this program for more than ten years. She has been a guest columnist in the Themis and Brújula magazines, both linked to the Catholic University, as well as in the newspaper El Comercio, and recently in the online newspaper Altavoz.



## DR. **Barbara** **Wells**

CIP Director General Dr. Barbara H. Wells joined CIP in February 2014. She is an accomplished senior executive with extensive scientific and business experience in research, general management, strategic planning, regulatory processes, and the technical development and commercialization of products in agricultural and forestry markets throughout the world. Prior to her appointment as CIP Director General, Barbara was Vice President of Global Strategy at Agrivida, Inc. responsible for planning and implementing the company's global commercial development strategy and scientific collaboration activities with an initial focus on Latin America. Earlier, as President and CEO of ArborGen, Inc., a global forestry tree seedling, and tree breeding business, she led the transformation of the organization from a start-up biotechnology company to a fully operational business with commercial sales of more than 250 million tree seedlings in the US, New Zealand and Australia. She was also Vice President for Emergent Genetics, an agricultural investment firm. The first 18 years of her career were spent at Monsanto as Co-Managing Director of Brazilian operations and in several leadership roles in field product development across the world for crops including cotton, corn, soybeans, tree crops and other products. She received her Ph.D. in Agronomy from Oregon State University, her M.S. in Plant Pathology and her B.S. with Honors in Horticulture from the University of Arizona.



MRS. **Nane**  
**Annan**

Born in Stockholm, Nane Annan was formerly a lawyer who enjoys painting. When her husband became UN Secretary-General in 1996, she focused in particular on the issues of HIV/AIDS, women's empowerment and girls' education. During that time she also wrote two books for children that she used in schools to talk about the UN. Most recently, food and nutrition security has become one of her priorities.





THE WORLD  
FOOD PRIZE

Laureates









## DR- **Jan** **Low**

Dr. Low's advocacy work under the Sweetpotato for Profit and Health Initiative (SPHI) has changed the image of sweetpotato as a crop of poor women to a healthy food for all. The ground-breaking two-year proof-of-concept study conducted by Dr. Low in Central Mozambique (2002-2004) showed that in households producing and eating bio-fortified varieties of OFSP, mean serum retinol (a proxy for vitamin A status) increased significantly and vitamin A deficiency declined by 15% in the children. Because of the quasi-experimental design having comparative control groups (no intervention), the study has become known in nutrition circles as one of the few food-based interventions with a solid evidence base along with a going-to-scale follow-up study (Reaching End Users) led by HarvestPlus in which Dr. Low also participated.

In many of the worst VAD-affected areas in Sub-Saharan Africa, people ate white- or yellow-fleshed sweetpotato as their staple food. These varieties had little or no beta-carotene, the precursor to vitamin A. Sweetpotato varieties with orange flesh, however, are rich in beta-carotene. Initial resistance to the orange color started to change when Jan Low realized that people in SSA liked some of the OFSP varieties she was testing. Children especially liked the sweeter taste and the orange color. She found that the barrier for adults to adopt them was the texture and not the color.

In the mid-1990s Vitamin A supplementation was the main vehicle for treating VAD in Sub-Saharan Africa. Taking a capsule seemed to be the easiest solution, especially since it did not require a major change in behavior, but there were major challenges in guaranteeing funding for these programs and keeping them running. Moreover, capsules do not address one of the key underlying causes of VAD—inadequate intake of vitamin A rich foods. In order to overcome the supplementation “magic bullet” movement and the bias against food-based approaches, solid evidence was needed to support the validity of using such a food-based approach. In 1999, Dr. Low developed a proposal that emphasized using OFSP as a key entry point for changing child feeding practices in Central Mozambique. She proposed using an integrated agriculture-nutrition-marketing approach, using a quasi-experimental design with intervention and control villages and capturing essential outcome measures such as vitamin A intakes and vitamin A status. Because agriculture and health donors work in separate silos, Dr. Low spent 3.5 years actively pursuing funds for this innovative approach.

By 2001, funding was secured and in 2002 she moved to Quelimane, Zambézia to operationalize a study that became known as the Towards Sustainable Nutrition Improvement Project (TSNI). This proof-of-concept study demonstrated that the integrated approach led to vitamin A intake increases of over eight (8) times by intervention children compared to control children, with a 15% decline in VAD prevalence attributable to the intervention. Key findings were published in the *Journal of Nutrition* in 2007 and Dr. Low and her team were awarded the Outstanding Scientific Paper for 2007 at the 2008 CGIAR Annual General Meeting.

