

Progress Report – Project Funding

Center

Name (long)	International Potato Center
Abbreviation (short)	CIP

Project

Project Title	Seeds of Change: Enhancing Potato Innovation Systems for Scaling Climate-Smart Technologies for Smallholders in Ethiopia
Project Coordinator	Rogers Kakuhenzire
Contract Number	81235249
Project Number	18.7860.2-001.00
Countries	Ethiopia
R4D Phase	-

Reporting Period

From	01/01/2020
To	31/12/2020

Contract Duration

from	10/05/2019
to	09/05/2022

State of Project Implementation

This report builds on achievements of 2019. Activities were initiated at the end of the inception phase in December, where intervention districts had been identified and project implementation structures set for field activities. Outlined here by outputs (OP) is the state of project execution in 2020.

OP1 aims to improve the supply of a broad range of climate-smart, robust, and disease-resistant varieties. Two participatory variety selection (PVS) trials with 17 multi-trait clones were conducted at Holetta Research Center (HRC) and Adet Research Center with two evaluations per site. Five candidate varieties were presented for release: 396034.103, 392657.171, 396034.268, 391058.175 ('Burka'), and 395017.242 ('Feysa'). The clone traits sought include late blight (LB) and virus resistance, processing quality, wide adaptation, heat and drought tolerance, high yield, and user acceptability.

OP2 aims to improve the efficiency of early generation seed (EGS) potato production. To strengthen EGS production, partner tissue culture (TC) labs were supported, and they produced 22,037 plantlets of varieties 'Gudene', 'Belete', 'Dagem', and 'Jalene' and 3,000 plantlets of 'Burka' and 'Feysa' in OP1. In July 162 plantlets of 'Gudene' and 'Belete' were delivered to SolarGrow PLC, which produced >6,000 rooted apical cuttings (RACs) by September. Akabit Farmer Seed Group Coop received 3,000 G1 minitubers for EGS production in a net house. More EGS bulking began with 21 trained decentralized seed multipliers (DSMs). Meanwhile, 2,700 TC plantlets were imported from CIP–Nairobi as 18,000 minitubers are being bulked for delivery in 2021. In 2020, 384,900 minitubers were locally produced for seed bulking in 2021.

OP3 aims to improve capacity of farmer seed group cooperatives (FSGCs) in high-quality seed production. In the three project regions, 45 master trainers and 115 development agents (DAs) were trained in potato bacterial wilt (BW) control and other potato production technologies. In seed quality assurance, 63 quality declared seed (QDS) inspectors were trained. Forty FSGCs with 2,256 members (14.7% women) were trained and supported to produce QDS. Farmers involved in QDS production received part of either 100,442 G2 or 9.8 tons of G3 seed and together planted ~6 ha. Four virus and six BW enzyme-linked immunosorbent assay (ELISA) kits were imported for seed health testing.

OP4 focuses on taking to scale validated technologies to increase potato productivity. The project executed activities in 40 wards from 13 districts, training 45 master trainers (6.7% women), 115 DAs (22.5% women), and 18,092 farmers (5,967 [33%] women). One assessment for master trainers and three for DAs were conducted to determine effectiveness of training.

OP5 deals with integrating gender-sensitive methods for access to technology and knowledge in project intervention activities, including monitoring, evaluation, and learning (MEL). Monitoring of project targets reveals a fair participation of women and youth in implemented activities. In PVS at least 40% of participants were women. In training of trainers, 22.5% were women and 98.2% were youth. Among 2,644 members of FSGCs, 14.7% were women; 33.3% of 21 individual DSMs were women; and 36.1% of 18,092 of the trained farmers were women. A baseline survey was conducted; a report is being written.

OP6 seeks to strengthen potato innovation systems and partnerships. One workshop for potato

value chain actors (VCAs) attended by 32 delegates from public and private sectors and FSGCs was held under the auspices of the Irish Potato Coalition in Ethiopia. An annual national potato research and development (R&D) review conference was held with 25 researchers. A project review and planning workshop was held with 23 implementers, and a study tour was organized to train NARS scientists in RACs. Two PhD students working on LB and BW management graduated and provided tools for the control of the two diseases.

