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FINAL PROJECT REPORT

BETTER POTATO FOR A BETTER LIFE (BPBL) PROJECT

1 OCTOBER 2009 – 31 DECEMBER 2016








April 2017

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1 October 2009 – 31 December 2016

Title of Activity:	Tackling Food Insecurity and Malnutrition through Diversification: Exploiting the Potential of Potato and Sweetpotato to Reduce Food Insecurity and Dependence on Cereals
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GLOSSARY

AIQC&QA	Agricultural Inputs Quality Control and Quarantine Authority
AKLDP	USAID-funded Agricultural Knowledge, Learning Documentation and Policy
APA	African Potato Association
ArARC	Areka Agricultural Research Center
ARARI	Amhara Agricultural Research Institute
ARC	Agricultural Research Center
ASE	Agri Service Ethiopia
ATA	Agricultural Transformation Agency
BPBL	Better Potato for a Better Life Project
BoA	Bureau of Agriculture
BoANRD	Bureau of Agriculture (and Natural Resources Development)
BoARD	Bureau of Agriculture and Rural Development
BoH	Bureau of Health
BW	Bacterial wilt
CDCS	Country Development Cooperation Strategy
CGIAR	Consultative Group for International Agricultural Research
CF	Community facilitator
CIP	International Potato Center
CRS/MCS	Catholic Relief Services/Meki Catholic Secretariat which works in Oromia
DA	Kebele development agent
DLS	Diffused light store
DSM	Decentralized seed multipliers
DVM	Decentralized vine multiplier
ELE	Engna Leegna (NGO)
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agriculture Organization
FFS	Farmers Field School
FGC	Farmer groups and cooperatives
FRI-E	Farm Radio International, Ethiopia
FTC	Farmer training center
GAP	Good agricultural practices

GO	Government organizations
GRAD	Graduation with Resilience to Achieve Sustainable Development
HARC	Holetta Agricultural Research Center
HEW	Health extension worker
HH	Household
IFDC	International Fertilizer Development Cooperation
M&E	Monitoring and evaluation
M4M	Mums for Mums (NGO)
MF	Model farmer
MoA	Ministry of Agriculture
MT	Minitubers
NARS	National Agricultural Research System
NGO	Nongovernmental organizations
OFSP	Orange-fleshed sweetpotato
ORDA	Organization for Relief and Development in Amhara
PLC	Private seed multipliers
P&SP	Potato and sweetpotato
PQM	Primary quality planting material
q	Quintal = 100 kg
QDPM	Quality declared planting material
QDS	Quality declared seed
QPM	Quality planting material
REST	Relief Society of Tigray
RTC	Root and tuber crops
RTCWG	Roots and Tuber Crops Working Group
SARI	Southern Agricultural Research Institute
SASHA	Sweetpotato Action for Security and Health in Africa
SBCC	Social behavior change communication
SNNPR	Southern Nations Nationalities and Peoples Region
SQM	Secondary quality planting material
TARI	Tigray Agricultural Research Institute
TC	Tissue culture
ToT	Training of trainers
VAD	Vitamin A deficiency

WFSP	White-fleshed sweetpotato
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

The International Potato Center (CIP) and its partners have successfully implemented a 7.3-year long (October 2009 – December 2016) project "Tackling Food Insecurity and Malnutrition through Diversification: Exploiting the Potential of Potato and Sweetpotato to Reduce Food Insecurity and Dependence on Cereals in SNNPR and Tigray," also known as "Better Potato for a Better Life" Project (BPBL) with financial support from the United States Agency for International Development (USAID)– Ethiopia. BPBL received $10,542,739 for the entire life of the project. Initially the BPBL was a 4-year (October 2009 – September 2013, mentioned as Phase I in this report) project and after successful implementation of this phase a 15-month cost extension (October 2013 – December 2014, mentioned as Phase II in this report) was approved with additional funding. In order to consolidate the results the project attained in SNNPR and Tigray and to extend the best practices of these two phases to Amhara and Oromia regions (two major potato producing regions in the country) a second cost extension (January 2015 – December 2016, mentioned as Phase III in this report) was approved, with additional funding.

There were two well-connected goals for different phases. **The goal of Phase I** was: To enhance the livelihoods of food insecure rural farmers in SNNPR and Tigray through the diversification of cropping systems, increasing potato and sweetpotato productivity and strengthening potato and sweetpotato value chains. **While the goal of Phase III** was: Enhanced rural incomes, food security and nutrition in four regions of Ethiopia– Amhara, Oromia, SNNPR and Tigray- through resilient and profitable sweetpotato and potato value chains. There were 22 objectives and 6 intermediate results (only for Phase III) that guided the project design and implementation. The objectived and intermediate results are presented in the introduction section. This report presents achievements and lessons learned from all three phases. The report also presents opportunities and next steps as recommendations for future intervention.

An ambitious target that is a total of 390,000 (250,000 Phase I and 140,000 Phase III) farmers (men and women) will be producing potato and sweetpotato as a result of, establishing and strengthening quality seed value chain. To achieve this ambitious target, the project employed an intensive partnership approach for implementing the project activities and the activities were accomplished within the project life.

Over the past 7.3 years, the project has established close partnerships with a range of research and development partners, including seven government research and extension institutions, six nongovernmental organizations (NGOs), four universities and six commercial seed companies. (In collaboration with these partners, decentralized seed production systems were successfully established in Amhara, Oromia, SNNPR and Tigray. Tissue culture (TC) laboratories at the Ethiopian Institute of Agricultural Research – Holetta Agricultural Research Center (EIAR-HARC), Tigray Agricultural Research Institute (TARI) and the Southern Agricultural Research Institute (SARI) had produced disease-free planting materials. Bacause of BPBL's capacity strengthening effort early generation seed production capacity by these institutes has increased phenomenally. In case of potato these institutes' baseline capacity of producing In-Vitro plantlet was 17,000 and in 2016 it increased to 165,000 (970%); in case of minitubers (MT) baseline capacity was 170,000 and in 2016 it incrased to 1,650,000 (970%). Similarly, in case of sweetpotato in baseline situation In-Vitro plantlet production capacity was 0 and in 2016 it was

increased to 160,000; and in case of screenhouse vine production was 0 and in 2016 it increased to 1,050,000. These early generation planting materials were then further multiplied by the private sector/Farmer Groups and Cooperatives (FGCs), located in major production areas. As a result, the demand for quality seed in Amhara, Oromia, Tigray and SNNPR can now be met through local production, thereby achieving seed self-sufficiency in these regions and reducing the risk of introducing seed borne diseases through seed imports from neighboring regions. Since inception, the project-supported FGCs have produced more than ***37,500 tons*** (t) of quality seed potato tubers which is equivalent to a value of ***16 million $US in sales***. The **annual FGC potato seed production capacity** at the end of the project is about **20,000 t** equivalent to a value of ***9.3 million $US in sales annually.*** In the same period, more than ***160 million*** sweetpotato cuttings were sold and distributed representing a sales value of ***2.2 million $US***. Seed storage, an important bottleneck, has been alleviated through the construction of more than 1,100 diffused light storage (DLS) for seed storing with a cumulative capacity of around 8,800 t. A standard DLS, 72 meter sq costs approx. USD 2,398 and can serve at least for five years.

Emphasis was given to rapid dissemination of late blight-tolerant potato and orange-fleshed sweetpotato (OFSP) varieties. The cumulative number of households (HH) to be reached with quality planting material since the inception of the project was 390,000 for potato and sweetpotato. The project reached and surpassed its key targets—namely, giving 548,602 (23% female) HH potato and sweetpotato quality planting material. It should be noted, though, that it was only possible to achieve and surpass these targets by collaborating with partners and Food and Agriculture Organization (FAO) who received substantial funding from other donors in 2011 and 2013 for the dissemination of seed in drought-affected areas (emergency seed supply). CIP/BPBL and FAO signed an MoU for rapid dissemination of quality seed. Under this MoU, BPBL and three emergency response projects of FAO (*OSRO/ETH/I02/USA -"Scaling-up of Root and Tuber Crops Diversification in 15 woredas of Tigray, Oromiya, SNNP and Amhara Regions of Ethiopia"; OSRO/ETH/I04/EC -Contribute to Food Security of Vulnerable Pastoral, Agro-pastoral and Farming Communities in Afar, Oromiya, Somali and SNNP Regions" and OSRO/ETH/I06/CHA -"Emergency Seed and Planting Material Support for Drought Affected People in Oromiya and SNNP Regions*") collaborated and expanded seed dissemination between 2011 and 2012. In the absence of such events, realistic project targets would need to be reduced significantly.

Since project inception, 2,649 (43% female) extension agents and more than 42,000 (24% female) farmers have been trained on improved potato and sweetpotato production, and post-harvest technology. The impact of farmer capacity building, combined with the use of quality seed, is highlighted by the fact that participating farmers achieve average potato yields of 22.2 tons/ha (based on 133 yield measurements) while average national yields are around 8 tons/ha. A BPBL performance evaluation conducted in 2014 documented that sweetpotato and potato **productivity was about 42% and 81% higher with participants** (11.9 and 17.5t/ha) than with non-participants (8.3 and 9.7 t/ha).

An informal seed inspection system, Quality Declared Planting Material or QDPM, was piloted through the project. The QDPM piloting was recognized in the Ethiopian Seed Proclamation No. 782/2013 (February 2013) as an approach to increase the availability of quality seed in the country. Later in April 2015, the Ethiopian government formally ratified the quality declared seed (QDS) policy, which is one of the main thrusts of the project, to improve farmers' access to quality planting material (QPM) in the four regions and to better link seed producers with potential customers.

A multi-layered social behavior change communication (SBCC) strategy for the promotion of orange-fleshed sweetpotato (OFSP)-based dishes and products was developed and implemented. This strategy utilized mass media, school clubs, demonstrations, bill boards, posters and public events. More than 316,000 (62% female) participants in 261 kebeles from 4 regions were reached, resulting in increasing demand for OFSP roots among rural and urban households. The BPBL project contributes to reducing malnutrition by increasing crop and dietary diversification. The USAID performance evaluation found that in Tigray, in terms of food consumption, there was significant improvement from 47% (baseline) to 77% (evaluation value); with 68% of households in Tigray having an acceptable level of consumption. The overall Dietary Diversification Index (DDI) showed that on average, 55% of households met the minimum dietary diversification score, with a higher proportion of households in Tigray compared to SNNPR. This would indicate that households are changing their behavior by incorporating OFSP into their diet. Additional data on the adoption will become available after completion of the project endline survey in January 2015. A similar survey was planned to be conducted after the Phase III but was not possible because project activity started late in 2016 and then implementation flow was interrupted by the unstable security situation, Later, a time extension was requested for conducting the survey but was not approved by the donor. But, significant achievement was made in the output and some outcome level indicators in relation to the project impact pathway which is presented in Annex A (Phase III).

LESSONS LEARNED

PARTNERSHIP APPROACH: The BPBL project was implemented through a partnership approach that helped achieving ambitious targets. But, the approach required significant resources for consultation, joint planning and technical/financial backstopping; with delayed project implementation and reporting.

DECENTRALIZED VINE MULTIPLICATION (DVM)/FGC AND QUALITY DECLARED SEEDS (QDS): Highly decentralized seed production systems, whereby FGCs. DVMs and Model Farmers (MF) multiply disease-free source seed obtained from public or private producers of potato minitubers or sweetpotato pre-basic material, are of critical importance to give large numbers of farmers' sustainable access to quality seed at affordable prices.

BACTERIAL WILTAFFECTING ETHIOPIA'S POTATO INDUSTRY: Bacterial Wilt (BW), caused by Ralstonia solanacearum (Rs) a soil- and seed-borne pathogen, is one of the most significant limitations to the production of clean seed potato and hence its containment of major importance for disease free production. A BW study conducted by BPBL and research partners in 2015 and 2016 in major potato growing regions suggests that the disease is spreading faster. The disease is spreading to the highland areas, too, which are ideal for seed potato production. It may be speculated that the situation may get worse with rising temperature. Therefore, the project proposed that a BWcontainment strategy with multi-level advocacy is highly necessary.

SOCIAL BEHAVIOR CHANGE COMMUNICATION (SBBC): The adopted approach of combining measures to raise awareness about the urgency to improve nutrition through consumption of vitamin A rich foods by giving targeted households access to planting material, establishing demonstration home and school gardens and practical cooking demonstrations has proved to be quite effective in increasing consumption diversity and triggering changes in nutritional behavior. The nutrition awareness and education events were successful in attracting a large number of participants and disseminating a wide range of nutrition related messages. A large portion of the participants (62% or 316,702 individuals) were female.

OPPORTUNITIES AND NEXT STEPS

DECENTRALIZED VINE MULTIPLICATION (DVM)/FGC AND QUALITY DECLARED SEEDS (QDS): The ratification of QDS as Law will definitely benefit the DVM and FGCs. But a proper implementation of QDS and certifying farmers' seed will need lots of efforts. Roll out has been initiated by the Ethiopian Government but needs support for a period of three to five years with proper facilitation, management and institutional capacity building.

CONTAINMENT STRATEGY FOR BACTERIAL WILT (BW): The survey results documented by BPBL project indicates that there is an urgent need for policy makers to address BW issue as this disease is expanding fast. In the absence of a formal seed certification scheme and lack of regional quarantine measures, BW is becoming a very serious concern threatening the rapidly expanding potato industry as well as the food security of the growing population. A multi-pronged approach to Bacterial Wilt management will be required to combat the spread of BW; if no action is taken, further growth of the potato sector in Ethiopia will be constrained.

VALUE CHAIN DEVELOPMENT: Significant progress has been made in registering and strengthening the FGCs and linking them to market. But, more work to be done to keep the FGC sustainable and play a positive role in establishing a sustainable quality seed value chain. Further institutionalization of established FGCs, either as board or union, is necessary to link them with the regional and federal level relevant institutions for accessing resource and institutional support. Thus, they will be able to access required resources for their continuation. At the same time, any future effort should focus on both seed and ware value chain. It can also look for product diversification for both potato and sweetpotato.

SOCIAL BEHAVIOR CHANGE COMMUNICATION (SBCC):

Promoting OFSP and potato for healthier diets continues to offer great opportunities to contribute to better nutrition in Ethiopia. BPBL demonstrated that nutrition messages find receptive audiences and when combined with access to planting material of nutritious crop varieties, a virtuous cycle of demand and supply of nutritious food can be initiated.

In order to scale up this experience, support is required to strengthen the integration of nutrition messages and food demonstrations into the mainstream extension work by the Bureau of Health (BoH) and the training of nutrition extension staff. Innovative approaches to cost-effective community-level and household-level follow up visits are available from other countries and can be rolled out in Ethiopia, in partnership with BoH and other government agencies. Aligning and synchronizing extension service delivery by Bureau of Agriculture (BoA) and BoH in support of nutrition can be a major step forward in enabling the access of rural household to both agricultural technologies and nutrition and health knowledge and skills. Through existing stakeholder platforms at local and region level, practical options – including experiences from this Project – can be presented and recommendations for institutionalization can be advocated.

Finally, CIP sincerely thanks USAID for the generous funding for 7.3 years that enabled CIP and its partners to impact on the thousands of poor rural households by implementing the ambitious project.

1. INTRODUCTION

An estimated eight million Ethiopians live in chronic food insecurity, with an ever-increasing number of people unable to meet their basic consumption requirements. The majority of these chronically food insecure households are located in rural areas; 30% live below the poverty line. They face a variety of production constraints and lack access to financial services, market information and linkages. And, chronic malnutrition among women and children remains one of the biggest public health challenges in the country.

Ethiopia's population is expected to reach 150 million people by 2040. In order to realize the required productivity and production gains necessary to enhance food security and eliminate chronic malnutrition, root and tuber crops such as potato and sweetpotato should increasingly supplement the cereals traditionally cultivated and consumed as staple foods. Potato and sweetpotato are important food security and cash crops for Ethiopia, because they produce more calories per unit area and per water unit than any other major food crop. They are short duration, hunger-busting crops that produce a harvest within three to five months, thereby breaking the hunger gap experienced by most rural households one to two months prior to the harvest of later maturing cereals. Moreover, because potato and sweetpotato are not considered major commodities of international trade, prices are relatively unaffected by global food price fluctuations, making them an affordable source of nutritious food for the urban poor. The two crops are also complementary; while potato grows well in highland areas, sweetpotato is adapted to warmer and dryer environments.

To address the problem of chronic food insecurity and malnutrition by increasing production and productivity "Tackling Food Insecurity and Malnutrition through Diversification: Exploiting the Potential of Potato and Sweetpotato to Reduce Food Insecurity and Dependence on Cereals in SNNPR and Tigray," also known as "Better Potato for a Better Life" Project (BPBL) with financial support from the United States Agency for International Development (USAID) – was designed and implemented for 7.5 years. The project received $10,542,739 for implementing its activities for the entire life. Initially the BPBL was a 4-year (October 2009 – September 2013, mentioned as Phase I in this report) project and after successful implementation of this phase a 15-month cost extension (October 2013 – December 2014, mentioned as Phase II in this report) was approved. In order to, consolidate the results the project attained in SNNPR and Tigray and to extend the best practices of these two phases to Amhara and Oromia regions (two major potato producing regions in the country) a second cost extension (January 2015 – December 2016, mentioned as Phase III in this report) was approved. Well-connected but different goals, objectives and intermediate results (only in Phase III) were conceived for different phases.

THE GOAL AND OBJECTIVES OF PHASE I WERE:

GOAL: To enhance the livelihoods of food insecure rural farmers in SNNPR and Tigray through the diversification of cropping systems, increasing potato and sweetpotato productivity and strengthening potato and sweetpotato value chains.

OBJECTIVES: Over a four-year period, the project seeks to strengthen the national capacity to provide sustained access of resource-poor farmers to high quality planting material of potato and

sweetpotato, demonstrate the potential enhancement of incomes through the establishment of at least four profitable value chains in different locations and assure that at least 250,000 households have improved food security and diet quality. The first year focused on establishing the foundation for sustainable seed systems through investing in the infrastructure and human capacity at regional research programs and ten Farmer Training Centers to produce and maintain clean primary planting material of both crops utilizing the best available technologies and in organizing and training approximately 1,000 decentralized secondary multipliers (many organized into farmer's associations) of potato and sweetpotato in Tigray and SNNPR.

SPECIFIC OBJECTIVES FOR EACH CROP ARE PRESENTED BELOW

SPECIFIC OBJECTIVES FOR POTATO

1. Establish the foundation for a sustainable and profitable seed system to provide clean materials of high yielding, late-blight resistant varieties that are acceptable to consumers. The coordinator will effectively link public and private sector partners and seek to ensure that tissue culture facilities for pre-basic seed production are fully utilized with appropriately trained technical staff, introduce the new *aeroponics* technology to break the multiplication rate bottleneck, and facilitate the development of outgrower seed production in collaboration with the private sector.
2. Improve the efficiency of the agricultural input and ware potato output chain, through facilitating dialogue between traders, growers, processors and retailers and, improving negotiation skills of farmers, providing price information to farmers, introducing improved ware storage techniques, and developing grades and standards that will improve access to export markets and high-end domestic markets and increase returns to farmers.
3. Enable farmers to meet new quality standards through the development and introduction of improved management techniques under rain-fed and irrigated systems to control late blight and the spread of BW, control size and other quality characteristics and minimize environmental damage, thus assuring sustainable potato production.
4. Strengthen the ability of smallholder farmers to maintain their own healthy seed stock through the widespread training and support of public and private extension personnel in proven on-farm selection techniques and integrated disease management.
5. Build researcher capacity through strengthening their involvement with regional research collaboration on management of major potato diseases.

SPECIFIC OBJECTIVES FOR SWEETPOTATO

1. Build capacity of the Regional Research Center at Awassa to maintain germplasm banks of clean, primary sweetpotato planting material.
2. Backstop the private sector tissue culture lab to engage in large-scale multiplication of clean, in-vitro sweetpotato plantlets and facilitate linking this facility to regional sweetpotato multiplication efforts.
3. Develop and implement a training program for use by public sector and nongovernmental extension personnel on the establishment and maintenance of clean planting material in primary and secondary multiplication sites.
4. Adapt improved seed systems research findings to the Ethiopian context and assure the dissemination of improved methods for assuring timely provision of planting material and vine conservation at the household level.

5. Investigate the potential for forage and dual purpose (feed and food) sweetpotato varieties as a livestock feed (particularly for cattle and goats).
6. Investigate the potential for sweetpotato silage production as a source of income in Tigray and SNNPR.
7. Identify and coordinate public and private sector partners in the health, nutrition, and communication fields interested in promoting the pro-vitamin A rich OFSP using an integrated approach that incorporates awareness of nutritional value of OFSP, promotes improved dietary practices, and creates market demand for OFSP roots.
8. Understand the role of sweetpotato and potato in the diets of vulnerable households and calculate OFSPs potential contribution to reducing vitamin A deficiency.
9. Develop appropriate mass communication and training materials for OFSP introduction and promotion.
10. Conduct widespread participatory demonstrations of high yielding, drought tolerant sweet potato varieties of any type.
11. Investigate the feasibility of OFSP-based processed products for both rural and urban markets, conducting consumer evaluations of at least 2-3 products deemed to have the highest potential.
12. Make government at all levels aware of the potential of the crop in addressing food security and nutrition.

