REPORT

Technical Backstopping within the Potato Working Group in Seven SEWOH Partner

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Technical Backstopping within the Potato Working Group in Seven SEWOH Partner Countries

Final Technical Report (5 November 2018–31 December 2020)

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Acronyms

BECOSA	Bureau d'etudes de conseils et de services agricoles
BW	Bacterial wilt
CIP	International Potato Center
CoE	Center of excellence
CTPTA	Technical Centre for Potatoes and Artichokes
DGPA	Directorate-General for Agricultural Production
EAC	East African Communities
EGS	Early generation seed
GAP	Good agricultural practices
GPVCWG	Global Potato Value Chain Working Group
GIL	Groupement Interprofessional des Légumes (Interprofessional Vegetable Group)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IAAA	Innovations for agriculture and agri-food
IFDC	International Fertilizer Development Center
IITA	International Institute of Tropical Agriculture
INRAT	National Institute of Agricultural Research of Tunis
ISSD	Integrated Seed Sector Development
LAMP	Loop mediated isothermal amplification
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NPCK	National Potato Council of Kenya
NRCRI	National Root Crops Research Institute
NSCS	National Seed Certification Services
PCN	Potato cyst nematode
QA	Quality assurance
RACs	Rooted apical cuttings
RMT	Rapid multiplication technology
RTCs	Root and tuber crops
SEWOH	One World-No Hunger (from the German Sonderinitiative EINEWELT ohne Hunger)
SRK	Stokman Rozen Kenya Ltd
TC	Tissue culture
UHSB	University of Horticulture Sciences, Bagalkot
UTAP	Tunisian Union of Agriculture and Fisheries

Executive summary

This is the final technical report (15 November 2018–30 December 2020) for the Technical Backstopping within the Potato Working Group in Seven SEWOH Partner Countries project, funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Three very high priority areas that needed technical and advisory support in the SEWOH (One World–No Hunger) partner countries were identified during the first annual workshop, held in Nairobi, Kenya. These were (1) capacity building for early generation seed (EGS) production, (2) formation of a potato stakeholder platform, and (3) country-adapted good agricultural practices (GAP) in potato production. A concept note was developed by focal points of SEWOH partner countries to describe the roadmap and the expert needs within those very high priority areas. A focal person, Dr. Kalpana Sharma, from the International Potato Center (CIP), has been coordinating and providing advisory services and technical backstopping to the SEWOH partner countries based on this concept note.

From 15 November 2018 to 30 December 2020, CIP focused on all three priority areas of Global Potato Value Chain Working Group (GPVCWG) partner countries either as face-to-face meetings and trainings facilitation or via specific consultations and trainings on request for working group member countries and partners of Cameroon, India, Kenya, Mali, Nigeria, Tunisia, and Uganda.

Regarding capacity building for EGS production, India, Mali, Nigeria, and Tunisia received technical backstopping and advisory services on topics of the production of rooted apical cuttings (RACs), and Tunisian partners are already deploying the RAC technology. Programmatic backstopping support was given to the Groupement Interprofessional des Légumes (Interprofessional Vegetable Group) and Mabrouka to increase the supply of EGS via RACs, and to have a functional seed system by bringing public and private sector actors together. Indian partners also received technical and advisory support on RAC technology and secured the subgrant agreement from GIZ–India to CIP– India to scale out and operationalize the technology. Nigeria has received CIP potato germplasm, which will complement the efforts to develop seed systems with the introduction of RAC technology to boost the production of EGS in the country. Cameroon is included in the plan to incorporate RAC technology through CIP's GIZ-funded ProCISA project. Support via GPVCWG was instrumental in introducing RAC technology in Cameroon, India, Tunisia, and Nigeria.

CIP is also giving technical and advisory support on the subtopic of seed certification to Uganda by drafting a stand-alone seed potato certification protocol to support seed regulatory aspects. The CIP focal person (Dr. Sharma) revised the current seed regulation and certification guidelines to ensure that the key areas of application for seed production, EGS production and inspection, field inspection, lot inspection, and sampling protocols were adequately covered in the seed certification protocol to bring Uganda up to the East African Communities (EAC) standards. This will also help to harmonize the seed potato trade across the East African community border countries. The revised seed regulatory framework is a key innovation to bring changes in the seed regulatory or policy framework related to advisory services provided to Ugandan partners via GPVCWG.