The productivity of improved OFSP varieties is considerable, but yields depend on the quality of the planting material, the use of good agronomic practices, the quality of the soil, and whether the farmer uses irrigation or fertilizes. The beauty of OFSP is that it does not require a large field to make a difference in terms of vitamin A supply. Using the varieties of OFSP that the team developed, just 500 square meters of an OFSP yielding 10 tons/hectare would meet the annual needs for vitamin A of a family of 5.

In 2008, Dr. Low led a nine month consultative process to assess the bottlenecks preventing sweetpotato from achieving its full potential in sub-Saharan Africa. During this process, six major workshops were held, 10 countries were visited during which key collaborators were identified, and a working paper series updating the state of current knowledge produced. This process resulted in the


successful funding of the ten year Sweetpotato Action for Security and Health in Africa (SASHA) project, which addresses identified bottlenecks and tests delivery systems. It also led to the multi-partner group launching the Sweetpotato for Profit and Health Initiative (SPHI) which seeks to improve the lives of 10 million African Households in 17 sub-Saharan Africa countries by 2020. Dr. Low now co-leads the SPHI with the Executive Director of the Forum for Agricultural Research in Africa.

The SASHA project has addressed the lack of quality planting material available at planting time by developing low cost net tunnels, which guarded disease free planting materials from insects. For drought-prone areas, the Triple S technology, developed and validated a process in which planting material is sprouted from roots stored in sand during the dry season.

Due to SASHA's close collaboration with the Alliance for a Green Revolution in Africa (AGRA) in supporting national sweetpotato programs, 56 better adapted varieties have been released since 2009, of which 42 are orange-fleshed. The new accelerated breeding approach has reduced the time for producing new varieties from seven or eight years to four years. Quality labs with Near Infrared Spectrometers enabling fast composition analysis are now at Sweetpotato Support Platforms in Uganda, Mozambique and Ghana.

The project also pioneered a public-private partnership that developed a commercialized processed product available in Rwanda--the Golden Power Biscuit, in which 43% of the wheat flour was replaced by OFSP puree. SASHA also tested an innovative model for linking access to OFSP vines to health services for pregnant women in Western Kenya, which demonstrated positive results for those fully participating in the project.

In designing the 10 year SPHI, the geographic scope of the Initiative was determined based on the importance of sweetpotato in the cropping system, the severity of vitamin A problem, and the potential for making impact in 10 years given political constraints. Seventeen countries were selected, distributed throughout the three SSA sub-regions. In each sub-region, a Sweetpotato Support Platform was established, with a distinct population development program for specific traits, quality labs were established to be able to assess in large numbers the micro- and macro-nutrient content of clones, and germplasm management enhanced. As of September 2015, 1.9 million beneficiary households were reached through efforts of at least 20 projects in 14 of the 17 countries.



Sweetpotato is genetically diverse; it grows from sea level to 2,400 meters; performs on marginal soils, and is fairly drought tolerant once established. Dr. Low emphasizes the diverse roles sweetpotato can play: as a basic food staple, as a vegetable (both roots and leaves), as an animal feed (especially dairy and pigs); as a snack food, and as an ingredient in processed products. Given the growing interest in nutrition-sensitive agriculture interventions to help tackle chronic undernutrition in children under two years of age, the OFSP-intervention has become known in nutrition circles as one of the few food-based interventions with a solid evidence base.



## DR. **Maria** **Andrade**

Mozambique-based Maria Andrade began working on OFSP varietal selection when she released nine varieties selected from materials introduced from several countries in 1999. Then in 2000, Mozambique experienced its worst flooding in 50 years, with more than 450,000 people displaced. Andrade advocated for the widespread dissemination of the new OFSP varieties as a disaster relief and recovery crop. Two months after planting OFSP a farmer can harvest the leaves for food and in four months they are harvesting the roots. It is one of the crops with the highest rates of productivity per unit of area. Andrade and the OFSP team forged a strong partnership with the Government of Mozambique, who officially recognized the potential value of OFSP for food and nutrition security. Since orange-colored varieties were not known in Mozambique, an education program accompanied the dissemination. This was highly effective and by the end of 2001, 122,616 flood-affected households had received OFSP planting material and been exposed to key nutrition messages. The concept of demand creation was born and a campaign branding orange as the color of healthy vitamin A rich foods was critical to the success of OFSP in Mozambique and in other countries in the region.

As a result of Maria's work, the Government of Mozambique recognized that bio-fortified OFSP can be promoted to reduce the country's high VAD rate. OFSP is



now well known as a key crop for food and nutrition security in Mozambique, and a 'business card' for the bio-fortification work in Africa. After several interventions under El Nino and La Nina emergencies in Mozambique, sweetpotato has also been recognized as one of the most important crops for disaster relief and recover. OFSP has become an essential food security crop known by the popular slogan, "the sweet that gives health."