OBJECTIVES OF PHASE II

Phase II was direct extension of Phase I thus this phase contained the Goal from the previous phase but had some consolidated objectives:

1. Capacitate seed producer FGCs to become profitable and sustainable seed production enterprises (under objective 8 of Phase I).
2. Develop, test, and establish a low-cost seed inspection system for the production of QDPM for potato and sweetpotato (under objective 1 and 4 of Phase I).
3. Initiate the establishment of functional and commercially viable value chains for planting material of potato and sweetpotato in SNNPR, Tigray, and Oromia (under objective 1 and 4 of Phase 1).

GOAL, OBJECTIVES AND INTERMEDIATE RESULTS (IR) OF PHASE III:

Phase III adopted a twofold implementation strategy tailored to the needs of the project regions: in the two previous regions (i.e., SNNPR and Tigray), emphasis was more on consolidation and strengthening. In Oromia and Amhara, however, the project initialized certain processes and created capacities (e.g., building new FGCs) and expanding public and private facilities for pre-basic and basic seed production of potato and sweetpotato (P&SP). Furthermore, the Phase II linked to and strived for synergies with other ongoing projects, especially USAID-GRAD (Graduation with Resilience to Achieve Sustainable Development). The goal, objectives and Intermediate Results (IR) of Phase III were:

GOAL: Enhanced rural incomes, food security and nutrition in four regions of Ethiopia– Amhara, Oromia, SNNPR and Tigray- through resilient and profitable sweetpotato and potato value chains

OBJECTIVES AND IRS:

1. Establish and strengthen potato and sweetpotato value chains
   IR 1.1: Improve production capacity of disease-free, tissue culture derived potato and sweetpotato seed

IR 1.2: 140,000 households with increased access to quality seed of potato or sweetpotato
IR 1.3: 50,000 households with increased potato and sweetpotato production and productivity
IR 1.4: 8,000 households with higher income from increased potato and sweetpotato sales and marketing

2. Increase production and consumption of potato, sweetpotato in conjunction with other nutritious food crops
   IR 2.1: Raise awareness about nutritional benefits of OFSP, high Fe and Zn potato and other nutritious crops for home consumption
   IR 2.2: 51,000 men, women and children with improved nutrition through the consumption of OFSP, high Fe and Zn potatoes and other nutritious crops

   Note: the project was not able to promote Fe and Zn rich potatoes during the implementation period and these bio-fortified varieties were not released by EIAR until now.

The BPBL Project adopted an intensive partnership approach by engaging with numerous government organizations (GOs), NGOs, and private stakeholders. Activities of the project were mostly carried out by the partners according to their respective core competencies (e.g., pre-basic/basic P&SP seed production; research; training and backstopping of FGC; nutrition promotion). All partners implemented activities as per their work plans and budgets agreed in the beginning of each year.

The BPBL Project was implemented as per the workplan jointly developed by CIP and partners. Initially there 9 staff and the number of staff increased as the size of the project increased. In Phase III, there were 25 staff who were assigned either fully or partially for the project implementation.

This report is structured according to thematic areas rather than by objectives and intermediate results of different phases as presented above for maintaining a better flow of the accomplishments and results. The report therefore provides good presentation of the accomplished objectives in contributing to the overall intervention goals and targets, with emphasis on building national capacity to provide quality potato and sweetpotato planting materials, value chain linkages/development, promotion of nutrition and behavioral change messages, capacity strengthening and advocacy, and monitoring and evaluation for results. All thematic areas also contain sections with an analysis of challenges, responses and lessons learned as well as recommendations for opportunities and next steps.

2. IMPLEMENTATION APPROACH

2.1 PROJECT IMPLEMENTATION APPROACH AND ROLE OF PARTNERS

In 2009, the BPBL project was designed and initiated considering the prevailing national and regional problems, such as, high food insecurity, high malnutrition and low productivity of crops. And it is evident that the majority of the food insecure and malnourished people are located in rural areas. Thus, the **BPBL** project was designed to contribute USAID/Ethiopia Country Development Cooperation Strategy (CDCS) Development Objective #1: Increased growth with resiliency in rural Ethiopia by improving the

productivity and commercialization of potato and sweetpotato, using a value chain approach, and working in vulnerable areas with chronically food insecure households to provide a "push" factor for engagement in the improved agricultural markets and related livelihood opportunities for increasing the target households income and nutritional status. Phase I, started with ambitious target of reaching 100,000 farmer households should be growing improved LB-resistant potato varieties and 150,000 farmer households should be using quality sweetpotato planting material by the end of the project life. In order to achieve this ambitious target with quality and sustain the achievements in the intervention communities the project adopted an implementation approach that enriched in strong partnership with different entities – GOs (National and Regional Research Institutes, Bureau of Agriculture in the regions), NGOs (National and International) and private seed multipliers (PLCs). The project continued with this partnership base approach from Phase I to Phase III for implementing all activities. A partnership approach has the advantage that project-initiated activities are more likely to be sustained after the termination of the project. Moreover, diverse approaches and activities are likely to better cater to regional and local development needs and priorities. However, a partnership- based implementation approach also implies that considerable time and energy need to be invested in awareness of and commitment to creation, discussion, joint planning, and monitoring of project activities. From Phase I to Phase III, the BPBL project established, partnership by signing sub-grant agreements with following partners:

- Bureau of Agriculture (BoA) of Amhara (in Phase III only)
- BoA of Oromia (in Phase III only)
- Bureau of Agriculture and Natural Resources Development (BoANRD) of SNNPR
- Bureau of Agriculture and Rural Development (BoARD) of Tigray
- Amhara Agricultural Research Institute (ARARI, in Phase III only)
- Southern Agricultural Research Institute (SARI)
- Tigray Agricultural Research Institute (TARI)
- Ethiopian Institute of Agricultural Research (EIAR)
- GOAL-Ethiopia, an NGO, in SNNPR
- VITA RTI Ethiopia, an NGO, in SNNPR and Amhara
- CARE-Ethiopia, an NGO and prime implementer of the Graduation with Resilience to Achieve Sustainable Development (GRAD) project; CARE itself has sub-grant agreements with Relief Society of Tigray (REST) in Tigray, Organization for Relief and Development (ORDA) in Amhara, Catholic Relief Services/Meki Catholic Secretariat (CRS/MCS) in Oromia, and Agri Service Ethiopia (ASE) in SNNPR. GRAD is a USAID-financed project which was linked to BPBL by formal agreement, budget and workplan with potato and sweetpotato related activities.
- Engna Leegna (ELE), an NGO, in SNNPR and Oromia
- Mums for Mums (M4M), an NGO, in Tigray and Amhara
- Farm Radio International (FRI, Phase I only)
- Food and Agriculture Organization (FAO) led consortium (Phase I only)
- Wageningen University, Department of Social Sciences (Knowledge Technology and Innovation Group), and Department of Plant Sciences (Centre for Crop Systems Analysis)
- Hawassa University
- Haramaya University
- Mekelle University
- Additionally, the project collaborated with existing seed-producing companies, such as Solagrow PLC, Muluneh Boru, Ezra Trading, Wamole SP Vine Production, Jara Agro-industries and Zerab

PLC, who produce tissue culture (TC)-based potato minitubers (MT) and SP vine multiplication. The project worked with these private companies mainly in Phase I to ensure rapid multiplication of planting materials for making quality materials accessible at farmers' end. From Phase II, FGCs were encouraged to procure pre-basic seed from these companies, as an alternative to the research institutions, as seed providers.

Implementation of project activities were carried out by partners as per their respective core competencies (see Figure 1).

The **project partners' activities** and respective expected outputs were complementary to each other, i.e. are all part of project objectives/intermediate results and respective overall workplan, which is nevertheless comprised of individual partners' workplans, discussed and concerted in regional and overall project planning and review workshops:

The federal (EIAR) and regional (TARI, SARI, ARARI) **research institutes** with their respective on-station field and laboratory sites were capacitated and strengthened to produce disease-free tissue culture based early generation seed (minitubers and G2/3 in potato and foundation/primary quality material in sweetpotato). The **extension and 'farmer capacity strengthening' partners** (Bureaus of Agriculture and NGOs) worked towards the establishment of and gave direct support to FGC for seed potato production and to DVMs, which then were linked to the research institutes and private partners (e.g. Solagrow, Muluneh Boru, Ezra Trading, Wamole SP Vine Production, Jara Agro-industries and Zerab PLC) to have access to early generation seed as 'starter' seed or for seed stock renewal. Training of the trainers (ToT) in agricultural practices and business skills was organized for extension partner staff by research institutes, CIP staff and external consultants, which then was cascaded within extension partner organizations and to lead or 'model' farmers (i.e. from *woreda* to *kebele* level) and finally cascaded down to targeted farmer communities (seed and ware producers). Furthermore, quality seed for ware production was purchased by the project and distributed freely to interested farmers, in order to raise demand and adoption of improved varieties of potato and sweetpotato. In many cases, this free distribution of quality seeds for demand creation were distributed to non-project woredas termed as *Outscaling* woredas. Value chain linking and sensitization events were held by the extension

partners according to their conceptional and methodological approaches [e.g. multi-stakeholder platform (MSP), B2B, market linkage forums, market activation and farmer field days].

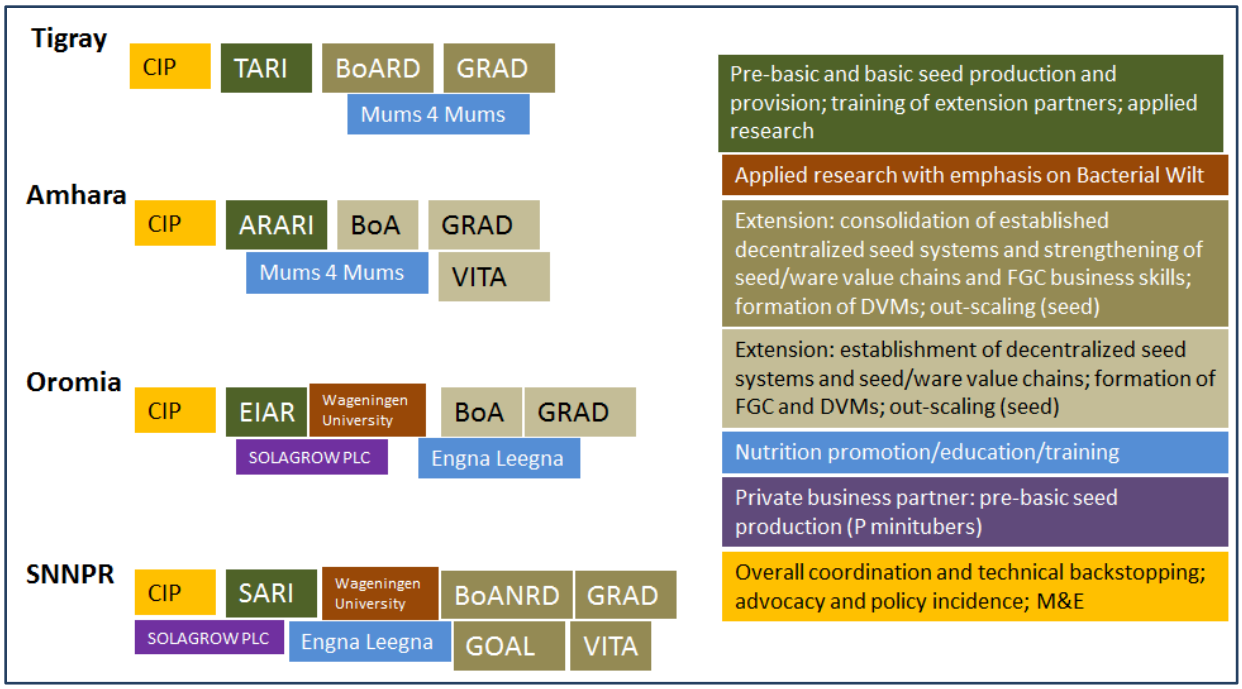

Figure 1: Implementing partner by region, roles, and responsibilities.

Farmers' capacity strengthening and strengthening of value chain linkages was reinforced and institutionalized by the ongoing and project supported roll-out of a low-cost seed inspection and labeling system, Quality Declared Seed (QDS), which prior was informally piloted by BPBL and then been ratified as a formal institution by the Ethiopian Government. The project extension partners gave support to targeted farmers and groups by means of 'internal' seed inspections to get them prepared for the enrollment in the external (formal system) inspections. CIP accompanied that process by **advocacy** work, scientific expertise in the elaboration of the regulatory framework, and as well training of the concerned regional regulatory agencies (including inspection laboratories), in cooperation with the **Ministry of Agriculture** (MoA). Finally, the **Nutrition partners** (ELE, M4M) in coordination with extension partners were doing nutrition promotion through SBBC in project *kebeles* as well as to a wider public (by radio program and urban promotions) and were targeting direct beneficiaries with more specific nutrition education and training combined with agricultural practices training of the extension partners. Consumption, and thus home production, of potato and especially OFSP in combination with other nutritious food (vegetable) has been promoted. Regular coordination meetings among partners strived to harmonize those activities with e.g. distribution of seed by the extension partners. Nutrition oriented ToT was conducted as well for capacity strengthening of agriculture & nutrition related governmental entities (BoA, Bureaus of Health and Education) at district and project community level, to allow for further cascading and scaling out to non-project Woredas and *kebeles*.

In collaboration with another international research partner, the University of Wageningen, CIP and the national research partners have accompanied the project work context with intensified research activities on potato related pest & disease problems, especially Bacterial wilt. (BW) The results of survey

work and analysis of latent infection problems will enter sector related policy recommendations, e.g. concerning the functioning of the QDS system.

2.2. INTERVENTION AREA

From Phase I to Phase III, the project worked in 60 woredas for implementing activities, providing technical backstopping and monitoring the progress in four regions (see Figure 2). Some of these woredas were overlapped through phases in SNNPR and Tigray regions. But, always worked in distinct kebeles. In Phase II, consolidation was done in old woredas and kebeles extension of activities took place in new Woredas and kebeles (in Amhara and Oromia regions). A list of project direct intervention woredas is provided below (Table 1).

TABLE 1 PROJECT DIRECT INTERVENTION WOREDAS

Region	Partner	No. Woredas	Project Woredas
SNNPR	BoA, ELE, GOAL, GRAD, VITA	25	Arbaminch Zuria, Bonke, Boricha, Cheha, Chencha, Damot Gale, Damot Woyde, Dita, Doyo Gena, Geta, Gumer, Hawassa Zuria, Hawela Tula, Hula, Kacha Bira, Kedida Gambela, Lemo, Loka Abaya, Marko, Meskan, Mirab-Azernet, Misha, Misrak Badawacho, Shebedino, Sodo Zuria
Tigray	BoARD, GRAD, M4M	15	Alamata, Atsbi, Axum, Endamehoni, Enderta, Hawuzen, Hintalo Wajirat, Kilte Awlalo, Mekele, Mereb Leke, Ofla, Q/ Temben, Raya Azebo, S/ Saherti, Tanqua Abergele
Amhara	BoA, GRAD, M4M, VITA	10	Ankasha, Dabat, Debark, Dega Damot, Dera, Farta, Guangua, Lay Gayint, Libokemkem, Sekela
Oromia	BoA, ELE, GRAD	10	Adami Tulo, Arsi Negele, Degem, Jeldu, Kofele, Shala, Shashemene, Wolmera, Wonchi, Ziway Dugda

Seed distribution for demand was done in 32 outscaling woredas (Table 2). In Amhara, demand creation seed distribution was done mostly within project intervention woredas but in different kebeles. The BoA Amhara found this approach better for follow up and coordination.

TABLE 2 PROJECT WOREDAS ONLY SEED DISTRIBUTION FOR DEMAND CREATION

Region	Partner	No. Woredas	Project Woredas
SNNPR	BoA	9	Andercha, Alicho Woriro, Angacha, Damat Pulasa, Mareka, Masha, Sodo, Tocha, Yem, Shy Bench
Tigray	BoARD	9	Adwa, Ahferom, Emba Alaje, Ganta Afeshum, Gulomeckade, L/Maichew, S/T/ Emba, T/ Maichew, D/ Temben,
Amhara	BoA	1	Albiko Legambo
Oromia	BoA	13	Cheliya, Dawo, Digalu Tijo, Dire Inchini, Itefa, Ilu, Jibat, Kersa Malima, Kore, Limu Bilbilo, Siraro, Weliso, Wendo

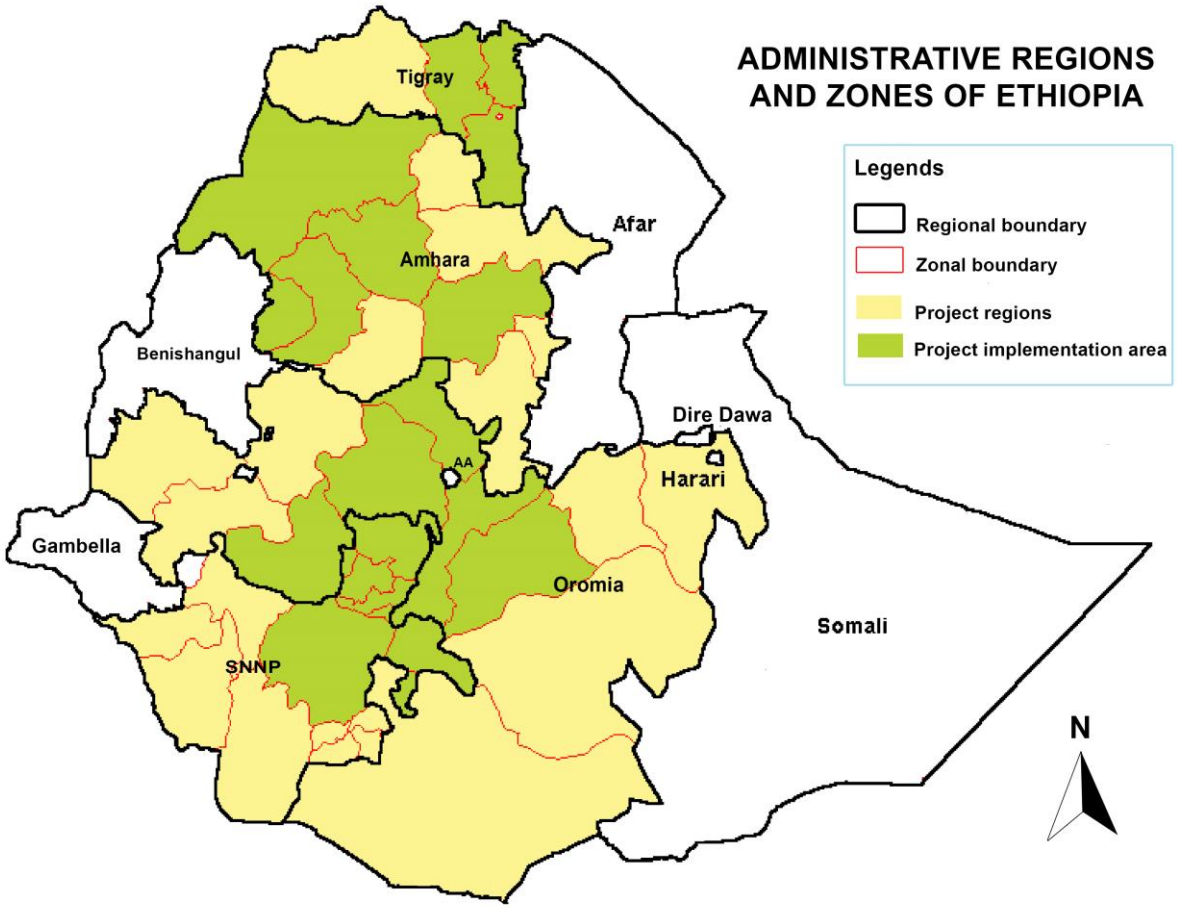

Figure 2: Map of Ethiopia and project intervention areas highlighted

Source: CIP-Ethiopia archive

3. DEVELOPMENT ACTION AND ACHIEVEMENTS

3.1. BUILDING NATIONAL CAPACITY TO PROVIDE QUALITY POTATO AND SWEETPOTATO PLANTING MATERIAL

3.1.1. SEED SYSTEM DESIGN IMPROVED

At the start of the project in late 2009 production of high quality potato and sweetpotato seed were below 1% of the production areas, respectively. Although, a legal framework for a formal root and tuber seed certification scheme had been in place it lacked implementation and no seed has been officially

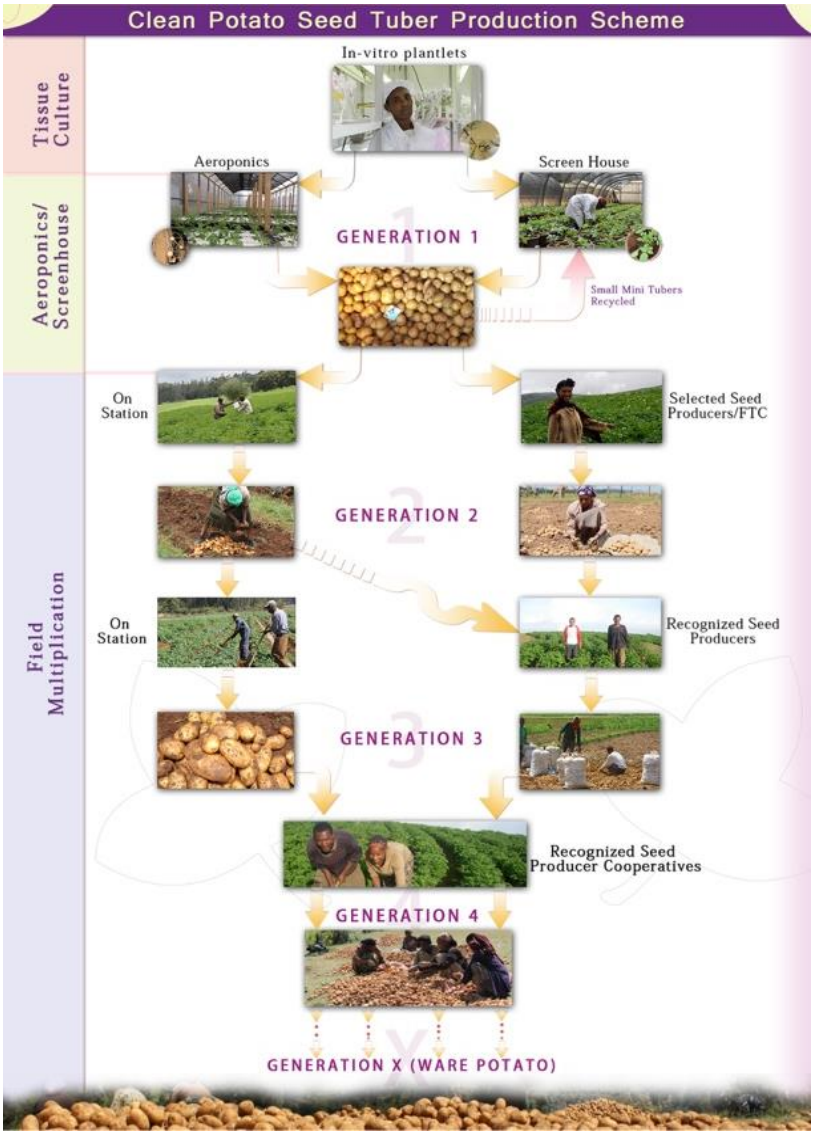

Figure 3: Seed production approach for potato

certified. Given the Ethiopia's large area size, the still limited road infrastructure and the fact that potatoes and sweetpotatoes are being produced by millions of small-scale farmers (instead to few large-scale commercial producers), the costs for implementing a formal seed certification scheme would be prohibitively high; so the logistic requirement is extremely challenging. It has been therefore unrealistic to assume that such a system could be under operation at a national level in medium term. Hence most of the seed planted came from the informal system is characterized by the absence of quality control mechanisms and is of poor quality, usually derived from farmers' own fields (farm-saved), and local markets or neighbors is planted for an unspecified number of generations. At the same time an alternative system involving farmer cooperatives and farmer groups (farmer cooperatives in the following) with technical support and supervision from the national research and extension system produce seed of relatively high quality, however only at a very small scale.