General Achievements and Problems encountered

Achievements

1. Four varieties - 'Gudene', 'Belete', 'Dagem', and 'Jalene' - have been cleaned of viruses and are being increased for TC plantlet and minituber production.
2. Two clones were released: CIP391058.175 with superior processing qualities and CIP395017.242, higher in zinc and iron than in any existing potato varieties in Ethiopia.
3. Achieved >90% increase in minituber production, from 200,000 to 384,900 units, between 2019 and 2020.
4. Mobilized, trained, and engaged 40 FSGCs (2,644 members, 14.7% women) in QDS production and BW containment and delivered 101,000 minitubers for community seed bulking.
5. Introduced RACs for rapid seed multiplication at SolarGrow PLC, HRC, and Adet Research Center.
6. Recruited 14 men and seven women to start model seed potato production businesses.
7. Trained 45 master trainers and 115 DAs (98.2% were youth) for capacity strengthening and technology scaling with emphasis on BW containment.
8. Trained 56 men and nine women as QDS inspectors to build seed potato quality assurance capacity.
9. Delivered four virus and six BW ELISA kits to strengthen seed potato health testing.
10. Trained 18,092 farmers (33% women) in improved potato production.
11. Conducted a workshop for potato VCAs to address seed potato scarcity under the auspices of Irish Potato Coalition with public and private sector actors, NGOs, and farmer representatives.
12. Two PhD students at Wageningen University developing tools for potato LB and BW management graduated.
13. The project team held an annual review and planning workshop.
14. Completed the project baseline survey.

Problems encountered

Most of the problems encountered in 2020 are related to the COVID-19 pandemic outbreak.

1. The training of trainers in Oromia and SNNP regions was suspended until July, which affected farmer training; however, this was completed when public meeting restrictions were eased.
2. Local procurement of TC chemicals could not be completed due to disruption in supply chains, at the risk of laboratory supplies being out of stock.
3. The suspension of office work and lack of remote connectivity of NARS staff affected procurement of most goods and services, thus delaying some partner activities.
4. Restriction of local and international travel affected some project activities planned mainly for Q1 and Q2. These were restarted and fast-tracked in Q3, with COVID-19 standard operational procedures.
5. In Y1 of the project, seed potato was a constraint to supporting the 80 planned wards; however, the project team managed to reach 40.
6. Funds to support farmer training by DAs were limited, as the training was prearranged to be funded by government or other NGO projects that later suffered budget cuts.
7. Delayed importation of varieties and advanced clones from CIP–Nairobi due to COVID-19 pandemic restrictions and reduced operations in TC labs and greenhouses.
8. Failure of the TC lab cooling unit at HRC resulting in work stoppage

Progress Towards Outcomes (and Goal)

The outcomes/goal of this project is built on four pillars:

- (1) farmers getting better and equitable access to climate-smart, resilient, high-yielding, and consumer-preferred potato varieties;
- (2) seed producers providing affordable and locally available high-quality seed while increasing return on investment;
- (3) seed multipliers, traders, and farmers having access to seed potato of guaranteed quality; and
- (4) more potato is produced, consumed, and sold due to the benefits of using high-quality seed of improved varieties, realizing better food security and higher household (HH) income.

This is anticipated to directly benefit at least 30,000 HH by accessing high-quality seed of improved varieties besides training in good agricultural practices. In this context, two potato clones —CIP391058.175 with superior processing qualities and CIP395017.242, higher in iron and zinc than in any existing varieties in Ethiopia—were accepted for release and entered into the seed potato production system together with four other popular varieties. Similarly, 2,644 members of 40 FSGCs and 21 DSMs received clean seed to initiate community-level seed bulking. The 21 DSMs received G1 minitubers to produce EGS and will serve as case studies for farmer-based seed potato business models. This approach is expected to shift a large proportion of EGS production from public to private actors in order to improve efficiency in the seed potato system.

Seed sales from DSMs and FSGCs could not be determined in 2020 because farmers have had their first crop from this intervention. However, the seed potato crops were inspected, serologically tested for latent BW infection, and registered into the QDS system to advance it to the next bulking stage or distribution to other farmers. The foundation to enable farmers, traders, and other seed users in the potato value chain to get seed of guaranteed quality has been set. Latent BW indexing will be done in collaboration with the teams trained from seed inspection and quarantine services to build potential and capacity to adopt it for routine seed potato quality control and curb the spreading of BW disease.