By 2003, the nine released OFSP varieties were performing very well, but a severe drought that affected three quarters of the country revealed the limitations of the first generation OFSP releases. Recognizing the limitations of the existing breed program, Andrade advocated for an OFSP breeding program in Mozambique. By 2011, 15 Mozambique bred, drought tolerant varieties were released, resulting from the introduction of advanced breeding systems (ABS) led by Andrade that cut the breeding time from eight to four years.

Marketing strategies in place involving food base approach initiated in 2000 in Mozambique and spilled over to 14 countries in Africa. More than 3000 of these events were carried out over the life of this program. About 26% of all sweetpotato grown in 2013 in Mozambique is OFSP. Since 2001 more than 1 million households have received improved high yielding OFSP planting materials. In 2011, new 15 drought-tolerant varieties were released and by 2016, about 0.5 million farmers were reached with these varieties. Roughly 55% of the household members who received the drought tolerant planting material were women. More than 300 Training Other Trainer workshops were conducted and more than 1 million farmers trained in sweetpotato production and protection. Since 2001, about 750 technicians from Mozambique and Southern Africa Region (40% of them female), were trained on production/plant breeding, on-farm, agro-processing, virology, and data management.

In 2008, OFSP became one of the crops evaluated under the Mozambique national agriculture survey. The results and lessons from this work have been integrated into the strategy of the Comprehensive Africa Agriculture Development Program for mainstreaming nutrition in national agriculture and food security investment plans.

The baseline survey indicated that before this dissemination program focused on new drought tolerant materials, about 20% of the families were growing OFSP in 100-m<sup>2</sup> plots. After a 24-month intensive intervention, 70% of households in the area of intervention were producing OFSP in an average area of 400 m<sup>2</sup>. These

farmers were also selling 25% of their production, an increase of 15% from the period before the intervention.

In 2016 seven more drought tolerant varieties were released: three dual purpose, two purple flesh and three orange flesh, all with high dry matter content.

Improved access to new production, storage, and processing technologies through improved marketing linkages is a critical factor to OFSP's success in Mozambique. Maria and her team built strong partnerships with different agriculture and nutrition institutions to develop and implement several marketing approaches to deliver integrated agriculture-nutrition interventions designed to raise awareness of the benefits of OFSP.

Convinced by previous results, USAID provided funds in 2012 to disseminate vines of the new varieties to 120,000 households in the major sweetpotato-producing areas of the country. Before the program about 20% of the families were growing. After 24 months, 70% of households were growing on average 400 m<sup>2</sup> of OFSP. As a result, in 2013, an estimated 26% of all sweetpotato grown in Mozambique is OFSP and more than 1 million households have received improved high yielding OFSP materials.

To evaluate potential health and economic impact, economists estimate the number of VAD-related Disability-Adjusted Life Years (DALYs) that could potentially be saved through the use of bio-fortified sweetpotato. In Uganda, ex ante analysis determined that if OFSPs were adopted by one in six Ugandan households within 10 years of them becoming available, the effort would achieve an estimated internal rate of return between 16% and 30% and yield a net present value between \$23 million and \$67 million. Multiplying this amount by the number of countries adopting OFSP shows that bio-fortified sweetpotatoes are worth hundreds of millions of dollars to the region.





## DR. **Robert** **Mwanga**

Starting in 2002, Robert Mwanga successfully developed 14 new varieties of OFSP, including a variety that combined high dry matter content, high resistance to viruses and blight, and high beta-carotene concentrations. His varieties are preferred by children, farmers and consumers and have been used in Uganda to show the feasibility and effectiveness of bio-fortified vitamin A-rich OFSP in increasing maternal and child vitamin A intake and status. Since then his varieties have been distributed in Ethiopia, Kenya, Rwanda and Tanzania. Robert's work is a fundamental piece in the success of the OFSP program. It is a best case example of non-governmental organizations and governments working in tandem to develop and distribute varieties appropriate for farmers.

Robert Mwanga's program focused on developing OFSP varieties with high retinol concentrations, increased productivity and with resistance to sweetpotato virus disease. The program sent 481,310 botanical seed (breeding populations) to 11 countries (Ghana, Nigeria, Burkina Faso, Ethiopia, Burundi, Rwanda, Kenya, Tanzania, Madagascar, Malawi, and South Africa). Uganda, Rwanda, Kenya, Tanzania, Malawi, Mozambique, Madagascar and Ethiopia have released OFSP lines from the breeding populations. The area under cultivation of the OFSP cultivars is expanding rapidly in countries such as Ethiopia, Tanzania and Kenya

due to promotion of OFSP to alleviate VAD by development partners.