Under the subtopic of seed quality assurance services, Kenya Plant Health Inspection Service and CIP have extended the capacity building of plant health/regulatory staff of GPVCWG partner countries on the use of field-deployable LAMP (loop mediated isothermal amplification) assay for *Ralstonia solanacearum* diagnosis through diagnostic courses and practical hands-on trainings. Use of the new field-deployable LAMP assay will give reliable results within a short period of time without the need to send samples to the lab with long waiting times, thereby increasing the efficiency and reliability of certified seed production. The shortened protocol and process involved, as well as convenience, will further attract farmers' investment in seed business.

The National Potato Council of Kenya was contracted to give south-to-south advisory support to stimulate the formation of a potato stakeholder platform initiative in Nigeria and Cameroon; Tunisia also received similar support. This advisory support was listed as one of their very high priorities areas.

In addition, the potato working group of Tunisian partners received advisory support on GAP in Tunis in January 2020. A special focus was given on (1) best practices for integrated late blight management in potato; (2) improving productivity in potato-based farming systems: an approach to link research, extension, and smallholder farmers; (3) steps in developing and conducting a farmer field and business school; (4) soil conservation practices in potato production; (5) diagnosis and management of potato diseases caused by soft rot bacteria; and (6) potato virus Y and Fusarium wilt management.

The CIP–GPVCWG focal person, Dr. Sharma, and CIP's Global Potato Program leader, Dr. Ian Barker, participated in the Second GPVCWG Annual workshop, held on 2–6 March 2020 in Tunis. Dr. Barker spoke about the development of a national potato strategy and facilitated some of the workshop sessions. Dr. Sharma explained how CIP implemented the 2019–2020 GPVCWG support activities for potato sector development in the member countries of the GPVCWG. Recent support activities of the group provided to member countries were acknowledged, and further opportunities were pointed out. Entry points and a road map along the main topics of (1) capacity building for EGS production, (2) GAP, and (3) platform creation/advocacy/national strategy of the GPVCWG Phase II were further discussed and agreed. This was very instrumental in designing the advisory support and technical backstopping services of CIP–GPVCWG Phase II for Cameroon, India, Nigeria, Mali, and Tunisia.

Although advisory services and technical backstopping for Mali, India, Uganda, and Nigeria were planned for late 2020, because of the current COVID-19 pandemic, however, these activities were postponed until essential travel restrictions were lifted (now since cancelled). These resources were geared not only for virtual training and virtual technical backstopping support, but also to support the new center of excellence (CoE) for RAC production. The CoE for RAC production will offer training on RAC production to production of EGS, in soilless media and in the field, to the seed producers and researchers within the country and abroad. CIP has recently signed a memorandum of understanding with Fruits and Veggies Global Ltd at Jos, Nigeria, to formalize collaboration and working modalities in this regard.

The CIP team did its best to ensure that all activities were delivered and completed by the end date of the current contract, considering the availability of the respective SEWOH partners for the training workshops and under very restrictive conditions because of the COVID-19 pandemic.

1. Progress report by project objectives

Under the One World–No Hunger initiative (SEWOH) of the German government (Federal Ministry of Economic Cooperation and Development, BMZ), two Global projects (Green Innovation Centers and Promotion of Nutrition-Sensitive Potato Value Chains in East Africa) dealing with the potato value chain are being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The global project Green Innovation Centers is focusing on improving the potato value chain, among other work, in five of the 16 SEWOH countries; namely Cameroon, India, Nigeria, Mali, and Tunisia. The global project Promotion of Nutrition-Sensitive Potato Value Chains in East Africa is working in Uganda and Kenya. Each global project is supported by a steering unit in Germany. To stimulate cross-country learning, and to harmonize the advisory services on the global potato projects, a GIZ Global Potato Value Chain Working Group (GPVCWG) was established in 2015. The GPVCWG offers an effective platform whereby country experiences and best practices for potato value chain improvement can be exchanged, needs and opportunities articulated, and capacity building organized. Furthermore, the GPVCWG provides the opportunity to harmonize and synchronize advisory services and improve efficiency. In 2018, coordination of the GPVCWG was handed over to the global project, Promotion of Nutrition-Sensitive Potato Value Chains in East Africa.

The International Potato Center (CIP) provides technical backstopping and policy advice to the GPVCWG for the seven SEWOH partner countries: India, Cameroon, Mali, Nigeria, Tunisia, Kenya, and Uganda.