The road to empowering smallholder farmers to improve their potato yields has been set, despite drawbacks due to the COVID-19 pandemic. In 2020, 18,092 farmers (i.e. 21 individuals as DSMs, 2,644 members of FSGCs, and 15,427 ordinary potato farmers, of whom 5,967 (33%) were women) were trained. Of the trained farmers, 2,665 (395 [14.8%] women) directly received seed for bulking before distribution to other smallholders.

In capacity strengthening, 45 districts and 115 ward agricultural extension officers were trained as farmer trainers. Sixty-three QDS inspectors, including nine women, were trained to strengthen seed quality assurance.

BMZ Outcome Target and IDO Contribution

The project was designed to contribute to the number of smallholder farming HH in Ethiopia through the adoption of improved varieties and management practices, increase their agricultural productivity and incomes, and be able to meet their minimum dietary energy requirements. The project aims to reach 30,000 HH directly with training and high-quality seed of improved varieties and other agricultural technologies, resulting in a 30% increase in yield and a 20% increase in income over 36 months. Further, 30,000 HH would benefit indirectly through informal sharing of seed, knowledge, and information. The project also aims to reclaim at least 1,000 ha that are threatened by potato BW. The net result of this intervention would be that at least 4,000 vulnerable HH will be food secure, targeting a high proportion of female-headed HH.

In 2020, 18,092 farmers were trained on improved agronomic practices, representing 60.3% of the target HH of whom 5,967 (33.0%) were women. Forty FSGCs with 2,665 members—395 (14.8%) women—had two special seed potato production training sessions; the second session emphasized BW management. This was in addition to 21 DSMs who are being developed as commercial seed producers. Here, 16 DSMs and one FSGC were supported with 7,800 G1 minitubers to pilot EGS production. Fifteen FSGCs were supported with 95,000 G2 or G3 minitubers to start group-based EGS production. In addition, 25 FSGCs with 1,774 members (322 [18.1%] from female-headed HH) received 5 t of G4 seed to start QDS production. The FSGCs and DSMs supported in 2020 will provide seed to more HH in 2021.

Information on land reclamation from BW infestation will be delivered from the fields whose seed potato would test negative to latent infection. Additional data will be obtained from soil sample analysis from fields of FSGCs and DSMs in 2021 determined before planting establish the impact of the intervention.

The path to overcoming food insecurity in the project intervention districts has been set by first engaging elite FSGCs and DSMs to multiply seed of high-yielding varieties. This will be accelerated in 2021 by including the two newly released varieties that have special market attributes. More quality seed will be available in 2021 by importing clean nucleus seed and expediting TC plantlet production in Ethiopia.

A rural rapid appraisal revealed that of the 36,626 HH in the project intervention wards, 6,211 (17%) were headed by females. In 2020, of the 15,427 farmers involved in training and seed distribution, 5,572 (36.1%) were women. This is in addition to 2,665 members of FSGCs and DSMs (14.8% women), thus showing better participation by women in project activities. In the baseline study, basic data were disaggregated by gender and HH typology to ensure that female HH are deliberately targeted and supported.

Review of Impact Pathway

The impact pathway of this project builds from OPs and outcomes to intermediate development outcomes (IDOs) for GIZ and the CGIAR's strategic level outcomes. This impact pathway has its base in OPs 5–6 cutting across OPs 1–4. OP5 addresses equity and MEL for scaling technologies across the gender and social divide. OP6 deals with potato systems innovation and partnerships for scaling technologies in OPs 1–4. To achieve a logical linkage from OPs to IDOs, gender indicators in each OP were added to the project logframe.

The potato innovation system in OP6 has been energized under the Irish Potato Coalition by mobilizing private and public sector potato VCAs from agricultural R&D centers, NGOs, EGS producers, SUNSELET potato processor, and farmer seed group cooperatives to address seed potato shortage in Ethiopia. This team has set actor commitments to solve national seed potato constraints.