The informal and alternative seed systems will therefore remain to be the dominant seed production and dissemination mechanism in the country for the time being. Interventions designed to improve farmers' access to quality seed at affordable prices should therefore aim building upon the existing two systems. The approach was that a highly-decentralized seed production systems, whereby FGCs or Model Farmers (MFs) multiply disease-free source seed obtained by public or private producers, farmer-to-farmer seed exchanges/sales are key value chain linkages for the establishment of sustainable seed systems. The project partners designed and implemented a seed system through establishing linkages between producers of pre-basic seed with farmer-based (cooperatives, lead farmers) seed multiplication and dissemination systems accompanied by the introducing the concept of QDPM and thereby creating a new hybrid system that incorporates and improves components of the alternative as well as informal seed systems (see Figure 3). Such a system has clearly demonstrated the potential to give large numbers of potato farmers 'access to quality seed. In accordance with project objectives, emphasis continues to be given to out-scaling activities for the rapid dissemination of late blight-tolerant potato and sweetpotato varieties. The cumulative number of HH reached with quality planting material of improved varieties since the inception of the project is more than 285,000 for potato, which is 167% higher and 440,000 for sweetpotato, which is 200% higher. The project therefore reached and surpassed its key targets—namely, giving 170,000 HH access to quality potato seed and 220,000 HH to sweetpotato quality planting material.

3.1.2. ENHANCEMENT EARLY GENERATION SEED CAPACITY

Production of clean Tissue Culture (TC) are at the heart of any seed system of vegetative propagated crops. Once in the field, viruses accumulate, causing seed degeneration which is leading to yield reductions. Soil borne diseases, most prominently Bacterial Wiltin potato, require exclusion from the planting material pool. TC techniques can provide clean materials, free of virus, bacteria or fungi, of released varieties whenever required and accelerate multiplication processes. Further multiplication in screenhouses using adequate rapid multiplication technologies aiming both to reduce the cost and increase the multiplication rate of early seed generations. During the three project phases, significant investment has been made in the upgrade of early generation seed or foundation material production facilities at national research institutes.

PHOTO CREDIT: ARARI

Figure 4: In vitro-propagation and G1 production in newly constructed screenhouse at Adet Research Center (ARARI)

Equipment and lab supplies supplied to ARARI, EIAR-HARC, SARI and TARI have been targeted to increase capacity for TC multiplication and screenhouse multiplication for both crops. The upgrade of TC Labs followed standard requirements whereas screenhouse multiplication systems used aeroponic, sand hydroponic and conventional technologies based on respective suitability and on lessons learned from previous investments. Moreover, the project provided TARI with a desalination to reduce high plant toxic salt levels of the water and EIAR with a backup generator as response to recurrent respective problems. Besides the upgrade of the facilities increasing capacity of National Agricultural Research System (NARS) staff to operate early seed generation facilities has been one of major achievements which however requires a continuous refreshment to become sustainable.

Before the BPBL intervention the country had only a small capacity for potato in-vitro plantlet and minituber production which has been increased almost 10-fold (Table 3). However, problems with contamination and poor handling in 2015 and early 2016 led to a situation that the facilities only operated at between 30 and 80% of their respective capacity, which also lowered the amount of starter material for subsequent seed multiplication in the field to basic seed. These problems have been addressed by the project team and it is excepted that NARS facilities reach at least an average of 75% of their respective production capacity.

The project also supported the private company Solagrow PLC, with in-vitro plants of diseases resistant improved varieties as starter material for further multiplication and contracted them to produce seed

for seed producer FGC's. Solagrow got its basic seed farm with minituber-facilities at Wenchi and installed the complete crop and harvest line for potato seed production. To assure the seed potatoes are free of diseases, Solagrow established its own plant and molecular laboratory (ELISA and qPCR). With this complete seed line, Solagrow is the unique licensed private potato seed producer in Ethiopia, capable to produce seed at export level. However, due to the destruction of the Wenchi seed farm during politic unrest in December 2015, Solagrow lost almost all its basic seed and screenhouses for MT production. It will take at least two years before Solagrow will be able to supply significant amounts of quality potato seed again.

TABLE 3 ANNUAL CAPACITY FOR POTATO IN-VITRO PLANTLET AND MINITUBER PRODUCTION SUPPORTED BY THE PROJECT

Institute/Region	In-Vitro Plantlet production capacity		Minituber production capacity	
	Baseline	2016	Baseline	2016
ARARI-Amhara	2,000	60,000	20,000	600,000
EIAR-Oromia	15,000	75,000	150,000	750,000
TARI-Tigray	0	30,000	0	300,000
Total	**17,000**	**165,000**	**170,000**	**1,650,000**

The availability of sweetpotato (SP) planting material derived from TC was very limited. Only the universities of Addis Ababa and Haramaya produced small quantities of in-vitro plantlets and foundation material. However, in 2011, TC laboratories at Holetta (EIAR), Areka (SARI), and Mekelle (TARI), and in 2015 Bahir Dar (ARARI) were equipped to produce SP in-vitro plantlets and foundation material in newly constructed screen houses, with support from the BPBL and Mashav projects. Production started in 2012. This was a major achievement as it will now be possible to produce disease-free foundation material in the projects regions to be fed into the regional and national SP multiplication schemes.

TABLE 4 ANNUAL CAPACITY FOR SWEETPOTATO IN-VITRO PLANTLET AND MINITUBER PRODUCTION SUPPORTED BY THE PROJECT

INSTITUTE/REGION	IN-VITRO PLANTLET PRODUCTION CAPACITY		SCREENHOUSE VINE CUTTINGS	
	Baseline	2016	Baseline	2016
ARARI-Amhara	0	20,000	0	200,000
EIAR-Oromia	0	5,000	0	50,000
SARI-SNNPR	0	50,000	0	500,000
TARI-Tigray	0	30,000	0	300,000
Total	**0**	**160,000**	**0**	**1,050,000**

Overall BPBL increased the capacity of tissue culture and early generation seed in controlled environments 10-20-fold for both crops.

Though the field production of basic planting material has been up to the project targets, the full production capacity given by the capacity of the rapid multiplication technologies facilities could not been reached due to the described problems in TC lab multiplication but also due to limited access to suitable land.

CHALLENGES, RESPONSES AND LESSONS LEARNED

Although the capacity for early generation seed has been significantly improved the project faced significant problems to run the operations at full capacity.

- Recurrent plant loss through contamination (bacterial, fungal), requiring problem analysis and trouble shooting. Contamination problem can emerge suddenly in previously functioning labs. Most technicians working in Ethiopian TC labs do not have the necessary experience to foresee, analyze or deal with these problems. Total loss of plantlets and inability to restart production are the consequences. A CIP expert helped in identifying and eliminating the source of contamination, improve handling and sterile practices by backstopping TC personnel, identification of equipment malfunction and its repair have been undertaken to bring contamination levels down to <2 %.
- Human capacity due to high staff turnover has been a consistent problem, periodically leaving the TC labs with poorly trained technicians, who had to be trained and backstopped in addition to those initially trained.
- Low plantlet quality, leading to low multiplication rates and low acclimatization success, due to suboptimum growth room conditions (temperature, ventilation, light, relative humidity). In such cases, *in vitro* production continues with low reproduction rates, but acclimatization fails, resulting in total loss or low multiplication rates. To tackle this, we introduced mini-greenhouse system, to improve plantlet quality *in vitro* by improving growth conditions (temperature, light) and use of plant growth promotors such as Chitosan to counteract sub-optimum growth conditions.
- Problems with water supply and quality, power, acquisition of consumables, maintenance and repair of equipment). Electricians and technicians able to maintain and repair TC culture lab and aeroponic units are difficult to find and contract within the NARS system. Attempts to improve basic conditions such as energy and water supply have been made by supplying generators and water treatment equipment. Reliable supply of consumables remains to be a problem, as several reagents fall under national security laws, such as all nitrates and are delivered late due to lengthy custom clearance processes.
- Multiplication plans in TC labs, screenhouses and field need to be aligned carefully and to be projected for the entire production cycle up to the point of sale. The apparent bottleneck of suitable land for seed production free of soil and seed borne diseases must be addressed by identification of new "clean "land which can be used for multiplication without the risk of disease contamination.
- Capacity and implementation of diseases detection/testing and disease elimination is crucial for operating early seed generation production in a sustainable manner from TC lab to the basic seed production in the field.

OPPORTUNITIES AND NEXT STEPS

With the facilities and equipment in place it will be of major importance to guarantee an efficient use of the rapid multiplication technique facilities to produce many starter planting material in a sustainable way. To assure sustainable operations, additional capacity-building at the national level beyond NARS and inclusive of universities is required to ensure human capacity building continuously and locally. This will

require developing crucial technician and researcher training in biotechnology and the further training of trainers and lecturers.

3.1.3. ESTABLISHMENT OF DECENTRALIZED MULTIPLICATION WITH DECENTRALIZED MULTIPLIERS (DVM/FGC)

PHOTO: CREDIT: CIP-ETHIOPA ARCHIVE

Figure 5: Seed Potato farmer in Chencha

Since 2009, CIP has partnered with national public and private partners from research, extension, development, and business to develop a seed system intervention aimed at improving access to quality seed with a decentralization of seed multiplication to reach project target. The establishment of a large network of Decentralized Seed P/SP Multipliers (DSM), with potato mainly organized in FGC's for increasing access to high quality seed, improving yields and incomes of smallholder potato farmers, and fostering functional linkages along the potato value chain. Local availability and distribution are major seed sector bottlenecks. Seed potato is very bulky and, at a planting rate of 2–2.5 t/ha, and sweetpotato vines are highly perishable making transport over long distances between the seed production sites and a wide spectrum of farming communities impractical and economically unsustainable. The production and marketing of high-quality seed potato only becomes feasible once the specialized production chain is more efficient and has strong linkages to trained DSM, who further multiply seed locally and make it accessible to ware growers. The significant investments required to produce early generation seed result in a few centralized producers who are unable to reach or supply a larger potato farming community. National research system (EIAR, TARI, and SARI) and hopefully increasingly the private sector should provide initial source material and by continuous provision technical training/backstopping to extension partners and seed producers. Such a system requires more input/resources at an initial stage. Once established, however, it drastically reduces transaction costs and dependence on outside intervention to function sustainably. The system has been successfully piloted, and up scaled but will further facilitated and promoted at a larger scale. Thus, networks of DSM linked to early generation seed producers are an essential component of a functional seed system. BPBL invested successfully in an interlinked early seed production and by the project established local multiplication through a network of trained DVM's and FGC's.

Prior to the project several government and project initiatives established potato seed producer groups / cooperatives (FGC). These FGCs have received technical training and support for the construction of diffused light stores (DLS). Seed is produced under technical supervision of government and/or project staff. BPBL built on this approach and transformed 320 FGC's into potato seed producer FGC's consisting of more than 10,000 farmers (Table 5).

TABLE 5 SEED POTATO FGCS BPBL PROJECT CAPACITATED FROM PHASE I TO PHASE III

Region	# members			Actual Num. FGCs[1]	Phase I	Phase II	Phase III
	Male	Female	Total				
Amhara	1,583	267	1,850	27	-	-	27
Oromia	212	33	245	11	-	-	11
SNNPR	5,105	1,992	7,097	254	213	104	100
Tigray	894	190	1,084	28	12	6	17
Total	**7,794**	**2,482**	**10,276**	**320**	**225**	**110**	**155**

[1] *Actual number of FGCs that the project worked with was 320, but many of them overlapped through phases in SNNPR and Tigray regions*

The market for SP planting material in Ethiopia is somewhat unique in that it is dominated by a few large-scale dealers/multipliers, mostly located around Hawassa in SNNPR, and large-scale institutional buyers such as FAO, aid agencies, and the MoA. This is because SP is widely recognized as an excellent disaster-relief crop and hence substantial donor funding is available annually to produce and disseminate SP vines in areas affected by natural calamities and in other areas. The problem with this system is that, during the absence of an inspection system for vegetative propagated planting material, these commercial dealers/multipliers generally purchase diseased, poor quality vines from local SP farmers and then sell it as planting material to institutional buyers. This has led to the widespread dissemination of SP pests and diseases in Ethiopia. CIP and research partners addressed this by linking these large-scale dealers/multipliers to the national research system for the supply of primary quality planting material (PQM) which the commercial multipliers then multiply following the established QDS standards (see following section) before selling it to institutional buyers. The market for SP planting material has therefore been highly centralized and donor driven; in effect, it favors large-scale commercial producers and traders and reduces farmers to recipients of donor and government hand-outs. To give millions of SP farmers sustainable access to high-quality planting material, a decentralized, farmer/community-based multiplication system has been established by the BPBL alongside the current system. Farmer groups, individual farmers, and farmer training centers run by the national extension system and, where available, commercial multipliers located in these production areas were trained in producing quality planting material, catering for their own seed needs and providing seed to other growers operating in that area. Clean planting material was injected at the head points of the schemes, multiplied, handed on through farmer-to-farmer exchange and/or GO/NGO seed dissemination activities, and then multiplied further before finally reaching the consumer.

In the first two project phases FGC's in SNNPR and Tigray regions have been trained and backstopped which continued into project phase III. In project phase III BPBL expanded to Amhara and Oromia regions. Continued strengthening technical, business skills and organizational capacities of FGCs have been provided in two to four rounds, respectively through the BPBL intervention phases. Most DVM's and FGCs now have the technical know-how to produce and store planting material and skills in effective business management. Initial business skill trainings were held by the BPBL, however, further mentoring and follow up is needed to ensure sustainable and economically viable entities.

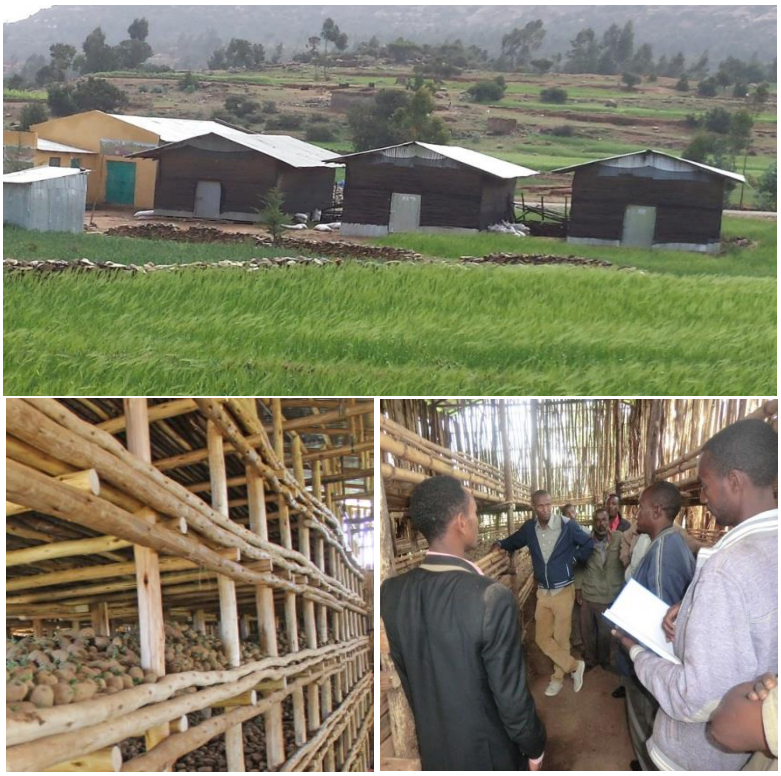

PHOTO CREDIT: BOARD-TIGRAY

PHOTO CREDIT: FREZER A CIP-ETHIOPA

PHOTO CREDIT: BOA-OROMIA

Figure 6: DLS seed potato stores with project supported seed Farmer Group Cooperatives

Besides the training BPBL partly supported storage solutions for seed multipliers. Potato seed storage, an important bottleneck, has been alleviated through the construction of more than 1,100 diffused light seed stores, with a cumulative capacity of around 8,800t. For sweetpotato the preservation of planting material with "Triple S" system (storage, sand, sprouting) to maintain planting material during long dry seasons (up to 6 months) have been promoted in Tigray to address the rather long dry spells (Figure 7). In regions with higher precipitation net tunnel systems have been prompted to keep a virus-free stock on-farm for several seasons to source material for further field multiplication.

PHOTO CREDIT: CIP-ETHIOPA ARCHIVE

Figure 7: Left: "Triple S" system (storage, sand, sprouting) to maintain planting material during long dry seasons. Right: Net tunnel to protect seed stock from virus transmitting vectors

Following training and accompanied by intensive backstopping production of seed resumed starting with the Meher 2010 season in SNNPR and Tigray and Meher 2015 for Amhara and Oromia. Since, the project supported FGCs have produced more than ***37,500 tons*** of quality seed potato tubers which is equivalent to a value of ***16 million $US in sales***. The **annual FGC potato seed production capacity** at the end of the project is about **20,000 t** equivalent to a value of ***9.3 million $US in sales annually.*** In the same period, more than ***160 million*** sweetpotato cuttings were sold and distributed representing a sales value of ***2.2 million $US***.

CHALLENGES, RESPONSES AND LESSONS LEARNED

The establishment of a decentralized seed system in BPBL relied on FGCs and private multipliers and was an intensive, multi-year process requiring substantial resources, time and various types of expertise. Rather than over-promising to establish a system comprised of a large number of cooperatives and private multipliers that is likely to disintegrate immediately after project completion, the BPBL concentrated project resources on the creation of a less extensive system that is more likely to be self-sustained past project intervention. However, highly decentralized seed production systems, whereby a large number of FGCs or MFs multiply disease-free source seed obtained from public or private producers of potato minitubers or sweetpotato foundation material are of critical importance to give large number of farmers' sustainable access to quality seed at affordable prices to sustainably improve productivity at national scale.