1.1 Facilitation of face-to-face meetings and trainings

1.1.1 GPVCWG annual workshops

During the project period, two annual workshops were organized. The First GPVCWG annual workshop was held 7–9 May 2019, in Nairobi, Kenya, at the GIZ agriculture office (Photo 1). Participants included focal persons and members of national working groups from Tunisia, Mali, Cameroon, Nigeria, Uganda, Kenya, and India; the project steering unit from Germany; and the project partners CIP and the Royal Tropical Institute of the Netherlands. CIP's regional director, Dr. Paul Demo, and a CIP focal person, Dr. Kalpana Sharma, participated in the workshop and facilitated some of the workshop sessions. Dr. Monica Parker of CIP also gave a special input via presentation on RAC technology. Information on major challenges and bottlenecks in potato sector development from five SEWOH partner countries (Cameroon, Mali, Nigeria, Tunisia, and Uganda) was presented by the

Photo 1. Participants at the First GPVCWG annual workshop, held on 7–9 May 2019, in Nairobi, Kenya.

Royal Tropical Institute and further validated by the GIZ in-country focal person as well as by respective country experts from the national programs. During the workshop, participants ranked as "high" and "very high" priority training needs, capacity building, and other specific requirements in Cameroon, Mali, Nigeria, Tunisia, Uganda, India, and Kenya. A road map with different entry points for Cameroon, India, Mali, Nigeria, Tunisia, and Uganda was agreed during the workshop in Nairobi. Three very high priority areas across countries were identified: (1) capacity building for early generation seed (EGS) production, (2) country-adapted good agricultural practices (GAP) in potato production, and (3) formation of a potato stakeholder platform. A CIP focal person shared the terms of reference for the major training and capacity-building requirements with the GIZ GPVCWG coordinator and the respective SEWOH partner countries.

The Second GPVCWG annual workshop was held on 2–6 March 2020, at the Penthouse Suites Hotel in Tunis, Tunisia. Hosted by its GIZ Green Innovation Center project and its national partners, the workshop was attended by focal persons and members of national working groups from Cameroon, India, Kenya, Mali, Nigeria, Tunisia, and Uganda; the Potato Project steering unit from Germany; and the project partner from CIP, including CIP's Global Potato Program leader, Dr. Barker, and focal person, Dr. Sharma. Dr. Barker spoke about the elaboration of a national potato strategy and facilitated some of the workshop sessions. Dr. Sharma explained details of the 2019–2020 GPVCWG support activities (which have been implemented by CIP) and elaborated on the respective further opportunities for potato sector development in the member countries of the GPVCWG. Recent support activities of the GPVCWG provided to member countries were acknowledged and the potential follow-up and further opportunities were pointed out. The GPVCWG agreed on a base structure to develop a common road map and identify the needed support along the main topics of (1) capacity building for EGS production, (2) GAP, and (3) platform creation/advocacy/national strategy (Photo 2). Expectations of the GPVCWG partner countries and demand for support from the group were further discussed.

Photo 2. Various interactions during the Second GPVCWG annual workshop on 2–6 March 2020, in Tunis, Tunisia. **A, B, C,** and **D**: partners from SEWOH countries discussing and developing ideas for advisory support; **E**: road map of three priority areas; and **F**: road map with entry points (an example from Cameroon).

1.2 GPVCWG Phase 1 technical backstopping and policy advisory services

Figure 1 shows an overview of GPVCWG Phase 1 technical backstopping and policy advisory services that CIP provided along the main topics of (1) capacity building for EGS production, (2) GAP, and (3) platform creation/advocacy/ national strategy across the seven SEWOH partner countries (i.e., India, Cameroon, Mali, Nigeria, Tunisia, Kenya, and Uganda). Sub-subtopics of RAC and LAMP under main topic "EGS" were offered to India, Mali, Nigeria, and Tunisian partners. South-to-south advisory support of the National Potato Council of Kenya (NPCK), Kenya, by Mr. Wachira Kaguongo, was geared to stimulate the formation of National Potato Platform in Cameroon, Nigeria, and Tunisia. In addition, Tunisia also received advisory support on GAP.

Figure 1. Mapping of GPVCWG Phase 1 technical backstopping and policy advisory services of CIP (green highlighted cells) along the main topics of capacity building for EGS production, GAP, and platform creation/ advocacy/national strategy across India, Cameroon, Mali, Nigeria, Tunisia, Kenya, and Uganda.