Achieving targets in OPs 5–6 is irrelevant without deliverables in OPs 1–4. Thus, two varieties were released: 'Burka', with superior processing qualities, and 'Feysa', with high levels of iron and zinc. Seventeen advanced clones of diverse genetic background, such as LB and virus resistance, high yield, diverse adaptation, and heat and drought tolerance, are under evaluation. In OP2, potato TC labs and greenhouses for partners were supported to produce more plantlets and minitubers. With the participation of SolarGrow PLC, a novel technique for rapid seed multiplication using RACs has been introduced to supplement TC before rolling it out to farmers.

In OP3, 21 DSMs were identified for developing them as private EGS producers. Of these DSMs, 16 received 4,800 G1 minitubers and five received 5 t of G3 seed to start seed production business to improve smallholders' access to quality seed. Meanwhile, 20 farmer seed group cooperatives received 5 t of G3 and G4 seed to produce QDS. In OP4, 18,092 farmers (33% women) were trained in improved potato production and will receive seed in 2021. To build local capacity, farmer training was conducted by 115 DAs supervised by 45 district master trainers who were earlier trained by project implementing partners.

On the basis of the above actions, a firm foundation has been set to achieve project outcomes by the end of 2021 to deliver quality seed of preferred potato varieties in a more equitable, affordable, and sustainable way to many HH. This will be driven by a large pool of seed multipliers that has been mobilized and engaged to produce clean seed, and supported by DAs and QDS inspectors for quality assurance. Higher level results in improved potato production, food security, and HH incomes due to this project will be determined by 2022, when large quantities of seed will be readily available to most project target HH and beyond.

Conclusions for the following Reporting Period

This project is still highly relevant. Its goal and purpose will be achieved despite COVID-19 pandemic disruptions (as has been discussed in the first full year of project execution). With the hope that COVID-19 pandemic will ebb, and cognizant that EGS production is underway, the objectives on which this project was conceived will be met by 2022, despite delays in some activities that required staff travel and meetings. Activities that were deferred at the outbreak of COVID-19 were fast-tracked after getting guidance on mitigating disease spread and as meeting restrictions were eased. Seed production at all levels is on track; targets for 2021 will be achieved.

Two new varieties obtained through PVS will improve choices for farmers and consumers. Furthermore, 17 advanced clones are being evaluated via PVS to identify more user-preferred varieties. Combining clean EGS bulking in both Kenya and Ethiopia will accelerate availability of large quantities of quality seed in the target communities and beyond in time.

Partners' TC labs and facilities for EGS production were supported; RACs and an alternative and cheap rapid multiplication technique were introduced. These efforts will ease production of clean planting materials, even with modest facilities.

The districts and wards targeted by the project were achieved; however, 50% of FSGCs and 66% of the DSMs were reached in 2020 with training and seed. Production of EGS and QDS is in progress with support, regardless of COVID-19 restrictions.

District and ward master trainers as well as farmer trainers were trained in all project intervention districts. That more women participated as master trainers (20.9%) and farmer trainers (36.1%), whereas 98.2% of trainees were youth indicated better gender representation among extension agents. The first cycle of farmer training was completed; the second cycle is expected in early 2021. As part of project MEL, performance of farmer trainers was conducted and a baseline study carried out.

Deliverables in OP6 will be achieved through meetings, workshops, conferences, and information-sharing activities set up in OPs 1–5. Five key lessons learned are based on activities done in 2020: (1) farmers are keen to participate in seed potato production as a business if they are supported in seed marketing; (2) free seed distribution by other actors is affecting demand-led seed business; (3) women's participation is still limited as most actors have low regard for affirmative action; (4) it is possible to implement key activities that involve human interactions if the intensity of COVID-19 remains low and mitigation measures are observed; and (5) the spread of COVID-19 is uncertain and might affect activities in 2021. We will make all efforts to ensure continuity of critical activities such as seed production and delivery. Overall, this project is still relevant and on track to deliver all outputs by 2022.