For the decentralized seed system to function the following aspects are of major importance:

- Technical knowledge to produce, store, pack and transport healthy planting material
- Suitable land for multiplication available and cooperative based cropping rotation) plans implemented to avoid disease contamination of planting material
- Sound cooperative structure and business skills
- Adequate seed storage technologies and capacities
- Awareness among buyers and traders about the presence of high quality seed
- Functional business linkages among seed multipliers, buyers and traders so that these parties committed to buy high quality seed from the multipliers
- Seed multipliers exposed to the real market situation and market
- Regional boards or associations outlets to increase bargaining power for purchasing inputs and seed sales
- Quality standards and traceability (see QDS section)

OPPORTUNITIES AND NEXT STEPS

- To achieve significant yield gains at national level it is estimated that the use of high quality seed should be at least at about 10-20% (replacement after 5-10 seasons), depending on the respective disease pressures. Given that 254,000 ha are grown during Meher and Belg planting seasons, about 50,000 – 100,000 t of quality seed would be needed. Though, BPBL increased the supply of quality seed the current capacity still is only 40 and 20% of the respective 10 and 20% seed supply target. Hence, the capacity in quality seed production still needs to be enhanced

along the production chain inclusive of the establishment of new FGC's while continue to support existing FGC's on needs basis.

- For sweetpotato it is more difficult to estimate the real demand of planting material, but it is expected that the demand is far from being satisfied. Moreover, the seed producers do have a critical role in generating access to new resilient and nutritious varieties to smallholders. Besides this it is of importance that the QDS quality control system is systematically included in the decentralized seed production system to prevent further spread of devastating diseases of major importance. Uncontrolled distribution of planting material of unknown quality led to spread of diseases into many regions as documented for BW and viruses

3.1.4. IMPROVED LOCALLY ADAPTED SEED QUALITY CONTROL WITH QUALITY DECLARED SEED (QDS)

A major achievement of BPBL was the institutionalizing of the QDS system for potato and sweetpotato in Ethiopia. The principal idea behind QDS is to enable smallholder potato and sweetpotato farmers to produce quality seed/planting material at low costs and contribute to solving the critical problem of seed/planting material shortage. The smallholder farmers are advised to form cooperatives or other forms of farmer organizations to do this in a sustainable manner.

The semi-informal seed inspection system (Quality Declared Planting Material or QDPM) was piloted (Figure 8) and has been officially recognized in the updated Ethiopian Seed Proclamation No. 782/2013 (February 2013) as an approach to increase the availability of quality seed in the country. The pilot has been over four seasons in eight woredas in three of nine federal states. The pilot phase had strong involvement of local research and extension bodies with oversight from EIAR and included 14 Seed Producer Cooperatives with 672 members participated in the pilot. In that period, a total of 135 fields were inspected, out of which 116 met the seed quality requirements

The benefit of using QDPM/QDS seed became clearly apparent in the crop cuts with an average yield increase of 63% compared to farmers' seed (25.7 vs 15.7 t/ha (N=133)).

Experiences indicated that:

- Participant farmers, technicians and district administrators view the scheme as useful and suggest institutionalization: Initially, inspections should be funded by incorporating this activity into the regular work program of government line agencies while the cooperatives buy the labels; at a later stage, the inspection could be funded entirely by seed producers
- QDPM objectives and procedures need to be clearly communicated to both technical staff and district-level administrators as well as seed producer cooperatives to create confidence and ownership.
- Peer control among cooperative members is an effective tool to maintain quality standards, however, cooperatives need to develop and agree on guidelines on how to deal with rejected seed lots to avoid internal conflict.

- The currently used inspection procedures may need to be simplified / shortened to reduce staff/ farmer time needed for the inspections.

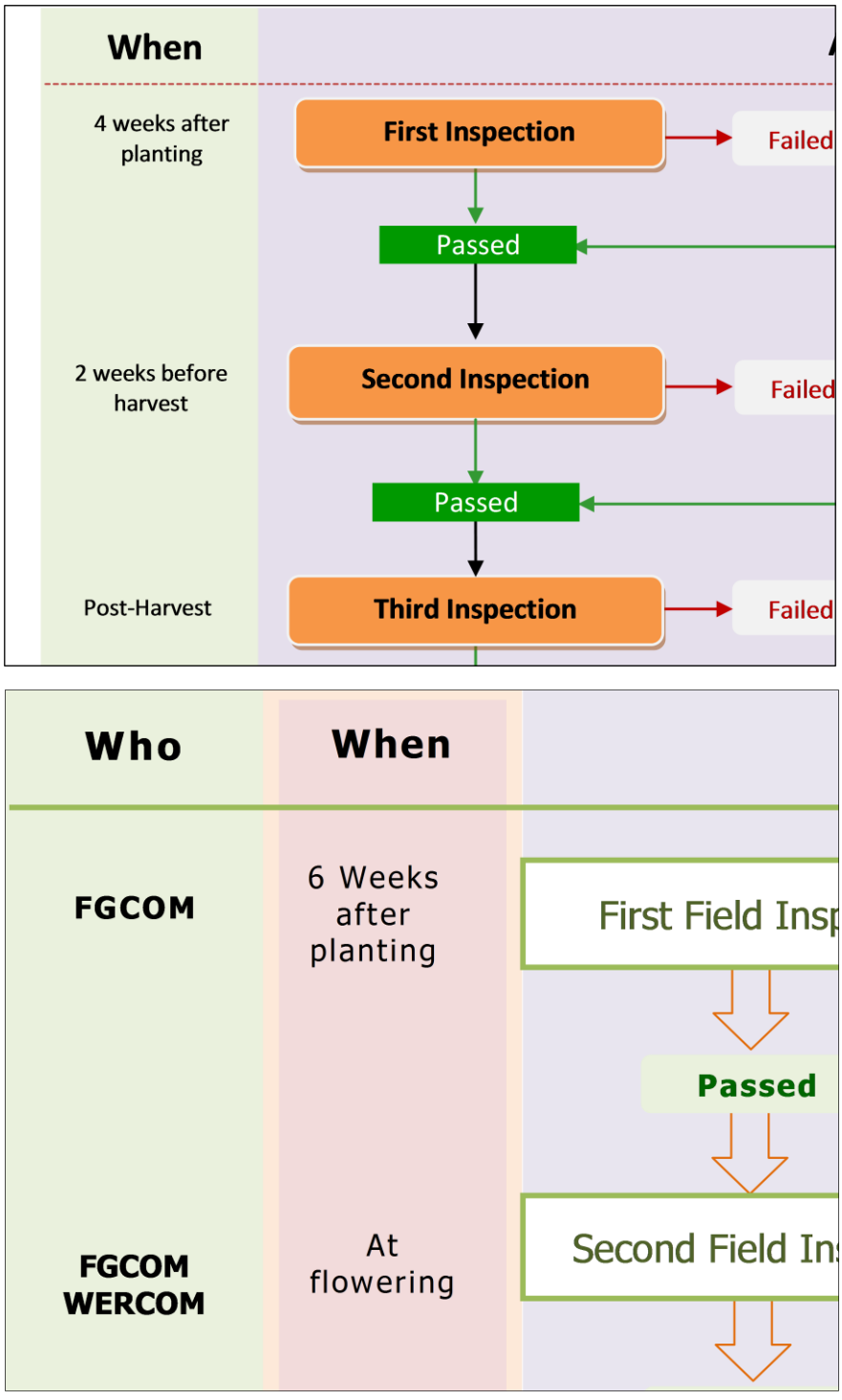

Figure 8: Piloted QDPM/QDS inspection scheme for sweetpotato (top) and potato (bottom)
Source: Technical Guidelines for the Inspection of Potato and Sweetpotato Quality Declared Seed

After the pilot phase has been concluded; a QDPM Task Force was established, comprised of representatives of the MoA, EIAR and CIP. The Task Force produced the final implementation procedures to enable institutionalizing the concept at national level. As a first step, regional feedback workshops were organized in the four states. A national workshop was conducted in January 2015 to present the final documents and to initiate the official ratification and approval process for the QDPM/QDS implementation procedures for both crops, allowing for the institutionalization and operationalization of the concept at national level. Because of the successful QDPM piloting inspection concept within the project phases 1 and 2, QDPM was ratified by the Ethiopian Government as a legal seed quality control standard in March 2015, however it has been renamed to Quality Declared Seed (QDS)). (Figure 9)

PHOTO CREDIT: ABIYOT A. CIP-ETHIOPA

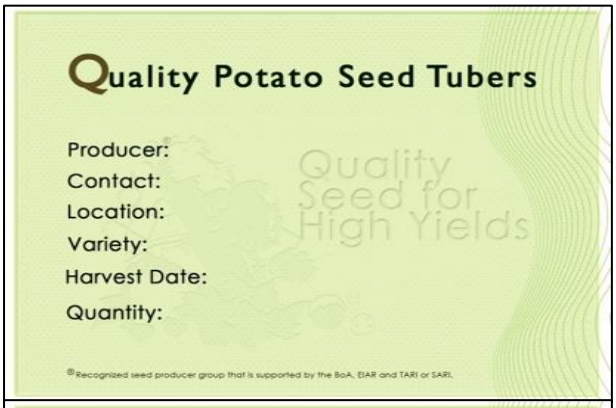

PHOTO CREDIT: BIRUK G. CIP-ETHIOPA

Figure 9: QDS seed potato production, labeled sweetpotato vines production and QDS labels

Since Meher 2015, government authorities started the QDS implementation. For potato QDS was rolled-out in all four project regions, for sweetpotato in three regions (not in Oromia where the public security situation hampered the implementation). In addition to continued capacity strengthening and training on P&SP QDS, the BPBL Project supported and enhanced the implementation as well as contributed to the institutional development process by providing a platform for review and discussion of the present situation of the QDS system. Seed system experts, implementers, and decision makers of the four regions came together to share experience and discuss options for process improvements.

Major lessons learned in the process from piloting to institutionalization of QDS have been following:

- Quality control required to prevent further spread of devastating diseases of major importance. Uncontrolled distribution of planting material of unknown quality led to spread of diseases into many regions – cases of BW and viruses.
- Decentralized seed production is a "MUST" due to limited road network & high transport costs ($20 to $80 per ton per 100 km) but also to strengthen regional seed self-sufficiency and reduce spread of diseases.
- Separate value chain for planting material is needed: Labeling, Seed quality control mechanisms & awareness creation about benefits of using quality seed (demonstrations, field days).
- District / zonal potato/ sweetpotato farmer organizations / representations are needed to increase bargaining power, conduct advocacy and develop, adjust and control standards.
- Strengthening business & leadership skills of seed coops have been crucial to manage QDS production and marketing (accounting, tendering, customer relations, conflict resolution).
- Extensive involvement of R&D partners at regional and federal level was important for increasing awareness, training, involvement and feedback. A champion in EIAR carried processes after recognizing the value of QDS.
- Real-life piloting crucial for convincing stakeholders that the system is functional and adapted to local conditions.
- Initiative needs to support National Policies and priorities.
- Objectives and procedures need to be clearly communicated to technical & administrative staff at district level (ownership, avoid misunderstandings).
- Peer control among members of cooperatives has proven to be effective.
- Labeling of seed is necessary for allowing direct contact between buyer and seller allowing for traceability and the development of trust between business partners.
- It has been decided to only use QDS (same concept for grain crops) as official term.
- Financial, human, and physical capacities of the inspection laboratories sometimes are inadequate and result in a tendency of only partially applying the inspection protocol, which in turn will result in compromising the quality standard of QDS.
- The internal inspections of the seed producers, by the extension service agents (BoA), have proven to be the most cost effective and reliable form of QDS inspection for maintain the quality standard.
- The requirement of a minimum of 2 ha of adjacent land for seed producers to have to undergo the external inspections is currently difficult to implement, and will most likely require a transition period for producers to adjust to. On the other hand, the requirement is considered functional in the sense of reducing inspection costs and of being coherent to a meaningful pest and disease containment strategy requiring the practice of a crop rotation system (e.g., control of BW in seed potato).
- Testing and certifying of pre-basic and basic seed production (at ARC or private sector producers) done by the seed inspection laboratories should become an integral part of the QDS system to assure its sustainability. That would include especially testing for latent BW infection.

- Supply of pre-basic and basic seed still must be increased significantly, which will include (besides the Agriculture Research Centers ARCs) more engagement of the private sector.
- BW infection is a widespread problem in potato and a threat to quality seed production. The implementation of a comprehensive containment strategy and the application of the QDS protocol are mutually enforcing.

OPPORTUNITIES AND NEXT STEPS

Following the ratification of the QDS standard by the Ethiopian Government, its roll out has been initiated and needs to be supported for a period of three to five-year by providing facilitation, management support, institutional capacity building and promotional activities to become fully implemented and a routine operation in Ethiopia. This should entail:

- National and regional workshops with participation of relevant authorities and seed multipliers to share experiences, identify and solve gaps and bottlenecks in the QDS implementation.
- Continuous capacity building for local inspectors and seed producers is required to scale up QDS
- Strengthen linkages and business relationships between early generation seed producers and QDS producers.
- Create further awareness about the benefits of QDS through demonstration and promotion activities.
- Development of Information systems and seed directories to inform where, when, how much, of which variety and at what price QDS seed is available.

3.1.5. EXTENT BACTERIAL WILTAFFECTING ETHIOPIA'S POTATO INDUSTRY AND STRATEGIES FOR ITS CONTAINMENT

Bacterial Wilt(BW), caused by *Ralstonia solanacearum (Rs)* a soil- and seed-borne pathogen, is one of the most significant limitations to the production of clean seed potato and hence its containment of major importance for disease free production. QDS currently designates zero-tolerance for bacterial wilt, based on visual assessments of symptoms in the field and storage in seed potato to avoid further disease spread through seed potatoes.

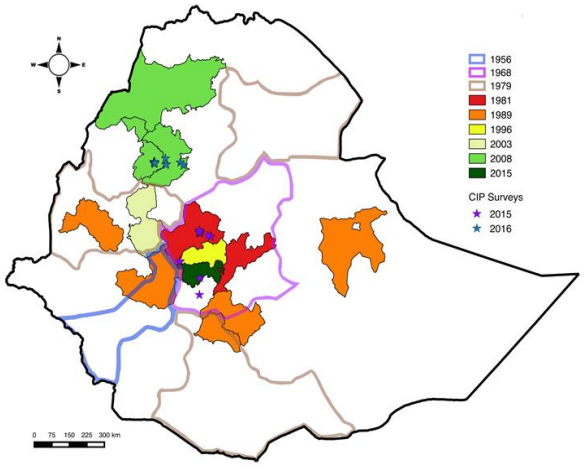

Figure 10: Reports of BW occurrence over time indicating the spatial dynamics of disease spread

Source: CIP-Ethiopia

BW was first identified in 1954 in southwestern Ethiopia. Since then, there are only 12 published reports of the disease with usually quite limited geographical and pathological details. The lack of a cohesive pathological history in Ethiopia, is the most significant limitation to map the historical progression and distribution of *Rs* in the country. Therefore, more cohesive BW survey was conducted in the BPBL project during 2015-16 planting seasons in major potato growing regions of the country to assess the presence and distribution of *Rs* so that BW- free areas could be recommended for QDS potato production to meet the needs for relatively clean potato planting material. Survey results revealed that BW has spread rapidly in Ethiopia after its initial discovery (Figure 10)), and has now been recorded in all major potato growing regions of the country. It is encroaching into highland areas that would be ideal for seed potato production, expanding into higher elevation regions breaching 3000 masl; and discovery of latent infection of *Rs* at elevations ranging from 2500-3000 masl is the first evidence that latent infection has become a problem in tubers within key high-altitude seed production areas (See Figure 11). It may be speculated that rising temperatures due to climate change is enabling the establishment of the bacterium in areas that were previously unsuitable. A similar phenomenon has been reported with Late Blight (LB) in the highlands of Peru. Unless controlled in an effective manner, BW will become a serious threat for the potato value chain, potentially impacting the food security status of millions of potato farmers, consumers and the emerging potato industry recently developed in Ethiopia.

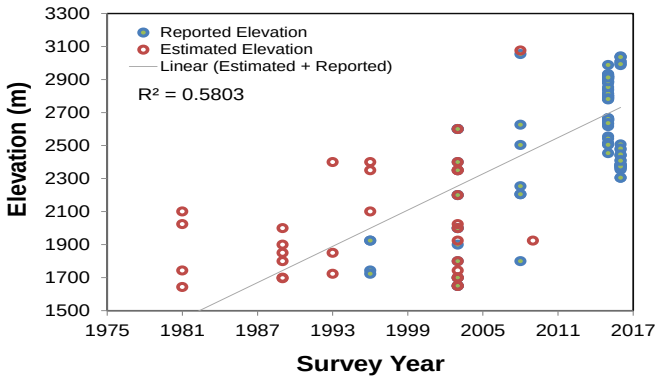

Figure 11: The distribution of BW over time (year) and elevation in Ethiopia (2015/2016 survey conducted only in elevations above 2200masl)

CHALLENGES, RESPONSES AND LESSONS LEARNED

- Being aware of the BW problem, CIP and partners established in phase III of BPBL a BW Task Force to expand collaboration and include applied research on BW.
- The project provided support to applied PhD-level research and developed and pilot a community-based BW control and containment strategy for the Chencha Woreda where BW was found in more than 90% of the farms at alarmingly high incidences.
- This applied research activity perfectly complemented the project's intervention regarding the establishment and institutionalization of an informal seed quality control mechanism (QDPM) which stipulates that quality seeds must be free of BW as a mandatory requirement.
- To capture the magnitude of the problem and identify the sources of infection and disease spread a national survey in high altitude seed production regions has been conducted. The

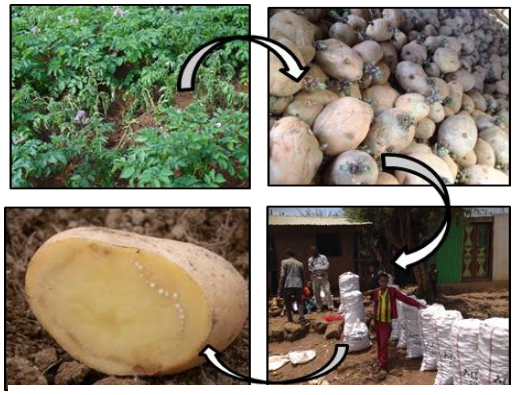

PHOTO CREDIT: CIP-ARCHIVE

Figure 12: Risk of pathogen spread through the potato value chain

survey results and subsequent laboratory tests confirmed that the bacterium has spread to major seed potato growing areas and from there spread to all major production regions through seed movement.

- In a sense of urgency, the project team therefore brought together the main actors in the potato domain for a policy dialogue and reach evidence-informed decision to increase financial and other commitments. In July 2016, a workshop was held to develop BWcontainment strategies on the ILRI campus, Addis-Ababa. This workshop brought together, policy makers and national and international scientists to develop a implementable strategy that will reverse the current trend of this very damaging disease, which if not contained, could cripple the industry. One outcome has been a policy brief which has been endorsed by the Ministry of Agriculture.

OPPORTUNITIES AND NEXT STEPS

Evidence indicates an urgent need for policy makers to address BW issue, which is expanding in worrying ways. In the absence of a formal seed certification scheme and lack of regional quarantine measures, BW is becoming a very serious concern threatening the rapidly expanding potato industry as well as the food security of the growing population. A multi-pronged approach to BW management will be required to combat the spread of BW; if no action is taken, further growth of the potato sector in Ethiopia will be constrained. Challenges include the lack of an effective seed certification regime, poor on-farm control practices, an immature seed system, and the ability of the pathogen to persist and spread via latent infection. QDS is being deployed to address these issues, however, the combination of zero-tolerance levels for BW and the rapid incursion of the disease in highland seed producing areas pose a critical challenge to QDS. Current zero tolerance levels would be difficult to implement, and should be replaced by a systems approach incorporating specific operational practices to reduce the likelihood of incursion, establishment, and growth of *Rs*.

Suggestions for addressing BW containment at local, regional and national levels include:

- Ensuring the production of thoroughly tested quality and *Rs* free early generation seed potatoes.
- Strengthening capacity of relevant stakeholders by providing training for the development of a molecular disease diagnostics hub and other relevant institutional arrangements allowing for certification, accreditation, authorization, licensing for seed quality assurance, traceability and transparency in the seed potato sector.
- Establishing functional healthy seed chain to develop an economically viable seed sector.
- Developing and implementing BW containment strategies for QDS seed cooperatives to clean up contaminated land (soil) and seed stocks.
- Creating awareness about BW and the nature of the disease at various levels, including policy makers.
- Developing rehabilitation strategies for areas currently infected through community based BW control measures.
- Conducting applied research to combat BW, and to decrease *Rs* inoculum in soil and water.

3.2. CAPACITY STRENGTHENING TO INCREASE PRODUCTIVITY

Farmers' skills and knowledge of good agricultural practices, postharvest handling, improved varieties the benefit of using high quality seed are often limited. Farmers seldom fully understand the connection between use/maintenance of clean seed, agronomic performance, and varietal specific susceptibility to

Figure 13: Distribution of clean sweetpotato vines to recipients of and planting demonstration

several diseases and pests. High-quality seed could help farmers to almost double their yields if they implemented good agronomic practices, however, quality seed potato is more expensive than on-farm saved seed. When farmers begin to invest in quality seed, they cannot afford to replace all seed requirements every season (nor could existing formal seed systems meet this new demand). Therefore, farmers can benefit from learning how to protect their investment in seed by maintaining the quality of on-farm saved seed. Besides disease and seed quality constraints, limited access to high yielding disease resistant varieties poor soil fertility and plant nutrition are among the most limiting factors of potato yield. Moreover, decreasing soil fertility is a major limiting factor for sustaining and increasing crop productivity, which highlights the need for soil fertility replenishment to ensure food security. To protect limited natural resources in the Ethiopian highlands as well as maximize already cultivated areas, potato-based production systems need to be improved through more effective production technologies such as improved crop rotation patterns, control of major diseases, and an increase in land-use-intensity by improved plant nutrition management alongside with good seed qualities of improved market demanded varieties.