Bio-fortified cultivars can contribute significantly to a viable, long-term, effective and sustainable food-based approach to prevent VAD. For example, sweetpotato yields (both white and orange) in Uganda were very low (4.4 t/ha) compared to the global average of 13.7 t/ha. The OFSP varieties bred by Robert Mwangi in Uganda have yields above 10 t/ha. In addition, compared to other crops, the fortified varieties require fewer inputs and less labor, making them particularly suitable for households threatened by migration or diseases such as HIV/AIDS.

Farmers are earning income by selling planting material. In eastern and central Uganda a single farmer can earn about US\$400 per month from the sale of planting materials and sweetpotato products at the beginning of the rains. These incomes generated helped farmers to meet other household obligations like education for their children, medication, clothing, improved shelter, as well as expanded farm area.

Over 10 million vine cuttings have been distributed and planted by farmers in East Africa by 2012. This level of progress can be sustained for the long term. Adoption rates increased when the OFSP varieties were available in the marketplace, both as fresh roots and vines and as processed foods with added value.

Robert provided key guidance in the development of the CloneSelector software currently used by sweetpotato breeders in Sub-Saharan Africa. CloneSelector is a simple MS Excel-based tool developed to help plant breeders working with clonally propagated crops to conduct field trials, analyze results and make accurate selection decisions. Using CloneSelector, breeders can elaborate a list of germplasm to test, select an appropriate statistical design and the corresponding field book, enter experimental data as well as information about the experiment, calculate derived variables and produce statistical results. All this can be done in the universally used Excel spreadsheet program. Adapted from the Maize Fieldbook developed by the International Maize and Wheat Improvement Center, CloneSelector was developed on the open source R statistical package.

All countries covered by the Sweetpotato Action for Security and Health in Africa (SASHA) project and those funded by AGRA to support sweetpotato breeding have used the accelerated breeding scheme to release OFSP cultivars, and they all use CloneSelector to simplify their work. Robert has backstopped sweetpotato breeders and their technicians in Uganda, Rwanda, Tanzania and Ethiopia,



and during annual sweetpotato breeders' meetings to use CloneSelector and accelerated breeding to speed up release of OFSP cultivars.

The characteristics of OFSP varieties make them ideal in addressing hunger, poverty, macro and micro undernutrition due their ability to generate superior levels of food per unit area per unit time compared to other major staples. Moreover, OFSP varieties have superior amounts of pro-vitamin A per unit area. These OFSP varieties are also more suitable for mitigating food shortages, disaster-relief-and-recover, and even famines that occur under the most severe sociopolitical circumstances such as in war-zones, common in Africa.







## DR. **Graham** **Thiele**

Graham Thiele, PhD, Director, CGIAR Research Program on Roots, Tubers, and Bananas (RTB). Graham is a social scientist and expert in targeting, priority setting, and impact and adoption studies of new agricultural technologies. He spent 17 years with the International Potato Center (CIP), most recently as the Leader for Social and Health Sciences. Graham has worked in Bolivia, Ecuador, Peru, Tanzania, Kenya, Benin, Rwanda, Indonesia, and the Philippines. He helped develop, implement, and assess several, novel participatory methodologies designed to link farmers with markets, inform research agendas, and promote innovation in policies, products, and technology uptake. Graham holds a PhD in Social Anthropology and an MSc in Agricultural Economics.



DR. **Oscar  
Ortiz**

Oscar Ortiz is the Deputy Director General for Development of the International Potato Center (CIP). He began his career at CIP in 1992 working on impact assessment of integrated pest management as a member of the Social Sciences Department. He was then appointed leader of the Integrated Crop Management Research Division from 2004 to 2011. During 2012 he was the leader of the Integrated Crop and systems Research Global Program, and he was appointed Deputy Director of Research for Regional Science Programs. He has ten years of experience in leading and managing interdisciplinary teams involving both biophysical and Social Sciences. Vast experience in participatory research and training related to integrated insect and disease control, integrated crop management (ICM), agronomy and seed management; impact assessment of research and extension activities; use of the agricultural knowledge and information systems, and of innovation system approaches for research and development; leading seed-related teams on potato and sweetpotato as part of ICM-related research and development; research related to innovation systems. He has published extensively in peer-reviewed journals, book chapters and conference proceedings. Oscar holds a PhD in agricultural innovation.







A member of the  
CGIAR Consortium

45  
Anniversary  
2016

INTERNATIONAL  
POTATO  
CENTER

Roots and tubers improving the lives of the poor