Publications, Papers and Reports

1. Damtew, Elias, Barbara van Mierlo, Rico Lie, Paul Struik, Cees Leeuwis, Berga Lemaga, and Christine Smart (2020). Governing a Collective Bad: Social Learning in the Management of Crop Diseases. *Systemic Practice and Action Research* <https://doi.org/10.1007/s11213-019-09518-4>.
2. Tessema, Lemma, Wassu Mohammed, and Tesfaye Abebe (2020). Evaluation of Potato (*Solanum tuberosum* L.) Varieties for Yield and Some Agronomic Traits. *Open Agriculture* 5:63–74. <https://doi.org/10.1515/opag-2020-0006>.
3. Tessema, L., Seid, E., Woldegiorgis, G., and Sharma K. (2020). Current status of bacterial wilt (*Ralstonia solanacearum*) disease in major seed potato (*Solanum tuberosum* L.) growing areas of Ethiopia. *J. Plant Pathol. Microbiol.* 11:497. <https://doi:10.35248/2157-7471.20.11.497>.
4. Tessema, Lemma, Gebrehanna, Wassu Mohammed Ali, and Tesfaye Abebe Desta (2020). Genetic progress for tuber yield and related traits of potato (*Solanum tuberosum* L.) in Ethiopia. *Journal of Plant Breeding and Crop Science* 12:184–191. <https://DOI:10.5897/JPBCS2019.0804>.
5. Shiferaw, Tafesse, B. van Mierlo, C. Leeuwis, R. Lieb, B. Lemaga, and P.C. Struik (2019). Combining experiential and social learning approaches for crop disease management in a smallholder context: a complex socio-ecological problem.
6. Shiferaw, Tafesse, E. Damtew, B. van Mierlo, R. Lie, B. Lemaga, K. Sharma, C. Leeuwis, and P.C. Struik (2018). Farmers' knowledge and practices of potato disease management in Ethiopia. *NJAS-Wageningen Journal of Life Sciences*. <https://doi.org/10.1016/j.njas.2018.03.004>.
7. Shiferaw, Tafesse, Rico Lie, Barbara van Mierlo, Paul C. Struik, Berga Lemaga, and Cees Leeuwis (2020). Analysis of a Monitoring System for Bacterial Wilt Management by Seed Potato Cooperatives in Ethiopia: Challenges and Future Directions. *Sustainability* 2020,12:3580. <https://doi:10.3390/su12093580>.
8. Ethiopian Improved Potato Varieties Catalogue 2020 (Final draft).
9. Seed potato production manual for smallholder farmers (Final draft).
10. Project targets monitoring tables.
11. ARARI project progress report (Oct. 2019–Mar. 2020).
12. ARARI project progress report (Apr.–Sept. 2020).
13. EIAR project progress report (Oct. 2019–Mar. 2020).
14. EIAR project progress report (Apr.–Sept. 2020).
15. Report on baseline survey process and observations.

Upload documents

Upload 1	Elias Damtew et al., 2020 - Governing a collective bad. Managing crop disease in community learning approach.pdf
Upload 2	Lemma Tessema et al 2019-Evaluation of Potato (Solanum tuberosum L.) Varieties for Yield and Some Agronomic Traits in Ethiopia.pdf
Upload 3	Lemma et al 2020 - Current-status-of-bacterial-wilt--ralstonia-solanacearum--disease-in-major-seed-potato--solanum-tuberosum-l-growing.pdf
Upload 4	Lemma et al., 2020 Genetic improvement of tuber yield and related traits of potato.pdf
Upload 5	Shiferaw Tafesse et al 2020 - Combining experiential and social learning approaches in potato disease management.pdf
Upload 6	Shiferaw Tafesse et al. 2020- Association between soil acidity and bacterial wilt incidence and severity.pdf
Upload 7	Shiferaw Teffessa et al 2020- Analysis of a monitoring system for BW management by FSGCs in Ethiopia.pdf
Upload 8	Catalogue of Improved Potato Varieties in Ethiopia (Aug2020).pdf
Upload 9	Manual for Local Seed Multiplication (Wubanbte).pdf
Upload 10	Project Targets Monitoring Table 2019-2022 - Combined (2019-2020).xlsx
Upload 11	ARARI - Project Progress Report (Oct2019 - Mar2020).pdf
Upload 12	ARARI - Project Progress Report (Apr-Sept2020).pdf
Upload 13	EIAR - Project Progress Report (Oct 2019 - Mar2020).pdf
Upload 14	EIAR - Project Progress Report (Apr- Sep2020).pdf
Upload 15	Brief report project baseline survey implementation process.pdf