BPBL addressed this challenge in a multipronged approach by out scaling good quality seed of high yielding late blight-resistant varieties and OSFP and white fleshed sweetpotato (WFSP) varieties in a large-scale dissemination at small quantiles. The BPBL partners invested intensively in ToT from extension service providers and development partners in good agricultural practices, who then trained farmers. Additionally, BPBL researchers conducted applied research in cooperation with other projects aiming to provide farmers with better management options suitable for their socio-economic and general farm environments.

3.2.1. LARGE SCALE AWARENESS CREATION OF THE VALUE OF HIGH QUALITY SEED AND IMPROVED VARIETIES.

Recent studies revealed that in Ethiopia, improved varieties and high quality seed in the last two decades have only been deployed in rather close proximity to the research stations, while most Ethiopian farmers neither got access to the advances made in breeding nor benefitted from quality seed. One of the main thrusts of BPBL therefore, was to widely improve farmers' awareness of the benefits of quality seed and improved varieties aiming to increase productivity. In collaboration with project partners, small

quantities of source seed have been provided to large numbers of households, in conjunction with training on how to use, store and maintain seed at farm level. In the case of sweetpotato, this involved some novel technologies such as the preservation of roots in sand during the dry season. BPBL did also support the testing of advanced potato clones out of which two new varieties named Belete (2011) and Dagim (2013) have been released as new varieties. Belete has been distributed alongside the improved varieties Jalene and Gudene. Belete has a high yield potential and is extremely resistant to late blight which helps farmers to reduce the number of chemical sprays significantly without experience yield losses.

A seed distributed to direct beneficiaries was labeled with the crop variety information and contact details of the seed producer. Recipients were able to communicate further demand and thus trigger demand for quality seed and establish linkages between seed producers and potential customers from a large farming community across SNNPR and Tigray starting in2015.

BPBL provided direct access for farmers (= direct beneficiaries) to quality potato seed tubers and SP vines (cuttings) by employing an out-scaling assuming a documented farmer-to-farmer transfer mechanism over time (after each harvest), thus resulting in a high number of indirect beneficiaries having access to new varieties and better seed qualities. Based on prior survey findings, BPBL indirect beneficiary calculations used for potato seed sharing with at least three other farmers, and with at least two farmers in case of sweetpotato.

PHOTO CREDIT: BOA-AMHARA

Figure 14: Fields of direct beneficiaries of seed potato distribution about 65-75 days after planting in Amhara

When using farmer to farmer exchange calculation BPBL provided **high quality planting material of improved varieties to 548,602 (23% female) farming households**. Farmer-to-farmer seed exchanges are an important and in Ethiopia very common mechanism for the dissemination of farmer-preferred planting material. This mechanism will continue to function, irrespective of any direct project intervention. It is important, however, to make sure that seed producers are connected to providers of source seed (HARC-EIAR, ARARI, SARI, TARI, and Solagrow PLC) to ensure that old, degenerated seed stock can be replaced with clean material, and that old varieties are replaced with new germplasm with enhanced traits such as high yield, disease resistance, and nutritional and postharvest qualities.

3.2.2. INCREASED CAPACITY OF EXTENSION AGENTS AND FARMERS

BPBL also put significant effort in increasing farmers capacity in good agricultural pratices and farming methods. To initiate the large-scale training CIP and EIAR researchers developed training manuals for different audiences. Comprehensive ToT resource books for both crops, ToT Farmer Field School (FFS)-light inclusive of several training modules and pamphlets for farmers have been developed and translated into local languages (Amharic and Sidamia)

PHOTO CREDIT: FREZER A. CIP-ETHIOPIA

Figure 15: Training of Trainers (ToT) at EIAR Holeta-ARC

For the ToT, trainings inclusive of refresher sessions have been provided to staff of the extension service partners, including woreda and kebele agents and for development partner staff, for further cascading to rural HH and farmers (Figure 15). These ToT were conducted for both potato and sweetpotato, either as separate crop-related events or combined for both crops (P&SP).

These events were organized by the BoAs in all four regions, as well as by SARI, GRAD, GOAL, Vita,

PHOTO CREDITS: BOA AMHARA

Figure 16: Potato field training day in Dega Damot, Amhara.

ELE, and M4M. The trainings were given on crop-specific agricultural practices (on seed and ware production) as well as postharvest management, seed selection, pest and disease control, and QDS system-related aspects (Figure 16). Nutrition training was given in conjunction with agricultural oriented content.

Since project inception, **2,649 (43% female)** extension agents from BoA and development partners and **more than 42,000 (25%) farmers** have been trained on improved potato and sweetpotato crop husbandry and post-harvest technology.

3.2.3. IMPACT OF COMBINED EFFECT OF HIGH QUALITY SEED, IMPROVED VARIETIES AND BETTER AGRONOMIC PRACTICES

BPBL enhanced the capacity of the participant farmers through training on P&SP production and postharvest management. The project also supplied seeds, partially financed the construction of DLS, and created markets and market linkages between seed and ware potato producers as well as with ware markets. In all regions, the proportion of project participants who got training, inputs support, and

market linkage services were higher than for the non-participants. With respect to technical assistance received by HH members, the proportions of wives who received technical assistance are higher for participants (30% in SNNPR and 41% in Tigray) than non-participants (21% and 35%, respectively). This underscores BPBL's gender sensitive approach by including female farmers more strategically than is done in the public extension systems.

The impact of farmer capacity building, combined with the use of quality seed, became evident in the crop cut exercise conducted with 133 potato farmers' showing that **participating farmers** achieve average potato yields **of 22.2 t/ha**- while **average national yields** are around **8 t/ha**. In a survey conducted at the end of BPBL Phase II those results cloud be confirmed with significant increases in productivity for both crops. To show the economic feasibility of using improved potato varieties with their recommended practices over the farmer's local variety and local practice, participatory partial budget analysis was conducted in Ofla. The analysis was made by comparing the improved potato variety Belete with its recommended practices and the local variety with local practice. The analysis revealed that the use of improved potato variety with its packages resulted in the net benefit of 53,115 Birr/ha compared to the use of farmers variety and practice (10,882 Birr/ha). The Marginal Rate of Return (MRR) in the use of improved potato variety with its packages are 279%. This implies that every unit of investment in the use of improved potato varieties with its packages resulted in about 2.80 Birr/unit extra returns. Therefore, much effort is needed to promote the use of improved varieties with its cultural practices to tap these benefits.

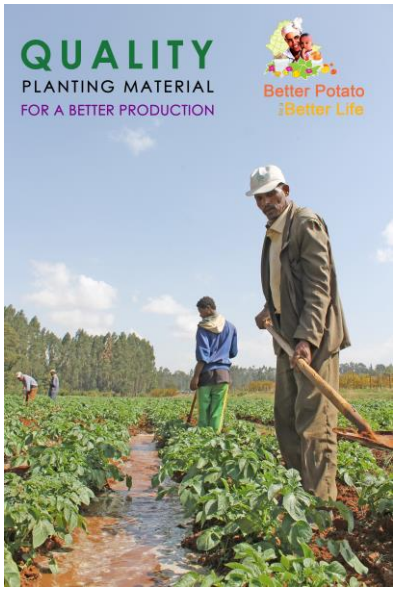

PHOTO CREDITS: CIP-ETHIOPIA ARCHIVE

Figure 17: Quality seed potato production using irrigation (top) Farmers harvesting sweetpotato (bottom) Sweetpotato production field

In a survey conducted in SNNPR and Tigray, sweetpotato and potato **productivity was about 42% and 81% higher with participants** (11.9 and 17.5t/ha) than with non-participants (8.3 and 9.7 t/ha), respectively. The improved soil fertility management and rotation also benefitted the crop followed by potato as seen in productivity of wheat (4.61 t/ha for participant vs. 2.90 t/ha for the non-participants). It became apparent that trained farmers also increased the area under P&SP in their respective farm as reasons it has been mentioned that the package provided made them confident to successfully grow the crops.

The higher yields for participants was also reflected in enhanced income levels. The proportions of farmers who sold P&SP were higher for participants (63% in SNNPR and 47% in Tigray) than the non-participants (27% in SNNPR). Participants also had a significant higher level of commercialization (+12% AND +7% for potato and sweetpotato, respectively) for both crops. **Participants almost doubled their total average**

annual revenue (Birr 10,651) compared to the participants (Birr 5,532) from the sale of potato. In the study areas, potato also became a major source of income following BPBL interventions.

In SNNPR and Tigray, participants perceived that food security has increased over the project period. According to key informants, in the project area all farmers produce potatoes at least for home consumption. Food consumption score also shows that the proportions of children under acceptable food consumption score were higher for participants (23% in SNNPR and 60% in Tigray) than for non-participants (16% in the SNNPR and 36% in Tigray), mainly due to better food supply from increased productivity and the introduction of OFSP varieties.

3.3. DEVELOPMENT OF VALUE CHAIN LINKAGES

3.3.1. ESTABLISHMENT OF POTATO BOARDS

The BPBL project started establishing seed systems for P&SP crops in SNNPR and Tigray from Phase I and in Phase III the effort extended to the Amhara and Oromia regions as well. The project helped strengthen the capacity of farmers in the selected woredas of the regions to produce improved varieties of quality seed potato for their own use and market. In addition to ensuring the availability of quality seed at HH level, the project supported those farmers for organizing as cooperatives to make the seed business sustainable. From Phase I to Phase III the project capacitated 320 seed potato-producing FGC in 37 woredas from four regions. Out of these 320, 97 are registered cooperatives, who work as quality seed source for their neighbors and distant woredas. The BPBL project's capacitation process enabled most of these FGCs to become registered. Lead members from all the intervention FGCs received business skills and management training and prepared their own business plan, which enables them to be organized as a business entity. To ensure sustainability of these FGCs for producing quality seeds, the project supported the development of potato boards, as part of the BoA work plans in SNNPR and Tigray. The major objectives of a "board" are to (1) look after and support the seed-producing cooperatives in extending their business; (2) coordinate different sectors (GOs and NGOs) in the woreda to support the cooperatives; and (3) work closely with concerned bodies in the woreda, zone, and region to create market linkages. Accordingly, a guideline was developed to help the participants understand the concept of the board and how it functions. The first board meeting was held on 29 November 2014 where the guideline was discussed, agreed and board members were nominated. The board members are FGC representatives, woreda administrators, agricultural office head, crop extension process owners and woreda focal persons. As of now, the project established potato boards consisting of 100 FGCs (3,490 HH members) in seven woredas (Cheha, Gumer, Geta, Mirab Azernet, Misha, Lemo, and Doyo Gena), in SNNPR. These boards are currently involved in the promotion of the available seed potato in different forums and strive to promote market linkages. Another aspect of their work is to take measures for ensuring access to lands for the woreda FGC (as especially reported for Cheha, Mirab Azernet, and Doyo Gena). By the end of the project (in 2016), the BoA and VITA are working together to establish zonal-level boards to better promote and pursue crosscutting issues and act in a more coordinated way. The partners are actively working to integrate the full roll-out of QDS system with these FGCs.

In Tigray, the process of establishing boards was initiated in 2014 but in early 2015, the BoA decided not to establish woreda-level boards and wanted to integrate potato topics into the work of the woreda and regional-level seed core teams. Furthermore, a union on seed multiplication has been established under the support of Agricultural Transformation Agency (ATA); therefore, it was decided to support the

registration of CIP-BPBL–supported FGC as members of the union. By the end of the project, 17 FGCs were capacitated who will be integrated to the union.

The idea of establishing potato board was initiated in Amhara (27 FGCs) and Oromia (11 FGCs) but CIP and its partners were not able to form the boards within the project period. The FGCs in these regions are not mature enough to form boards just in two years of intervention.

3.3.2. MARKET LINKAGES FOR SEED AND WARE POTATOES

By the end of Phase I (October 2009 – September 2013), it was observed that inspired by the success of the existing seed producer cooperatives farmers were organizing themselves in new seed producer cooperatives, thus overall seed production was increasing in the project woredas. Formation of new FGCs by farmers themselves was definitely a good success attributable to BPBL but new FGCs were increasing supply of seeds in the project areas. Observing this situation, in April 2013 a workshop was organized by BPBL in Tigray to ensure the establishment of sustainable and efficient ware and especially seed potato value chains. The workshop was attended by ware and seed potato FGC members, relevant government organizations (BoARD, TARI, TAMPA, SME, Seed Agency), donors/NGOs/UN body (FAO, IFAD, GIZ, ADCS, AGP, WVE) and various community based organizations. It was agreed that farmers would organize themselves in FGCs for smooth market linkages and BoA would facilitate the demand and supply flow between the farmers and buyers, including the institutional buyers. During Phase II (October 2013-December 2014), BPBL started advertising about the availability of quality seeds in national newspapers and on Solagrow PLC website. These efforts greatly linked the seed producing FGCs to the buyers outside of the project areas. The CIP-derived varieties released in Ethiopia and multiplied by the FGCs become popular quickly as these varieties need less fertilizers and agro-chemicals and multiplied through good agricultural practices. The market linkage effort further expanded during Phase III (January 2015-December 2016). In this phase, considerable work has been done in the project woredas in SNNPR and Tigray to enable farmers to produce high-quality seed potato of improved varieties. And the effort of market linkage was extended to Amhara and Oromia regions. The results from the started roll-out of QDS have shown the possibility of implementing the system at FGC level and created awareness among the concerned parties about the benefits of maintaining quality while producing seed potato. This will benefit the entire seed potato value chain up to knowledgeable seed buyers (i.e., traders and ware potato producers). In addition to strengthening links between seed and ware producers, BPBL worked to improve seed producers' access to essential agricultural inputs and financial service (especially the CARE/GRAD). The experience of QDS roll-out in potato suggests that QDS roll-out for SP will strengthen and benefit the link between vine multipliers and the quality root producers. Furthermore, to

PHOTO CREDIT: GRAD-REST

Figure 18: Promotion of potato and sweetpotato products with town consumers, Axum, Tigray.

strengthen the seed demand side, ware producers of P&SP were linked to traders and big consumers/ buyers (Figure 19) as well as to an improved agricultural input supply.

Figure 19: Teamti and Shewit coops together promoting their seed potato, Tigray.

In Phase III, BPBL partners GRAD (and its sub-grantees ORDA, CRS/MCS, ASE, REST), GOAL and BOA implemented different activities to promote P&SP value chain (Table 6) in four regions applying the business-to-business (B2B), multi-stakeholder platform/meeting, market linkage forum, market activation and creating access to credit facility methodologies. Implementation of these activities in Oromia and Amhara were delayed by the social turmoil: violent protests resulted in risks and traveling was hampered. In these two regions, these activities were implemented by the BoA once the situation improved (October to December, 2016). A total of 1,238 (19% female) seed potato FGC members, seed producing (P&SP) MFs, ware P&SP producers, traders, and woreda staff/experts participated in all these events (Table 6).

TABLE 6 POTATO VALUE CHAIN DEVELOPMENT ACTIVITIES IN PHASE III

Region	Type of participants	Male	Female	Total
Amhara	FGC members from the seven-potato project woredas, woreda experts/heads, cooperative organizers, other GOs & NGOs	300	16	316
Oromia	FGC members from the seven-potato project woredas, woreda experts/heads, cooperative organizers, other GOs & NGOs	30	30	60
SNNP	Model ware potato producer farmers, FGC members, traders, woreda agriculture representatives, Zone and woreda cooperative office representative, trader and two GOAL staff	518	161	679
Tigray	FGC members, MF and potential buyers	146	37	183
All Region	**All participants**	**994**	**244**	**1,238**

With all these efforts, farmer household reported that their income from sale of seeds has increased. The project FGC members could earn from seed sales USD 157/HH per season in 2016 and USD 168/HH per season in 2015; despite the serious drought in 2015. If quantified, the total sale (ware and seed) actual income would have been much higher. In case of SP revenue income for roots producers is not available. The vine multipliers (44 DVM) earned USD 179/HH per season. An impact assessment survey was planned to assess and document all the changes been achieved through this project but was not implemented finally. In Phase III, CIP started implementation relatively late and the late start was further affected by the adverse security situation. Thus, it was not possible to conduct the survey within the approved project life. Later, a time extension for conducting the survey was requested but was not approved by the donor.

3.3.3. LINKAGES WITH OTHER INTERVENTIONS/PROGRAMS

As part of establishing and strengthening the potato and sweetpotato value chain the project developed effective linkage with other interventions of CIP and different organizations. In Phase I, BPBL project collaborated with the CIP Project titled *Scaling out potato and sweetpotato-led interventions for improved food security and nutrition in Tigray and SNNPR, Ethiopia* (funded by Irish Aid) for creating demand of potato and sweetpotato and promoting consumption of these two crops. The project collaborated with FAO-led consortium entitled *Disaster Risk Management – Root and Tuber Crops Response for* linking BPBL supported FGCs and vine multipliers who sold a significant amount of seed potato and sweetpotato vines. That consortium distributed 60 million vine cuttings and 800 t seed potatoes in drought affected areas. The collaboration created a synergistic effect between emergency (the consortium) and development (BPBL) projects. The project also collaborated with the ATA and the International Fertilizer Development Cooperation (IFDC) for linking the potato seed producing FGCs to ware potato producers who were participating in different projects of these two organizations. The collaboration with FAO-led consortium, ATA and IFDC did not continued beyond the Phase I as interventions under those organization ended gradually. Therefore, in Phase III, BPBL project continued its collaboration with the Irish Aid funded CIP project for demand creation and consumption promotion of potato and sweetpotato. In addition, it partnered with the Farm Radio International, Ethiopia (FRI-E) for mass campaign of potato and OFSP demand creation in selected woredas under SNNPR and Tigray. FRI-E aired OFSP consumption promotion related message for ten weeks and use of quality seeds for six weeks. The campaign used participatory approaches by involving local farmers. A post intervention review documented that awareness and knowledge about planting and consumption of OFSP among farmers who were exposed to campaign increased comparing to those who were not. A similar result was documented on the use of quality seed potatoes.

In Phase III, much emphasis was given to consolidate the value chain activities already achieve in SNNPR and Tigray and expand project activities the new regions (Amhara and Oromia).

LESSONS LEARNED

- Partnership and collaboration with different organizations created positive demand for quality seed potato and sweetpotato and effectively linked the seed producers to ware producers. The collaboration helped the project achieve targeted beneficiaries.
- In Phase I, the project had ambitious targets with regard to the numbers of HH to be reached with quality planting material. Achievement of those targets was possible by collaborating with FAO and a FAO-led consortium of eight NGO partners who provided emergency seed aid to farmers in drought affected areas.
- Under this consortium, around 60 million vines and 800 t of seed potatoes were distributed to tens of thousands of households. This collaboration is an example for the creation of synergistic effects between emergency and development projects (BPBL).
- The emergency seed aid was utilized to make quality planting material of new varieties available to tens of thousands of farmers, improving the quality of the seed aid provided to drought affected farmers and allowing the BPBL project to significantly increase its outreach in terms of quality seed distribution.

- Establishment of FGCs proved very helpful for the smallholder farmers. They were linked to seed and ware markets for selling their produce. An organized FGC can ease the access to lands. However, it was observed that it needs time for FGC to mature and establish potato boards. The project started working in SNNPR and Tigray in 2010 and first board meeting was held in November 2014. Thus, establishing of Potato Board Amhara and Oromia was not achieved in two year.

OPPORTUNITIES AND NEXT STEPS

- By the end of the project there are several registered and well-capacitated FGCs are producing quality seed and planting materials.
- This is a strong likelihood for FGC sustainability for playing. a positive role in establishing a sustainable quality seed value chain. Further institutionalization of established FGCs, either as board or union, is necessary to link them with the bigger system.
- Linking to the board or union will be important for the FGCs to access required resources for their continuation. Also, full roll-out of the QDS system will help them labeling their seeds for earning better price. At the same time, any future effort should focus on both seed and ware value chain. It can also look for product diversification for both potato and sweetpotato.
- Any future project working on seed value chain should work for strengthening the business capacity of the FGCs and establish a strong market linkage for them. However, the project scope will not be limited only within seed market. It should work for both seed and ware marker as well as product diversification.

3.4. NUTRITION PROMOTION

3.4.1. INTRODUCTION AND DISSEMINATION OF OFSP TO COMBAT VITAMIN A DEFICIENCY

Vitamin A deficiency (VAD) is a major problem in Ethiopia. Reduction of vitamin A and micronutrient deficiencies among rural populations are the major entry points for the promotion of OFSP. However, in many regions of Ethiopia, OFSP is an entirely new crop. Moreover, as in SNNPR, white-fleshed sweetpotato (WFSP) varieties were commonly grown and consumed. Nutrition promotion and education activities are thus of major importance for the adoption of potato, OSFP varieties, and other nutritious crops. The project started implementing different nutrition promotion activities from Phase I in collaboration with CIP's *Scaling out sweetpotato and potato-led interventions to improve nutrition and food security in Tigray and SNNPR, Ethiopia* Project (funded by Irish Aid) and other two NGO partners (M4M & ELE). However, in Phase III the nutrition promotion effort was strengthened to address nutritional problem in the country. The Ethiopian Population and Health Institute (EPHI) 2013 survey found that consumption of vitamin A-rich foods among women and children is very low, with 41 percent to 96 percent of women (19-45 years) having inadequate vitamin A intake in SNNPR and Tigray respectively and only 3 percent of infants (under 2 years) receiving diets in line with IYCF guidelines[1]. At the same

[1] EPHI, 2013 Ethiopian National Food Consumption Survey, Addis Ababa, Ethiopia

time, access to vitamin A supplementation among children remains a concern at only 44 percent[2]. Country wide and particularly in rural areas, commonly consumed cereal staples lack adequate amounts of vitamin A, while vitamin A-rich animal source foods are costly and unaffordable to the poor. As a result, VAD remains high. Based on strong scientific evidence on the efficacy of OFSP for reducing VAD, BPBL sought to position OFSP as a mainstream tool for reducing VAD and as an entry point for increasing nutrition awareness with the goals to improve diet diversity and diet quality. In Phase I, the main focus was on establishing or strengthening seed systems for potato and sweetpotato (OFSP) production. From 2015, however, a new nutrition emphasis was added that supported SBCC to increase consumption of OFSP and other nutrient dense crops among the targeted populations. This decision was based on the evidence that integrating nutrition interventions will create demand for OFSP and other nutritious crops, and increase the likelihood, spread, and depth of adoption of these crops[3]. Using experiences and materials from OFSP programs in other African countries, BPBL designed and implemented nutrition promotion and education activities, including training in different nutrition topics, education sessions, cooking demonstrations for OFSP and other nutritious crops, recipe promotion, public awareness creation on food preparation, handling and food safety, public campaigns to promote the nutritional benefits of OFSP, and workshops for agricultural and health sector extension agents. The project reached 316,702 (62% female) participants in 261 kebeles from four regions in Phase I - Phase III with these nutrition activities (Table 7).

TABLE 7 NUTRITION PROMOTION AND EDUCATION/ TRAINING ACTIVITIES FROM PHASE I TO PHASE III

Region	Type of Activity	# Participants			# of distinct Kebele
		Male	Female	Total	
Amhara	Nutrition education/training, cooking demonstration and recipe competition, mass mobilization, and OFSP promotion	10,156	13,198	23,354	23
Oromia	Nutrition education/training, cooking demonstration and recipe competition, mass mobilization, and OFSP promotion	20,810	28,062	48,872	42
SNNPR	Sensitization/awareness creation workshop, nutrition education/training, cooking demonstration and recipe competition, mass mobilization, and OFSP promotion	53,183	77,132	130,315	146
Tigray	Nutrition education/training, cooking demonstrations, and recipe competition	33,932	80,229	114,161	50
Grand total		**118,081**	**198,621**	**316,702**	**261**

[2] Ibid.

[3] Low J., M. Arimond, N. Osman, B. Cunguara, B. Zano and D. Tschirley, "A Food-Based Approach Introducing Orange-Fleshed Sweet Potatoes Increased Vitamin A Intake and Serum Retinol Concentrations in Young Children in Rural Mozambique," *The Journal of Nutrition*, Vol. 137, No. 5, 2007, pp. 1320-1327.

3.4.2. SPECIFIC NUTRITION ACTIVITIES IN THE PROJECT REGIONS WERE AS FOLLOWS:

In Amhara, GRAD (ORDA partner), M4M and Vita implemented nutrition education, nutrition training, cooking demonstration and mass awareness events. These events were attended by DAs, HEWs, farmers, women (pregnant and lactating), children, youths, teachers and students. A total of 23,354 (56% female) people from 23 kebeles participated.

In Oromia, BoA, ELE, and GRAD (CRS/MCS partner) implemented nutrition education and training activities including cooking demonstrations. Cooking demonstrations try to promote local recipes integrating OFSP and other nutritious crops. These training and cooking demonstration sessions were conducted for community men and women, farmers, school teachers and students, CFs, model HHs, and extension workers. A total of 48,872 (57% female) participants from 42 kebeles were reached.

In SNNPR, ELE, GOAL, VITA and GRAD (CARE & ASE partner) implemented nutrition training, OFSP nutrition education, cooking demonstrations, and mass mobilization and promotion sessions. These sessions were conducted for community men and women, teachers and students in schools, woreda key decision makers, Women Development Army, Health Extension Workers (HEWs) and Kebele Development Agents (DAs), MFs, and women with children under 5 years. Overall, 130,315 (59% female) people from 136 kebeles participated in these events.

In Tigray, M4M and GRAD (REST partner) held cooking demonstration events for farmers, pregnant and lactating mothers, and adolescent girls for promoting the production and consumption of OFSP and other nutrient dense crops in 40 kebeles. A total of 114,161 (70% female) participants attended these events.

Participation in Amhara was somewhat lower than in the other regions, and this can be attributed to two factors. First, the initial awareness creation activities in Amhara were not well coordinated among the implementing partners, though this was strengthened in 2016. Secondly, the deteriorating security situation in Amhara in 2015 and 2016 affected BPBL operations and mobility of extension staff and thus reduced the number and size of nutrition events.

3.4.3. HOME GARDENS AND SCHOOL GARDENS

The BPBL Project introduced home and school garden activities to strengthen the nutrition promotion effort by having demonstration sites in strategic locations and by easing the access to OFSP for women and children. In total, participating households established 1,486 home gardens in 2015-2016 that included OFSP and other nutritious crops. These gardens served the dual purpose of providing households with nutritious vegetables and serving as demonstration gardens for neighboring households. Monitoring visits suggested that these gardens encourage other community members to establish their own gardens. The school gardens are an innovative approach to include food production and nutrition in the school curriculum and to encourage students and teachers to establish gardens of nutritious vegetables in their respective households. School gardens place the child in the center of household and community behavior change, where children learn about gardening and nutrition at school and shared the knowledge with their parents at home. However, some BPBL school gardens were affected by drought and inadequate planning and establishment. Some gardens were established during school vacation and there was nobody present to take care of these gardens during the important initial establishment. Better planning, as part of overall school management, is necessary for successful implementation of school gardens.

LESSONS LEARNED

- The nutrition awareness and education events were successful in attracting a large number of participants and disseminating a wide range of nutrition related messages. A large portion of the participants (62% or 316,702 individuals) were female.
- However, a limitation was the lack of systematic follow-up visits to participating households to better understand how these households, women and men, were applying OFSP and other nutrition related messages in their daily lives. While such household visits can involve large numbers of extension workers and can be expensive, evidence from CIP's agriculture-nutrition projects in other countries indicates that they are decisive for sustained adoption of OFSP and of improved nutrition practices.
- Cost-effective strategies involving the establishment of community-based nutrition clubs and combining household visits with community-level events should be considered.
- School gardens can be of great strategic value as a platform for nutrition education in school, variety demonstration and nursery gardens, and community sensitization. However, they require strong commitment from school administration, teachers, and the community to maintain them throughout the year. Planning and management of school gardens need to cover the vacation periods as well, and probably require caretakers from the community to volunteer during these times.

OPPORTUNITIES AND NEXT STEPS

- Promoting OFSP and potato for healthier diets continues to offer great opportunities to contribute to better nutrition in Ethiopia. BPBL demonstrated that nutrition messages find receptive audiences and when combined with access to planting material of nutritious crop varieties, a virtuous cycle of demand and supply of nutritious food can be initiated.
- In order to, scale up this experience, support is required to strengthen the integration of nutrition messages and food demonstrations into the mainstream extension work by the BoH and the training of nutrition extension staff. Innovative approaches to cost-effective community-level and household-level follow up visits are available from other countries and can be rolled out in Ethiopia, in partnership with BoH and other government agencies. Aligning and synchronizing extension service delivery by BoA and BoH in support of nutrition can be a major step forward in enabling the access of rural household to both agricultural technologies and nutrition and health knowledge and skills. Through existing stakeholder platforms at local and region level, practical options – including experiences from this Project – can be presented and recommendations for institutionalization can be advocated.
- Additional opportunities exist in promoting production and consumption of OFSP, vegetables, and other nutritious foods together, so that broader nutrition needs can be addressed efficiently and seasonal gaps can be bridged more easily. This approach requires an expansion of the current Project design and collaboration with additional technical partners, but the returns in terms of nutrition benefits would be justify this enlargement.
- In order to, have greater impacts on young child nutrition, collaboration with rural health services, in particular pre-natal and mother-child services, can be intensified. Current knowledge

of the interdependencies between child and maternal health and nutrition and access to institutional and economic resources suggests that a more broadly integrated approach, linking rural health infrastructure to education facilities and agricultural markets, will result in better nutrition outcomes[4]. The BPBL has established several collaborations that can be joined up to support such a holistic agriculture-nutrition-health approach.

3.5. CAPACITY STRENGTHENING AND ADVOCACY

3.5.1. INSTITUTIONAL CAPACITY STRENGTHENING

Capacity strengthening is an essential element in development. The capacity strengthening effort prepares relevant actors for carrying out job smoothly and accomplish the agreed-upon objectives. The BPBL project continued its efforts of capacity strengthening in all through its phases for accomplish its objectives. Right at the beginning, the project established strategic partnership with national research institutes, BoAs, NGOs (both national and international) as per these organizations' expertise required for accomplishing different objectives. Specific capacity strengthening effort is discussed below.

CAPACITY STRENGTHENING OF RESEARCH INSTITUTES (ARARI, EIAR, SARI & TARI)

The partner research institutes (ARARI, EIAR, SARI & TARI) in the project regions received on-the-job training for quality planting material multiplication in TC labs, special screenhouses and net tunnels. In addition to the training these research institutes received in kind contribution worth of **USD 76,915** in laboratory and research station consumables and **USD 197,709** in laboratory and research station equipment for ensuring smooth multiplication of quality planting materials, varietal improvements and release in the country. The research partners also received thousands of square meters of insect-proofed nets for constructing net tunnels and screen houses.

CAPACITY STRENGTHENING OF EXTENSION PARTNERS (BOAS & NGOS) THROUGH TRAINING OF TRAINERS (TOT)

A good number of ToT, either as new training or fresher have been provided to different staff members of the extension service partners, including woreda and kebele agents, for further cascading the knowledge down to farmers and rural households. These ToTs were conducted for both potato and sweetpotato, either as separate crop-related events or combined for both crops (P&SP). The participants were DAs, Community Facilitators (CFs), HEWs, regional, zonal and woreda agriculture officers, MFs, women development workers, kebele cooperative experts, seed multiplier (PLC) management, school nutrition team leaders and Regulatory and Input Supply agents. The trainings were given on crop-specific good agricultural practices (on seed and ware production) as well as postharvest

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[4] Hirvonen, Kalle; Hoddinott, John F.; Minten, Bart; and Stifel, David. Children's diets, nutrition knowledge, and access to markets. *World Development*. Article in press. First published online March 18, 2017. http://dx.doi.org/10.1016/j.worlddev.2017.02.031
Phuong H Nguyen, Kuntal K Saha, Disha Ali, Purnima Menon. 2014. Maternal mental health is associated with child undernutrition and illness in Bangladesh, Vietnam and Ethiopia. *Public Health Nutrition*. Volume 17, Issue 6, June 2014, pp. 1318-1327. DOI: https://doi.org/10.1017/S1368980013001043

management, seed selection, pest and disease control, and QDS system-related aspects. Nutrition training was given in conjunction with agricultural oriented content. From beginning to the end the project trained 2,649 (43% female) participants through ToT events (Table 8).

TABLE 8 TOT ON POTATO AND SWEETPOTATO GOOD AGRICULTURAL PRACTICE FROM OCTOBER 2009 TO DECEMBER 2016

BPBL Phases	Male	Female	Total
Phase I (October 2009-September 2013)	269	42	311
Phase II (October 2013 – December 2014)	82	20	102
Phase III (January 2015-December 2016)	1,154	1,082	2,236
All Phases	**1,505**	**1,144**	**2,649**

CAPACITY STRENGTHENING OF FGCS THROUGH TRAINING ON GOOD AGRICULTURAL PRACTICES (GAP), BUSINESS SKILL DEVELOPMENT AND AWARENESS CREATION EVENTS

As part of institutional capacity strengthening, BPBL actively worked with 320 FGCs in all three phases; many of these FGCs overlapped through phases. BPBL worked with 225 FGCs in Phase I, 110 FGCs in Phase II and 155 FGCs in Phase III (Table 9).

TABLE 9 REGION-WISE NUMBER OF FGCS BPBL PROJECT CAPACITATED FROM PHASE I TO PHASE III

Region	# members			Actual Num. FGCs[1]	Phase I	Phase II	Phase III
	Male	Female	Total				
Amhara	1,583	267	1,850	27	-	-	27
Oromia	212	33	245	11	-	-	11
SNNPR	5,105	1,992	7,097	254	213	104	100
Tigray	894	190	1,084	28	12	6	17
Total	**7,794**	**2,482**	**10,276**	**320**	**225**	**110**	**155**

[1] *Actual number of FGCs that the project worked with was 320, but many of them overlapped through phases in SNNP and Tigray regions*

Between October 2009 and December 2016, a high number of training events on potato and sweetpotato good agricultural practices (GAP) were conducted for FGC lead members and some MFs (trained and promoted in Phase III) who were involved in seed and ware potato production, and sweetpotato DVMs for roots production. These training events were organized by the extension partners (i.e., the BoAs, GRAD, GOAL, and Vita) in Amhara, Oromia, SNNP, and Tigray regions. These training events were the cascading down of ToT attended by project partner staff. A wide range of topics such as QDS, P & SP good agronomic practices, land preparation, fertilizer management, postharvest management, pest and disease control, selection of healthy seeds, Triple S demonstration for preservation of SP planting material, home gardening and nutritional benefits of OFSP and value addition are covered in these training events. Furthermore, training was accompanied by the productivity enhancing provision of simple technologies, e.g. the access to water was improved by the installation and training in the use of Rope and Washer pumps. The GRAD partner provided 23 Rope and Washer pumps to potato and sweetpotato producing farmers. Rope and Washer pumps were introduced in BPBL kebeles in 2016 after experiencing the serious drought in 2015. It was noticed that introduction of these pumps helped households maintain their home gardens in dry season. Provision of irrigation facility or linkage building with small scale irrigation projects should be considered in future

project design. A total of 42,070 (25% female) farmers were trained in the life of the project (Table 10). Female farmers' participation in these training events was above 21% in all phases. Our record on FGC enrollment and its membership data shows that 99% of these participants were from female headed households.

TABLE 10 CAPACITY STRENGTHENING TRAINING ON GOOD AGRICULTURAL PRACTICE FOR SEED AND WARE PRODUCERS P/SP

BPBL Phases	Male	Female	Total
Phase I (October 2009-September 2013)	8,703	2,406	11,109
Phase II (October 2013 – December 2014)	1,330	511	1,841
Phase III (January 2015-December 2016)	21,548	7,572	29,120
All Phases	**31,581**	**10,489**	**42,070**

CAPACITY STRENGTHENING TRAINING FOR BUSINESS SKILL DEVELOPMENT

From Phase II, the project started arranging business skills development training for the seed potato FGC members, DAs, woreda experts, woreda cooperative officers, zonal agriculture experts and zonal cooperative experts. Those trainings were conducted by the NGO partners Vita, GRAD (CARE, partners ORDA & REST) and BoAs of Amhara, Oromia, SNNPR, and Tigray in four regions A total of 4,028 (15% female) participants comprising of extension agent staff, FGC lead members and MFs attended these training (Table 11).

TABLE 11 CAPACITY STRENGTHENING TRAINING FOR BUSINESS SKILL DEVELOPMENT

BPBL Phases	Male	Female	Total
Phase II (October 2013 – December 2014)	1,105	149	1,254
Phase III (January 2015-December 2016)	2,293	481	2,774
All Phases	**3,398**	**630**	**4,028**

The objectives of these training events were to:

- Make participants aware of different tools and approaches of establishing and operating successful groups/cooperatives;
- Link the groups/cooperatives with concerned line agencies for future follow-up and backstopping;
- Enable participants to identify the problems and gaps of their respective groups/cooperatives and come up with recommendations for improvements;
- Enable participants to brand their seed potato; and
- Enable participants to develop an action plan for 2016 of their respective organizations for the implementation of the proposed recommendations.

To achieve these objectives, the trainings/workshops were facilitated following a very participatory approach and covered the following topics:

- The importance of group/cooperative formation
- Formation of functional groups and salient features
- Basic skills required for agro-enterprise development
- Business concept and its distinct features
- Cooperative as an enterprise
- General rules for success as business

Basic skills required to engage successfully with markets, which are the following: group organization and management, internal saving and lending, basic marketing skills, innovation and experimentation, and sustainable production and natural resource management skills.

These topics were covered during the trainings/workshops through several group discussions, which were guided by following key points:

- Examine the actual situation of your cooperative in view of the context of the basic components of the training and identify the prevailing problems and gaps therein.
- Discuss the possible ways of addressing the problems and gaps and propose the recommendations for improvement.
- Design detail activities for the realization of the recommendations.
- Develop an action plan for the implementation of the activities designed.
- Identify the actors for the implementation of the activities and indicate their respective roles.
- Stipulate the results expected from implementation of the action plan.

The concerned project partners followed up on the action plans elaborated by several FGC and ensured backstopping and strengthening of business skills to the farmer beneficiaries.

- Develop an action plan for the implementation of the activities designed.
- Identify the actors for the implementation of the activities and indicate their respective roles.
- Stipulate the results expected from implementation of the action plan.

CAPACITY STRENGTHENING THROUGH DIFFERENT AWARENESS RAISING EVENTS

The farmers and relevant staff from extension partners also participated in different promotional and awareness creation events (e.g., field days, field visits, experience sharing, exhibition, etc.). These events were organized in all four regions by the extension service partners (BoAs, GRAD, M4M and Vita) during the life of the project. These events were related to potato, sweetpotato and P&SP. These events covered quite a wide range of topics, such as, raising awareness of farmers on quality seed potato production, performance of improved potato varieties in improved storage, postharvest technology/construction and management of DLS, sensitization on BW and improved field sanitation, visit to TC lab (in Mekele) to see TC based seed multiplication, vegetative growth and yield performance of improved OFSP varieties, OFSP agronomic practice and consumption benefits, OFSP roots production and vine conservation, decentralized vine multiplication and market linkage creation. Overall, in three phases, a total of 7,486 (25% female) participants attended these events in four regions. The highest number of participants, 5,201 (24.57% female) are from Phase III; and this is possible as in this phase the project worked in 234 kebeles under 53 woredas. The project worked very intensively in Phase III as it had to consolidate the previous achievement in SNNPR and Tigray and extend and establish the potato and sweetpotato seed value chain in Amhara and Oromia.

3.5.2. POLICY DIALOGUE FOR IMPROVING FOOD AND NUTRITION SECURITY WITH POTATO AND SWEETPOTATO

Potato and sweetpotato are among the most important root and tuber crops in Ethiopia with a high potential to contribute to the Government's Growth and Transformation plan (GTP) through improving food and nutrition security and increasing household income. Research to generate technologies, multiplication of improved technologies including GAP to make them available to users, networking of partners engaged in potato and sweetpotato, and creating an enabling environment are the key factors to increase the contributions of potatoes and sweetpotato. CIP through the BPBL Project contributed to these key factors in many ways. Here, however, CIP's contribution to enhance seed quality and strengthen networking among partners through support to policy dialogue is presented.

1. Seed quality. Poor quality seed of potato and sweetpotato is one of the most important causes of low yield. To improve seed quality and increase productivity, the BPBL project implemented a QDS system, making Ethiopia one of the very few pioneer countries in Africa to use QDS (details are given elsewhere in this report). Quality declared seed has been piloted in some seed producer cooperatives formed by the BPBL project and the government ratified QDS in the seed law. This created an enabling environment for smallholder potato and sweetpotato farmers to access good quality seed at lower prices close to where they live. This has improved yield and quality and reduced transportation costs. It will have more profound impacts going forward.

2. Strengthen networking of partners. There are several governmental, non-governmental and private sector partners that work towards maximizing the benefits of potatoes and sweetpotatoes to smallholder farmers, traders and both rural and urban consumers. However, since they work independently, the impact has been much below potential. CIP through the BPBL Project and key partners collaborated in creating two platforms that engage policymakers in a dialogue to create an enabling environment.