Summary

This project was premised on a gender-responsive and equitable scaling of quality seed of improved varieties and related technologies among smallholders in OP5 to reduce poverty and food and nutritional insecurity at strategic level. This would be achieved through a strengthened potato innovation system and partnerships in OP6 delivering proven potato production technologies from OPs 1–4 to many smallholder HH, while ensuring equitable benefit across various gender categories monitored in a gender-sensitive evaluation and learning process (OP5). Through OP6, the project is expected to (1) sustainably deliver climate-smart, disease-resistant, robust, high-yielding, and user-preferred varieties (OP1); (2) increase the efficiency of EGS production (OP2); (3) improve capacity of FSGCs and DSMs to produce and deliver quality seed potato; and (4) scale out proven potato production technologies to smallholder HH (OP4). In a project structure developed in OP6, potato VCAs as Irish Potato Coalition for Ethiopia have designed approaches that would ensure gender equity in delivery of project benefits (OPs 1–4) to HH through a gender-sensitive project MEL by including gender-specific indicators for each of OPs 1–4. This report forms the first full year of project implementation and highlights progress toward achieving project OPs, purposes, and goal.

By adopting gender equity, an approximate equal number of men and women were engaged in PVS to assess 17 potato clones of diverse genetic background in new variety identification to ensure that gender preferences are used in variety development to enhance future uptake. Thus, two of the five candidate varieties were accepted for official release as part of OP1. Clone CIP391058.175 has superior processing qualities, and CIP395017.242 has higher zinc and iron content than any other potato varieties in Ethiopia. The national project partners have also enhanced production of TC plantlets and minitubers to meet the increased seed demand beyond what was previously planned.

To improve efficiency in EGS production (OP2), clean nuclear seed of varieties ‘Gudene’, ‘Belete’, ‘Dagem’, and Jalene, along with two newly released varieties, ‘Burka’ and ‘Feysa’, has been imported from CIP’s regional headquarters for further bulking in Ethiopia. Similarly, selected EGS producers as DSMs received >100,000 minitubers for bulking. This group of farmers received specialized training in seed potato production as a business. Meanwhile, RAC technology has been introduced for adaptation to diversify rapid seed multiplication.

In OP3, >2,600 members (14.8% women) of FSGCs were trained in QDS production and BW containment by ward DAs supervised by district agricultural extension officers. Before farmer training, however, the 45 district and 115 ward extension officers had been trained in improved potato production and integrated BW management. Among the trainers, 22.5% were women and 98.2% were youth. About 98,000 G3 and 5,000 kg of G4 seed were provided to 40 FSGCs for bulking at community level. To further strengthen seed potato quality control, 63 QDS inspectors, including nine women, were trained. ELISA has been introduced for routine use in seed health testing and quality control. Meanwhile, 10 researchers and technicians (five women) were trained on RACs for rapid seed multiplication.

To take validated potato production technologies to scale (OP4), >15,400 smallholders (36.1% women) were trained. This was in addition to >2,660 farmers trained as members of FSGCs and DSMs. Since January 2020, the project has directly benefited 18,092 farmers—5,887 (34%) women—with training and provision of quality seed.

In OP5, the foundation for better involvement of women and youth in project activities has been set with specific gender indicators included in the project logframe. More gender- aggregated participation will be recorded in 2021, as partners have been trained to ensure equitable gender involvement in project activities by clearly delineating and segregating gender roles, responsibilities, and contributions.

In OP6, the project team conducted one workshop for potato VCAs to develop a strategy for solving seed potato shortage in Ethiopia. Similarly, a national potato conference with >25 researchers was held to plan for potato R&D in 2020. Meanwhile, tools for managing potato LB and BW were developed and published by two PhD students who graduated in August. Finally, some members of the project implementation team published seven research articles, drafted a catalogue of Ethiopian improved potato varieties, and wrote several training manuals. The baseline survey report is underway despite delays due to disruptions caused by the COVID-19 pandemic.