    2.1 Root and Tuber Crops Working Group. CIP partnered with the EIAR, the Ministry of Agriculture and Natural Resources (MoANR), FAO and the USAID-funded Agricultural Knowledge, Learning Documentation and Policy (AKLDP) project to form a Roots and Tuber Crops Working Group (RTCWG) at a workshop held in 2015. The main purpose of the RTCWG was "to bring together lead agriculture sector policymakers, researchers, project implementers, extension workers, traders and agro-processors to share emerging best practices that will support Increased production and productivity of roots and tubers" (RTCWG, 2015). The objectives of the workshop included: (1) Mapping stakeholders engaged in roots and tubers, (2) Developing mechanisms that would lead to better coordination of interventions in research and development, and (3) Evaluating the need for a national strategy for roots and tubers development, and (4) Proposing a fundraising plan for promotion of root and tuber crops (RTCs). Workshop participants through two working groups recommended: (1) Forming a RTC platform to influence the government to have RTC on top of its agenda, bringing partners together and improving its coordination, (2) developing a National RTC strategic plan and propose a mechanism for fundraising, (3) strengthening the QDS system to produce quality planting material and (4) creating a strong data management culture which will support documentation of reliable statistics to influence government's priority setting and sharing of research results and GAP to avoid duplication of efforts. Such a coordinated approach will help support future longer-term investment in the

sub-sector. A concept note was also developed to implement the recommendations of the workshop to be financed by AKLDP in the first six months and thereafter by other donors. However, because of unfavorable prevailing situations in the country then, all this was not put into practice. Nonetheless, the initiative laid a good foundation that can be re-initiated whenever funds and situations permit.

2.2 Potato Coalition. To ensure a vibrant and equitable potato value chain in Ethiopia, it was deemed necessary to bring together different national and international organizations (governmental and non-governmental, research and CGIAR partners) including policymakers to forge synergies in the potato pre-production to consumption continuum organized under the Umbrella of the Ethiopian Potato Coalition. The Coalition was launched in December 2016 by the Irish Ambassador to Ethiopia and received strong support from the Irish Government through an NGO called Vita and from other member organizations.

The current members of the coalition include: MoANR, EIAR, ARARIs of Amhara, Oromia, SNNPR and Tigray regions, Vita, CIP, World Vision, AgroBIG, SNV, CARE, Concern WW, iDE, Gorta Self Help Africa, and Solagrow. The coalition has met a few times since its launch to discuss consolidating gains from individual actors and players in the industry. To work more effectively and freely, and make the Coalition more coherent, obtaining a legal status was found useful. The first attempt to register under Charities or Societies as per Ethiopian Charities and Societies Agency's Rules and Regulations was unsuccessful on grounds that the members represent various organizations each with distinct mandates. The Coalition then resolved to enhance its dialogue with policymakers to get support and liaise with similar organizations, for example, the National Potato Council of Kenya (NPCK) to get useful lessons from their experiences in legalizing their respective organizations. CIP took this responsibility and got useful tips from NPCK which will be discussed at the Coalition's next meeting.

3.5.3. CONTRIBUTING TO POSITION POTATO AND SWEETPOTATO: SUPPORT OF THE AFRICAN POTATO ASSOCIATION CONFERENCE

The African Potato Association (APA) Conference is a triennial meeting organized by the APA, a nonprofit organization formed in 1983. APA's core objective is to promote the production and use of P&SP in Africa. Currently, most APA members are scientists and practitioners drawn from 20 African countries. Every three years, the APA holds a scientific meeting to review progress in P&SP research in Africa. The meeting provides an opportunity for scientists to present their research and interact with other P&SP stakeholders through exhibitions, presentations, and formal or informal discussions.

Until 2013, nine triennial conferences were organized. The tenth triennial conference was held in Ethiopia at the ECA Conference Center in October 2016. A field trip was planned as part of the conference but, the security situation prevailing during that time forced the conference management to cancel the field trip thus shortening the conference.

The objectives of the conference were to:

- Create an opportunity for scientists to review advances in P&SP research in Africa.
- Strengthen links between research and development practitioners, investors, and representatives of input and output markets.

- Encourage public-private partnerships to increase investment and development in P&SP sectors, from lab to farm to fork.

The overall theme of the conference was "Potato and Sweetpotato for Health and Wealth." Within this theme, four subthemes were selected for oral and poster presentations and one subtheme for exchanges between private investors and stakeholders from industry.

The five subthemes were as follows:

1. P&SP breeding, germplasm exchange, and trade in a changing policy environment
2. Effective pathways to improve nutrition, health, and technology adoption
3. Advances in seed and cropping systems
4. Climate change adaptation and mitigation: risk and opportunities for P&SP
5. Opportunities and bottlenecks for private sector investments.

The BPBL project actively supported the APA conference by directly participating in the steering committee, making financial contribution, ensuring partner staff members' participation in the conference and supporting the APA operations manager based at EIAR.

The APA website was launched at www.africanpotoassociation.org. Financial support was received from Haramaya and Jimma Universities, the Syngenta Foundation, CIP's different projects and programs (BPBL, Sweetpotato Action for Security and Health in Africa (SASHA)) and the CGIAR Research Program on Roots, Tubers and Bananas (RTB). The Ethiopian Airlines as the official carrier provided 10% discount on every economy ticket. EIAR helped to organize the media work through connecting APA to the relevant media in the country.

The conference was opened with a welcome remark and conference overview by Dr. Endale Gebre, the APA 2016 President. HE Wondirad Mandefro, the State Minister, Ministry of Agriculture and Natural Resources officially opened the APA 2016 Conference. Dr. Barbara Wells, Director General of CIP, Dr. Oscar Ortiz, Deputy Director General of CIP and Dr. Fentahum Mengistu, Director General of EIAR were also present in the opening session.

The conference was attended by 299 (23% female) participants from 19 African countries and 13 non-African countries. There were 262 participants from African countries (highest 113 from Ethiopia, of which 26 were from BPBL partners) and 37 participants were from non-African countries. Out of these total participants, 154 from research institutions, 31 from universities, 31 from development agencies, 57 from government institutions and 28 from private sector.

On the third day, the African Potato Association Council Triennial Business Meeting was held with the main objective of selecting the host country and the new African Potato Association Council. In the meeting, Rwanda was nominated unanimously to host the 11th APA Triennial Conference. Participants evaluation of the conference came out favorably. Ninety-four percent of participates rated the conference venue as very good to excellent, more than 75% rated the conference materials were very good to excellent, more than 70% rated food and accommodation as very good to excellent. One improvement was suggested for the arrangement of parallel sessions.

4. MONITORING AND EVALUATION FOR RESULTS

The BPBL Project developed M&E Plans duly articulating its development Objectives (relevant for Phase I & II) and Intermediate Results (relevant for Phase III) from the beginning to track progress on activities and measure outputs and outcome/results that would occur as result of project implementation. The project carried out following monitoring and evaluation activities:

4.1 PROGRESS/OUTPUT MONITORING

Evidence has shown that many development projects end up without accomplishing the intended results, and analyses suggested that little impact was generated as planned activities were not implemented as agreed. Determining whether activities have been delivered to the required specification and targeted beneficiaries is important. Therefore, the BPBL Project developed a system of conducting Review and Planning workshops in participation with all partners. Right at the beginning of each implementation year the Project conducted regional and national workshops to review implementation challenges project faced, make recommendations for overcoming those challenges and develop workplan and budget for new implementation plan. These workshops worked as a platform to align partners workplan with the overall project objectives and to establish respective targets, as well as to assure coherence with the intervention logic of Outputs and resulting Outcomes. Once, the workplan and budget were developed the project established sub-grant agreements with partners and started implementation. As the implementation began the partners report using a uniform template (in Excel) which was developed as per the intervention logic and result framework of the project. During implementation partners provided training, technical backstopping to the FGCs, DVMs and other relevant farmer households and documented outcome level data regularly and reported to CIP on a six-month basis. The most important outcome level data reaching the agreed households in Phase I and Phase III is provided in Table 12.

TABLE 12 OUTPUT LEVEL ACHIEVEMENT ON KEY INDICATORS

Phase	Indicator	Target	Achieved
Phase I	# of producers producing OFSPs (including direct & farmer to farmer distribution)	150,000	214,650
	# of producers producing improved late blight-resistant potato varieties (including direct & farmer to farmer distribution)	100,000	132,290
Phase III	# households with increased access to quality seed of potato or sweetpotato (including direct & farmer to farmer distribution)	140,000	201,662
Both Phase	**ALL INDICATORS**	**390,000**	**548,602**

In addition, the project reached 316,702 participants through nutrition promotion activities and 1,486 HHs through home gardens.

4.2 OUTCOME/RESULT ASSESSMENT SURVEY

Outcome/Result encompasses a wider band of changes that may be translated as intermediate results (or in generic term effect and impact). Outcome/result are referred to changes in human behavior, improvements in systems and conditions (example, access to improved technology, better agricultural practices, quality seeds production, consumption practice, diet diversity, etc.) those occur from the use of goods and services provided by a project. Outcome/result provides beneficiaries an avenue to sustainably improve their well-being (i.e. leading to project impacts). In case of BPBL, these changes are: adoption of improved technology, use of quality planting materials, increase in yields, increase in sale volume, consumption of nutrient rich crops (potato, OFSP & vegetables), dietary diversity, etc. These intermediate results may lead to higher level results (in generic term impact) such as changes in income and/or nutritional status. These results ultimately complement to the assessment of a project's objective and impacts.

By the end of Phase II, BPBL conducted an outcome/result assessment survey (Performance Evaluation 2014) covering five years of implementation (Phase I & II) and documented encouraging results. The survey was conducted among 1,308 HH of which 219 were from Tigray and 1,089 from SNNPR. Out of the total households surveyed, 70% were project participants and 30% were non-project participant (control). The results of that study showed that there were increases in the production and productivity of P&SP because of BPBL. In SNNPR and Tigray, the proportion of farmers who grew P&SP were higher and statistically significant for project participants than the non-participants. During the Belg season, project participants allotted higher proportion of their land (64% in SNNPR and 26% in Tigray) for potato production. In SNNPR, the average area allotted for potato production during the Belg season by the project participants (0.31 ha) was higher and significantly different from the area allotted for potato production by the non-participants (0.20 ha). In the SNNPR, the area allotted for sweetpotato production was higher for participants (0.20 ha) than for non-participants (0.14 ha). Sweetpotato productivity was higher for participants (11.87 t/ha) than for non-participants (8.33 t/ha). In SNNPR, productivity of potato for participants (17.54 t/ha) was higher and significantly different from the productivity registered by the non-participants (9.7 t/ha).

In both regions, the area allotted for P&SP had been increasing during the project implementation period. In Tigray, the non-participants did not grow P&SP and thus there is no reference to comparison production and productivity level of P&SP of the participant farmers. The results from the key informant interviews support the results of quantitative analysis. According to key informants, after the dissemination of potato technologies to project participants, productivity of agricultural land has increased in both Belg and Meher seasons. In Belg season, area of land planted to potato has increased. Before the introduction of improved potato technologies by the BPBL project, only smaller portion of land was cultivated to potato and other crops during the Belg season. Before intervention, the productivity of potato was very low in the Belg because of the predominant use of local potato varieties and poor management practices. After BPBL, the productivity of potato has increased because of the use of improved varieties and improved potato field and storage management. In Meher season, productivity of land has also increased because of the increase in the fertility level of the land planted with potato in the previous season. According to the key informants, the increase in the productivity level of the land is mainly due to residue of fertilizer applied to potato in the preceding season. For instance, according to

the key informants, in crop rotation, wheat gives higher yield when planted on a plot previously planted with potato. Quantitative analysis also supports this claim of increase in the productivity of wheat (4.61 t/ha for participant and 2.90 t/ha for the non-participants in the SNNPR). Moreover, potato utilizes land and labor in the Belg season that would have been ideal for most of the crops are grown in the Meher season.

The BPBL Project enhanced the capacity of the participant farmers through training on P&SP production and postharvest management. The Project supplied seeds, partially financed the construction of DLS, and created markets and market linkages for the seed potatoes produced by participants. In both regions, the proportion of project participants who got training, inputs support, and market linkage services were higher than for the non-participants. With respect to technical assistance received by HH members, the proportions of wives who received technical assistance are higher for participants (30% in SNNPR and 41% in Tigray) than non-participants (21% and 35%, respectively). This shows that BPBL involved more female farmers in the course of its implementation.

The BPBL Project has helped to enhance the income level of project participants. The proportions of farmers who sold P&SP were higher for participants (63% in SNNPR and 47% in Tigray) than the non-participants (27% in SNNPR). Participants and non-participants also differed in the level of commercialization of P&SP. In SNNPR, in Belg season, participants commercialized 46% of potato and 25% of sweetpotato production, whereas the non-participants commercialized 34% of potato and 18% of sweetpotato. The BPBL Project has also brought change in the amount of products utilized for different purposes. In SNNPR, mean quantity of crops sold, used as seed, consumed, and used for other purposes during Meher 2013/14 and Belg 2014 were higher for participants than for non-participants. In Belg season, the amount of P&SP sold and consumed by the participants were higher and significantly different from the non-participants. Participants generated higher total average annual revenue (Birr 10,651 in SNNPR and Birr 9,984 in Tigray) than the non-participants (Birr 5,532 in SNNPR) from the sale of potato. In the study areas, potato was a major source of income. According to the key informants, before BPBL, they would borrow money from money lenders. However, after they started to participate in BPBL Project, they began to earn enough amount of money and did not need to visit money lenders.

The BPBL Project also improved the level of food security and dietary diversity of the participants. In both regions, the percentage of children from 6 to 59 months who consumed different food groups (grains, roots and tubers, legumes and nuts, dairy products, fish, poultry and liver/organ meats, eggs, vitamin A-rich fruits and vegetables, other fruits and vegetables) at least once per day was higher for participants (90% in SNNPR and 100% in Tigray) than for non-participants (87% in SNNPR and 96% in Tigray). Food consumption scores also shows that the proportions of children under acceptable food consumption score were higher for participants (23% in SNNPR and 60% in Tigray) than for non-participants (16% in the SNNPR and 36% in Tigray). The proportions of children meeting the minimum dietary index were higher for participants (56% in SNNPR and 87% in Tigray) than for non-participants (52% in SNNPR and 43% for Tigray). Considering the whole family member of the HH, proportions of HH meeting the minimum dietary index were higher for participants (64% in SNNPR and 76% in Tigray) than for non-participants (46% in SNNPR and 37% in Tigray). In SNNPR and Tigray, participants perceived that food security has increased over the project period. According to key informants, in the BPBL Project area, all farmers produce potatoes at least for home consumption.

Key informants also claim improvement in the HH health status after the introduction of potato technologies by BPBL; similar results were also obtained from health officers working in the districts of Gumer and Geta. According to the health offices, after the intervention of the BPBL Project, the number of clients visiting health centers decreased.

Key informants also claim improvement in school attendance by children after the BPBL Project. Before BPBL, only a few children (from relatively wealthy families) were attending school. After the introduction of BPBL, most of the farmers could send children to school because they had more food and cash.

A similar survey was planned to be conducted after the Phase III but was not possible because project activity started late in 2016 and then implementation flow was interrupted by social unstable security situation. Later, a time extension was requested for conducting the survey but was not approved by the donor. But, significant achievement was made in the output and some outcome level indicators in relation to the project impact pathway which is presented in Annex A (Phase III).

5. LESSONS LEARNED, OPPORTUNITIES AND NEXT STEPS

This section presents a documentation of the lessons project has learned and outlines the opportunities and next steps that can be taken in future efforts.

5.1 PARTNERSHIP APPROACH

LESSONS LEARNED: The BPBL Project was implemented through a partnership approach involving with 18 government, NGO and private sector partners. This approach required significant resources for consultation, joint planning and technical/financial backstopping and initially delayed project implementation. Individual work plans and budgets were prepared during annual review and planning meetings held at regional level in Amhara, Oromia, SNNPR and at a national level. These intensive consultation and planning processes were time and resource (human, financial) intensive, and sometimes delayed project implementation. However, those workshops enabled partners to jointly plan and fine-tune their work plans, reduce duplication and increase overall project efficiency and effectiveness. Most importantly, the approach was instrumental in instilling a sense of ownership of project activities in partner institutions and their staff thereby increasing chances that BPBL activities will be continued by partners after the end of the project.

OPPORTUNITIES AND NEXT STEPS: Through participating in capacity strengthening training, review and planning workshops and technical backstopping, implementing partners' capacity has been strengthened. The project has invested in the national research institutes' (ARARI, EIAR, SARI & TARI) laboratory capacity strengthening and as a result of the investment they are now ready for producing millions of minitubers and In-vitro plantlet. This is a very big opportunity for strengthening the national seed system. A future project on potato and sweetpotato focusing seed value chain strengthening may take advantage of these partners.

5.2 DECENTRALIZED SEED SYSTEM DEVELOPMENT

LESSONS LEARNED: The BPBL Project developed the decentralized multiplication approach for establishing and strengthening the seed system by engaging the FGCs and private multipliers. This approach of decentralized multiplication proved effective but it required substantial amount of follow up, technical back stopping, capacity strengthening training and financial resources at all stages in the seed multiplication chain. Early generation seed production requires careful management and adequate technologies. It has, for instance, become evident that the rapid multiplication technology with aeroponics, though it has the highest multiplication rate potential, is not suitable for situations with irregular power supply and with high staff turnover or limited commitment. It also remains questionable if agricultural research centers are employing the correct business model to become independent from third party support. The solution would be more engagement of private companies in the sector which is currently still minimal. However, calculation reveals a clear business case but seed production requires

sound skills and knowledge, access to suitable land and therefore can be a risky investment. The need to decentralize multiplication of seed generations following basic seed stages can be considered as a must due to the high cost of transportation and/or the perishability of the planting material. Therefore, the BPBL project worked with 320 FGCs and few private multipliers to concentrate its focus on the multipliers so that they can be sustainable for the long-term. However, highly decentralized seed production systems, whereby a large number of FGCs or MFs multiply disease-free source seed obtained from public or private producers of potato minitubers or sweetpotato foundation material, are of critical importance to give a large number of farmers' sustainable access to quality seed at affordable prices to sustainably improve productivity at national scale. FGC's capacity of producing quality seeds, knowledge of business management, access to adequate storage facility, strong linkage with markets and proper implementation of QDS are necessary for their sustainability

OPPORTUNITIES AND NEXT STEPS: To achieve significant potato yield gains at national level it is estimated that the use of high quality seed should be at least at about 10-20% (replacement after 5-10 seasons), depending on the respective disease pressures. Given that 254,000 ha are grown during Meher and Belg planting seasons, about 50,000 – 100,000 t of quality seed would be needed. Even though BPBL increased the supply of quality seed the current capacity still is only 40 and 20% of the respective 10 and 20% seed supply target. Hence, the capacity for quality seed production still needs to be enhanced along the production chain, such as, research institutes, private enterprises and FGCs. The research Institutes and private enterprises will multiply early generation seeds who then will supply to FGCs for rapid multiplication and quality seed production. For a successful seed value chain in which QDS producers are enabled to become successful, a formal control system must ensure that early generation seed (or starter seed for QDS multipliers) is free of major seed borne diseases. This could be guaranteed by the establishment of an independent authority responsible and capable to implement seed certification for basic seed. For sweetpotato it is more difficult to estimate the real demand of planting material, but it is expected that the demand is far from being satisfied. Moreover, the seed producers do have a critical role in generating access to new resilient and nutritious varieties to smallholders. Because of this, it is important that the QDS quality control system is systematically included in the decentralized seed production system to prevent further spread of devastating diseases of major importance. Uncontrolled distribution of planting material of unknown quality led to spread of diseases into many regions as documented for BW and viruses

5.3 IMPROVED LOCALLY ADAPTED SEED QUALITY CONTROL WITH QUALITY DECLARED SEED (QDS)

LESSONS LEARNED: To produce quality seeds locally by decentralized multipliers, quality control and traceability are important. Most of the project supported FGCs have initiated internal inspection of their fields in cooperation with the BoAs. However, to ensure full certification and labeling, the seeds needs external certification. The present requirement of a minimum of 2 ha of adjacent land for seed producers to have to undergo the external inspections is currently difficult to implement, and will most likely require a transition period for producers to adjust. On the other hand, the requirement is considered functional in the sense of reducing inspection costs and of being coherent to a meaningful pest and disease containment strategy requiring the practice of a crop rotation system (e.g., control of BW in seed potato).

OPPORTUNITIES AND NEXT STEPS: Following the ratification of the QDS standard by the Ethiopian Government, the roll out has been initiated. However, it will need to be supported for an

additional three to five-years by providing facilitation, management support, institutional capacity building and promotional activities to become fully implemented and a routine operation in Ethiopia.

5.4 DEVELOPMENT OF VALUE CHAIN LINKAGES

LESSONS LEARNED: Establishment of FGCs proved very helpful for the smallholder farmers. They were linked to seed and ware markets for selling their produce. An organized FGC can ease the access to lands. However, it was observed that it needs time for FGC to mature and establish potato boards. The BPBL Project started working in SNNPR and Tigray in late-2009 and first board meeting was held in November 2014 which suggests consolidation of FGCs into boards needs capacity strengthening and consultation with different actors (e.g. BoA, FGC, and other market actors). In Amhara and Oromia, FGC formation and capacity strengthening started in Phase III (January 2015 – December 2016). Yet, within a two-year timeframe it was not possible for them to organize as a board or union.

OPPORTUNITIES AND NEXT STEPS: Much work remains to keep the FGC sustainable and play a positive role in establishing a sustainable quality seed value chain. Further institutionalization of established FGCs, either as board or union, is necessary to link them with the bigger system. Thus, they will be able to access required resources for their continuation. Full roll-out of the QDS system will help them label their seeds and earn a better price. At the same time, any future effort should focus on both seed and ware value chain and look for product diversification for both potato and sweetpotato.

Any future project working on seed value chain should work for strengthening the business capacity of the FGCs and establish a strong market linkage for them. However, the project scope should not be limited only within seed market. It should work for both seed and ware marker as well as product diversification.

5.5 EXTENT BACTERIAL WILTAFFECTING ETHIOPIA'S POTATO INDUSTRY

LESSONS LEARNED: Bacterial Wilt (BW), caused by Ralstonia solanacearum (Rs) a soil- and seed-borne pathogen, is one of the most significant limitations to the production of clean seed potato and hence its containment of major importance for disease free production. A BW study conducted by BPBL and research partners in 2015 and 2016 in major potato growing regions suggests that the disease is spreading faster. The disease is spreading to the highland areas, too, which are ideal for seed potato production. It may be speculated that the situation may get worse with rising temperature. Therefore, the project proposed that the containment strategy with multi-level advocacy is highly necessary.

OPPORTUNITIES AND NEXT STEPS: Evidence indicates an urgent need for policy makers to address BW issue, which is expanding in worrying ways. In the absence of a formal seed certification scheme and lack of regional quarantine measures, BW is becoming a very serious concern threatening the rapidly expanding potato industry as well as the food security of the growing population. A multi-pronged approach to Bacterial Wilt management will be required to combat the spread of BW; if no action is taken, further growth of the potato sector in Ethiopia will be constrained.

5.6 SOCIAL BEHAVIOR CHANGE COMMUNICATION

LESSONS LEARNED: The nutrition awareness and education events were successful in attracting a large number of participants and disseminating a wide range of nutrition related messages. A large

portion of the participants (62% or 316,702 individuals) were female. However, a limitation of the BPBL Project was the lack of systematic follow-up visits to participating households to better understand how these households, women and men, were applying OFSP and other nutrition related messages in their daily lives. While such household visits can involve large numbers of extension workers and can be expensive, evidence from CIP's agriculture-nutrition projects in other countries indicates that they are decisive for sustained adoption of OFSP and of improved nutrition practices. Cost-effective strategies involving the establishment of community-based nutrition clubs and combining households visits with community-level events should be considered.

School gardens can be of great strategic value as a platform for nutrition education in school, variety demonstration and nursery gardens, and community sensitization. However, they require strong commitment from school administration, teachers, and the community to maintain them throughout the year. Planning and management of school gardens need to cover the vacation periods as well, and will require caretakers from the community to volunteer during these times.

OPPORTUNITIES AND NEXT STEPS: Promoting OFSP and potato for healthier diets continues to offer great opportunities to contribute to better nutrition in Ethiopia. The BPBL Project demonstrated that nutrition messages find receptive audiences and when combined with access to planting material of nutritious crop varieties, a virtuous cycle of demand and supply of nutritious food can be initiated.

In order to scale up this experience, support is required to strengthen the integration of nutrition messages and food demonstrations into the mainstream extension work by the BoH and the training of nutrition extension staff. Innovative approaches to cost-effective community-level and household-level follow up visits are available from other countries and can be rolled out in Ethiopia, in partnership with BoH and other government agencies. Aligning and synchronizing extension service delivery by BoA and BoH in support of nutrition can be a major step forward in enabling the access of rural household to both agricultural technologies and nutrition and health knowledge and skills. Through existing stakeholder platforms at local and region level, practical options – including experiences from this Project – can be presented and recommendations for institutionalization can be advocated.

Additional opportunities exist in promoting production and consumption of OFSP, vegetables, and other nutritious foods together, so that broader nutrition needs can be addressed efficiently and seasonal gaps can be bridged more easily. This approach requires an expansion of the current BPBL Project design and collaboration with additional technical partners, but the returns in terms of nutrition benefits would be justify this enlargement.

In order to have greater impacts on the nutrition of young children, collaboration with rural health services, in particular prenatal and mother-child services, can be intensified. Current knowledge of the interdependencies between child and maternal health and nutrition and access to institutional and economic resources suggests that a more broadly integrated approach, linking rural health infrastructure to education facilities and agricultural markets, will result in better nutrition outcomes. The BPBL Project has established several collaborations that can be joined to support such a holistic agriculture-nutrition-health approach.

5.7 REPORTING

LESSONS LEARNED: Timely reporting to the Donor has been a challenge for BPBL. In the early phases, preparation of regular financial reports was a big challenge. Partners were always delaying financial reporting. The research partners also tend to be slow on spending. To improve the situation, BPBL arranged financial training for partners' accountants. Later in Phase III, when the project size increased significantly, BPBL hired a Partnership Accountant. The Accountant started routine monitoring and follow-up on partner spending and provided on the job training and close support to the partners' accountants. Thus, financial reporting improved. However, in Phase III, timely preparation and submission of technical reports became a challenge for the partners. Often they were late, even delayed by 2 months, in submitting technical report. Delayed submission caused serious problem for CIP which resulted in late submission of technical reports in last two years of the project.

OPPORTUNITIES AND NEXT STEPS: From the lessons learned it can be said that in future efforts CIP should focus more on M&E capacity strengthening for timely and quality technical reporting.

ANNEX A: OVERALL OUTPUT COMPLETION

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
Objective 1: Establish and strengthen potato and sweetpotato value chains				
1.1.1 Early generation seed multiplication facilities established and upgraded in Amhara and Oromia	Quantity of disease-free foundation material produced annually	300,000 minitubers of seed potato & 20,000 SP Pre-basic cuttings annually by 2016	Level reached of total minituber production (ARARI + EIAR/HARC): 156,488. SP pre-basic cuttings (ARARI): 186,644	156,488 /300,00MT =52% (P) 186,644 /20,000vines =>1000% (SP)
1.1.2 Capacity of existing public and private sector foundation seed producers in SNNPR and Tigray strengthened	Quantity of foundation P and OFSP seeds produced annually	25,000 minitubers of seed potato and 5000 SP Foundation cuttings annually by 2016	Level reached of total minituber production (TARI): 21,500. SP pre-basic cuttings (SARI, TARI): 808,752	21,500 /25,000MT =86% (P) 808,752 /5,000vines =>1000% (SP)
1.1.3 Advise and technical backstopping on tissue culture operations and rapid multiplication techniques provided	Number of backstopping visits per year	At least 2 backstopping visits per year	Regular visits of CIP biotech expert to ARARI and EIAR/HARC laboratories and sites, shared planning and follow up to purchases	100%
1.1.4 NARS trained in disease diagnostics and seed quality control	Number of trainings held	2 trainings	Selected NARS staff (ARARI, EIAR/HARC, TARI) trained 'on the job' for and during BW survey in 3 regions; but no formal training courses	75%
	Number of quality control schemes piloted	1 quality control schemes piloted in SNNPR (Chencha)	In collaboration with Arba Minch Plant Health Clinic and Arba Minch Research Center monitoring and assessment done in Chencha, Dita and Bonke Woredas (VITA); furthermore, all FGC at community level which are participating in the roll-out of the QDS system undergo the internal and then external seed quality control (inspections)	>100%
1.1.5 Bacterial Wiltmonitored in major seed producing areas and strategy for reducing the disease developed	Number of areas in which the disease is monitored;	5 Selected kebeles in Chencha	BW infestation surveyed by visual field inspection and laboratory analysis, for 4 project regions, in 84 FGC (CIP&ARCs); separate activity of disease monitoring by VITA in Chencha, Dita, Bonke Woredas	>100%

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
	Whether a strategy for control of the disease is in place	Draft Strategy developed by 2016	Draft Strategy developed and endorsed by Ministry of Agriculture and research partners	100%
1.1.6 Implementation of informal seed inspection system (QDPM) is expanded	Number of regions in which QDPM concept is rolled out	QDPM rolled out in regions	Formalized (ratified by Government of Ethiopia) QDS system is being rolled out for potato in all 4 project regions and in 3 regions for sweetpotato (not in Oromia, for severe security issue); total of 33 FGC participated in P-QDS during Belg 2016, 23 (of which 7 are not project FGC) during Meher 2016. 21 vine multipliers participated in SP-QDS.	7 /8 =88%
	Quantity of P seeds and SP vines produced under the QDPM scheme	2,000 tonnes of P seeds and 2 million SP cuttings produced annually	16,487q of P-QDS seed (inspected) produced in Belg 2016, 221q in Meher 2016 (ongoing inspections).122.43m partial QDS vines (field inspected and accepted, but without post-harvest inspection);2.98m fully inspected (incl. PHI);	1,649+0.2 /2,000t =82% (P) 2.98 /2m =149% (full QDS SP), plus 122.43m partial QDS vines
1.2.1 Decentralised seed multipliers established for P and SP in Amhara and Oromia regions	Number of FGCs engaged in P seed and OFSP vine multiplication established in Amhara & Oromia regions	40FGCs and 30 private producers	15 FGC (P) newly established in Amhara, 8 in Oromia; but total of 27 (Amhara) and 11 (Oromia) attended (strengthened) by the project (see inventory); 21 DVM established (11 Amhara, 10 Oromia), of which 2 FTC and 19 private, which are producing or keeping vines in nursery (continuing multiplying in 2017)	38 /40 =95% (P) 19 /30 =63% (SP)
1.2.2 Existing seed production schemes in Tigray and SNNPR supported and strengthened	Number of FGCs and private seed producers supported in multiplying planting material in Tigray and SNNPR	80 FGCs and 60 private producers	A total of 117 FGC in SNNPR (100) and Tigray (17) supported over the years (inventory); 97 DVM (SP) established, of which 1 FTC, and supported, but only in SNNPR; no DVM establishment possible in Tigray due to adverse water access conditions (but centralized PQM and SQM/ TQM production by PLCs and NGO, 4 producers); total number of private SP multipliers attended: 101 (SNNPR) + 4 (Tigray) =105	117 /80 =146% (P) 105 /60 =175% (SP)
1.2.3 ToTs and model farmers trained in on-farm seed maintenance	Number of TOTs and model farmers trained (% of women)	100 ToTs, 2500 farmers trained	193 ToTs; 5402 farmers incl. DVM and nursery site managers; given as refreshment training to trainees of 2015 and new trainees, taking account of new kebeles	193 /100 =193% (ToT) 5402 /2500 =216% (farmers)
1.2.4 Pro-poor clean seed of disease resistant potato varieties promoted and diffused in small units	Number of households reached through out-scaling and farmer to farmer seed exchange	140,000 HHs	**Potato:** in 2015 in Belg and Meher a total of 9,176 HH were reached by seed distributions, in all 4 regions; in 2016 for both seasons in 4 regions a total of 3,791 HH were reached (total of 12,967 direct beneficiaries); **Sweetpotato:** in 2015 a total of 8,636 HH in the 4 regions	201,662 /140,000 = 144%

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
			were reached by vine distributions to root producers, mainly for Meher planting; in 2016 a total of 10,066 HH were reached in the 4 regions (total of 18,702 direct beneficiaries); furthermore, there were organized (reported) redistributions, thus organized farmer-to-farmer transfers of 2015 harvest for 2015/16 planting with irrigation, to 19,004 HH (indirect beneficiaries in Amhara and SNNPR); and again 2,681 HH in SNNPR for 2016/17 planting with irrigation; Simulations of farmer-to-farmer transfers, that is taking into consideration direct and indirect beneficiaries (see Section 11 of this report) result in a total estimation of 201,662 HH which have received access to quality seed for ware production; furthermore, all project FGC member households can be considered as having improved access to quality seed for their own ware potato production	
1.3.1 ToTs, farmers and input suppliers trained on sweetpotato/potato agronomy, value addition and storage	Number of ToTs, farmers and input suppliers trained (% of women)	100ToTs, 5,000 farmers (20% women)	434 ToTs and 9,445 farmers; given as refreshment training to trainees of 2015 and new trainees, taking account of new kebeles; overall percentage of female participation in ToT: 46%	434 /100 =434% (ToT) 9,445 /5000 =189% (farmers)
1.3.2 New technologies, including water conservation and small scale irrigation for OFSP/potato introduced to farmers	Number of households using new technologies for P and OFSP kitchen garden production	100 HH	37 (2015) + 23 (2016) Rope and Washer pumps installed; 15 springs developed (irrigation groups), incl. low capacity motor pumps; estimated >900 HH benefitted	900 /100HH =900%
1.3.3 User-friendly decision support tools for improved late blight management calibrated and tested in the field	Availability of a tested and farmer-accepted tool for late blight management	Tested and farmer-accepted tool piloted	The hand-held decision support tool has been tested during Meher season on a total of six sites in three regions (Amhara. SNNPR, Tigray) with the respective ARC partners. Comparison done against alternative LB management methods. Data collection and statistical analysis have been done. Discussion of results and conclusion-drawing, as well as piloting with farmers to be done	50%

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
1.3.4 Action research on adoption of new technologies and extension approaches conducted	Number of scientific and technical reports on adoption of new technologies and extension approached produced and published	2	TARI conducted field experiments for analysis of biofortified potato clones; data was internally (CIP) processed for the breeding program and will be made available for release committee decisions; formal reporting and publishing to be done;	10%
1.4.1 In collaboration with GRAD, value chains for seed/ware P and SP established in each region	Number of market linkage events conducted	5	In 2015, 20 linkage events held, in 2016, 11 linkage events (includes 1.4.4)	31 /15events =206%
	Number of P and SP growing households linked to the value chains (% of women)	2,000 (20% women) HH increase income from P/SP	6,060 member HH of the attended 155 FGC (P) improved income opportunities (revenues from seed production or from increased ware potato production for home consumption or market); of which 22% (1346) female headed households; 99 project FGC and 30 individual MF were reported to have been active in 2016 in seed potato market sales, with 4,105 members, having an average per HH revenue income of 157 USD from seed sales [similar in comparison to 2015 (168 USD) but only for 3,089 FGC members], which gives an idea of the size of presently achieved max. income increases from seed business for at least around thousand HH (4,105-3,089). Detailed empirical evidence is missing since a final survey for impact assessment (e.g. on gross and net income and respective changes) has not been donor approved. As well, the project had 12,967 direct beneficiary HH of seed distribution for ware production, but for lack of survey implementation unfortunately there is no evidence of income changes (against control) from increased P sales. For SP growing households, e.g. root producers which were direct beneficiaries (18,702) of vines distributions by the project, and established private DVMs (96) there is as well lack of detailed empirical evidence on income changes, for the lack of survey results. Revenue income for 44 DVM reached a total of 179 USD/HH () which can give an idea of max. possible absolute net income changes.	>100%
	Number of P and SP growing households with increased annual income from P and SP sales	2,000 (30% women)		

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
1.4.2 Potato and sweetpotato marketing systems improved	Number of P and OFSP producing woredas or zones with improved P and SP marketing system	Action plans for improved marketing in 4 zones implemented, increasing P/SP income of 6,000 HH	See as well 1.4.3 on the topic of Potato Boards at woreda and zonal level in SNNPR. It can be assumed that those project FGC in SNNPR (100 with 3,490 member HH) are attended by the Boards and their interests are taken care of, thus income opportunities are maintained; but, explicit action plans at zonal level were not documented/ reported.	0%
1.4.3 FGCs capacitated with business and cooperative management skills	Number of FGCs trained	10 FGCs developbusiness plans, 15 groups linked to other support services, 4 potato associations established	Training in business skills, cooperative and financial management has been given in two rounds in 4 regions, partially as a refresher in 2016: in 2015 to 53 FGC (not in Oromia) and in 2016 to 70 FGC (all 4 regions); all those FGC prepared their business plans; in 2015 the project accompanied the development of woreda level Potato Boards in 7 project woredas of SNNPR, where numerous FGC (88) are active; in Gamo Gofa Zone (SNNPR) the project supported the zonal Potato Board; among other functions, those boards are supporting the FGC in their access to complementary services; in Tigray the plan to establish Boards was discarded, instead the integration of potato issues into the work of the woreda and regional seed-core teams was promoted as well as the membership of the FGC in a newly created Union on seed multiplication. Associations were not considered as a relevant institutional innovation.	> 100%
1.4.4 Events aimed at linking seed producers to input (source seed, fertiliser, plant protection) and output markets conducted	Number of linkage events conducted	10	see 1.4.1	see 1.4.1
	Number of FGCs linked to input and output markets (P or OFSP producing farmers)	10	Number of FGC successfully linked to sales market, according to sales information for 2016. 99 plus 30 Model Farmers	>100%
1.4.5 Promotional activities to raise awareness on benefits of using quality seed and merits of P and SP conducted	Number of promotional events for QDPM conducted	8 events in 4 regions	14 field days in 2015, 25 field days in P&SP in 2016	39 /32events =122%

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
1.4.6 Appropriate low cost storage facilities for seed and ware tubers/roots promoted	Number of promotional activities/demonstration DLS established in each region	4	41 FGC level DLS, 130 HH-level DLS (for ware producers) and 2 model stores for ware potato constructed in 2015; in 2016, 13 FGC level DLS and 118 HH-level DLS constructed (project supported); more DLS were constructed on own HH initiative; Triple-S method for sweetpotato was tested in 2016 on 16 sites (SNNPR and Tigray) with around 900 farmers (841 in SNNPR on 14 project sites)	> 100%
	Number of HHs with improved food security & income through use of store	500 HH	All project FGC presently participating in the P-QDS inspections (49) (+ 7 in Oromia which are not considered project FGC) are fulfilling the requirement of having a common DLS, and thus having better revenue income from better sales of quality seed (estimated 1911 members, avg.39/FGC); furthermore, a total of 310 HH-level DLS were constructed during 2015-16 (partially project supported). Around 900 participants of Triple-S application are having the opportunity to preserve their seed (cuttings from newly sprouting roots) over the seasons and thus can continue root and vine production/sales.	1911+900 /500HH =562%
Objective 2: Increase production and consumption of potato, sweetpotato in conjunction with other nutritious food items				
2.1.1 Events to raise awareness among government actors on the potential for biofortified potato and OFSP in addressing food security and nutrition conducted	Number of events/workshops conducted with BoH and BOA officials to raise awareness of nutrition benefits of OFSP and potato in the regions	2 per region	2 workshops and regular training of Woreda Advisory Committees in 2015 in Tigray and Amhara; 5 workshops with woreda level officials (Amhara, Tigray, SNNPR)	7 /8 =88%
	In the regions OFSP and high Zn/Fe potato recognised by BoH for nutritional qualities	Feedback from regional R&D system and interest in pursuing varietal release	BoH in the regions is outscaling the contents of BPBL nutrition - ToT to non-project kebeles, based on action plans developed during trainings; but emphasis is on OFSP since biofortified potato is not available yet. Breeding activities (incl. trials) for development of Zn/Fe potato are underway in cooperation with the ARC partners	50%

TABLE 13 END OF BPBL PROJECT (2015-16 EXTENSION PERIOD) OUTPUTS AND COMPLETION

Impact pathway/ intervention logic	Indicator	Target	Report end of project (Dec. 2016)	Overall completion
Outputs:				
2.1.2 Farmer and consumer preferences for OFSP and Fe/Zn potato varieties documented	Number of research reports produced documenting farmer/consumer preferences for OFSP and potato	At least 1 scientific/technical publication	Research partner in charge of that activity (SARI) according to agreed workplan, lacked capacity to implement; furthermore, BPBL close-out survey activity, which would have included assessment of farmer/consumer nutritional preferences, was not approved by the donor	0%
2.1.3 ToTs and farmers trained in cultivation of OFSP, potato and other nutritious crops for household consumption	Number of ToTs and farmers trained	100 ToT, 2000 farmers	239 ToTs and 3055 farmers trained in 2016, as a refresher of 2015 (177 ToTs; 2,269 farmers), and additionally reflecting additional kebeles	239 /100 =239% (ToT) 3055 /2000 =153% (farmer)
2.1.4 Training and mass communication materials for OFSP and biofortified potato introduction and promotion developed	Number of FFS-lite and radio spots for OFSP promotion conducted	FFS-lite and radio spots produced	A total of 100 spots were broadcasted during three months, in all 4 regions	100%
2.2.1 Consumption of OFSP, potato and other nutritious crops promoted through gender sensitive integrated nutrition education approach	Number of people reached through a gender-sensitive integrated nutrition education approach	36,000 people (6,000HH)	Estimated 93,565 people reached in 2015 (incl. urban promotions); in 2016 during 295 cooking demo events estimated 37,686 people reached (no urban promotion), in 'old' (2015) and 'new' kebeles	> 100%
2.2.2 Household garden schemes promoted to increase consumption of nutritious food	Number of households cultivating OFSP and/or other nutritious crops in kitchen gardens	1,000 HH	858 HH established household garden plots in 2015; 624 HH in 2016; but empirical evidence is missing (lack of survey) on continued adoption of those 2015 HH.	858+624 /1000HH <=148%
2.2.3 Information on gender differentiated knowledge attitudes and practices, dietary diversity and food frequency for target populations collected to inform BCC activities	Number of publications/research reports documenting consumption data for 2 regions	At least 1 publication	see 2.1.2	0%
2.2.4 Integrated nutrition promotion approach up- scaled through collaboration with ENGINE, CIP´s Nutrition project and BoH	Number of people consuming OFSP and other nutritious food	15,000 people(2,500 HH)	No specific activity was defined and no monitoring outside project kebeles. Throughout the project the nutrition promotion/education component included capacity strengthening (ToT) of BoH staff which facilitated cascading of training to non-project kebeles via action plans drafted as part of the ToT	N/A

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