Main topic	Sub-topic	Sub-sub-topic	Country						
			Cameroon	India	Kenya	Mali	Nigeria	Tunisia	Uganda
Early generation seed	Rapid multiplication technology (RMT)	Rooted apical rooted cuttings (RAC)							
		Training on RAC to field multiplication							
		CIP germplasm introduction							
		Training materials							
	Seed quality assurance	Seed Certification protocol							
		Cross border seed trade harmonization							
		Diagnostics (LAMP)							
Good agricultural practices	Advisory support, presentations, briefs	Late blight management							
		Innovation sites, FFBS model							
		Soil conservation practices							
		Fusarium, PVY and soft rot mgmt							
National potato platform	South to south advisory support of NPCK	Stimulation and elaboration with stakeholders							

Mapped under GPVCWG Phase I project
Mapped under other donor funded projects (BMZ, GIZ, USAID, RTB…..)
Mapped under Promotion of Nutrition Sensitive Potato Value Chain Project

1.2.1 Capacity building for EGS production

Subtopic: Rapid multiplication technology (RMT)

Among different RMTs for seed potato multiplication, RAC has been promoted because of its high multiplication efficiency of EGS. RAC is a transplant produced in a screenhouse from tissue culture (TC) plants and handled the same way in the field as a nursery-grown seedling. Cuttings that are clean and free of disease are planted in the field in slightly raised beds to produce high numbers of EGS tubers. Below we describe the support on RAC technology that GPVCWG partner countries received.

RAC training offered to Mali, Nigeria, and Tunisia partners in Kenya, October 2020

Under the high priority area of EGS production, CIP trained 11 participants (four each from Mali

and Tunisia and three from Nigeria) on the subtopic "Rooted apical cuttings (RAC)" on 16–18 October 2019 in Nairobi (Annex 1). Participants were from public and private sectors who are engaged in seed potato production, seed quality assurance (QA) services, and TC laboratories.

Practical hands-on training on RAC took place at Stokman Rozen Kenya Ltd (SRK), Naivasha. SRK is a private sector firm that has been trained and technically supported by CIP to deploy RAC in their facility. They are now the lead producers and suppliers of RAC in Kenya. After a presentation by Dr. Monica Parker of CIP on RAC (link to RAC presentation), practical training followed. Participants learned about (1) the different stages of RAC production (Photo 3), (2) the soilless media preparation procedure, and (3) the insertion of soilless media into the paper plugs to grow cuttings.

Photo 3. Various stages of RAC production and packaging at SRK, Naivasha. **A)** TC plantlets, **B)** acclimatized mother plants from TC plants ready for cutting production, **C)** planting of cuttings in soilless media using plugs, **D)** fertilization and watering of cuttings, **E}** acclimatization/hardening of cuttings in a screenhouse, **F)** packaging of cuttings in boxes to deliver to seed multipliers, and **G)** participants of the RAC training at SRK.

Participants were taken to small-scale cuttings and certified seed producer. The owner is getting TC plantlets from a TC laboratory in Nairobi that she uses as mother plants to produce cuttings (Photo 4). She is also involved in certified seed production using cuttings and minitubers, which she supplies to neighboring farmers and surroundings. Participants learned that cutting production can be done at small scale using local supplies.

Photo 4. Small-scale cutting producer at Olkalou, Kenya. The farm's owner explains the production of certified seed using RACs and tubers at small scale (left); production of cutting in the screenhouse at small-scale settings (right).

Participants visited the certified seed producer at Charagita, who is using RACs to produce EGS (Photo 5). Participants saw different generations of seed production and learned to plant cuttings in rows using the small plot seed technology as well as in rows. They also observed the harvesting of tubers of different potato varieties that were grown using cuttings of different harvests (1st cuttings, 2nd cuttings, 3rd cuttings, until 12th cuttings). They were impressed to see that one cutting can produce 8–30 tubers, depending on the variety, and that there was no variation in the productivity of the 1st set of cuttings compared with the 7th–12th set of cuttings coming from the same mother plant. They understood that one mother plant can produce equally productive cuttings over four and five months without compromising the cuttings' productivity.

Photo 5. On their visit to certified seed producers at Charagita, participants observed **A)** production of EGS using cuttings, **B)** planting of cuttings using small plot technology, and **C)** harvesting of tubers planted from different sets of cuttings.

RAC training offered to partners in India, November 2019

Dr. Parker provided advisory and technical support to deploy RAC technology to partners in India (Annex 1). Participants were trained to produce cuttings from TC plants, grow them in beds for further multiplication and bulking, and integrate the plants into the seed system. Participants were from GIZ–India; India's National Potato Program at the Central Potato Research Institute; University of Horticulture Sciences, Bagalkot (UHSB); and CIP–Kenya, Georgia, and India (Photo 6). Recently, this support has converted to a bilateral agreement between CIP and GIZ–India to support the production of EGS for potential seed producers.

Photo 6. Participants assemble after the advisory services program on RAC by Dr. Parker (front row, second from left) to Indian partners at UHSB, India.

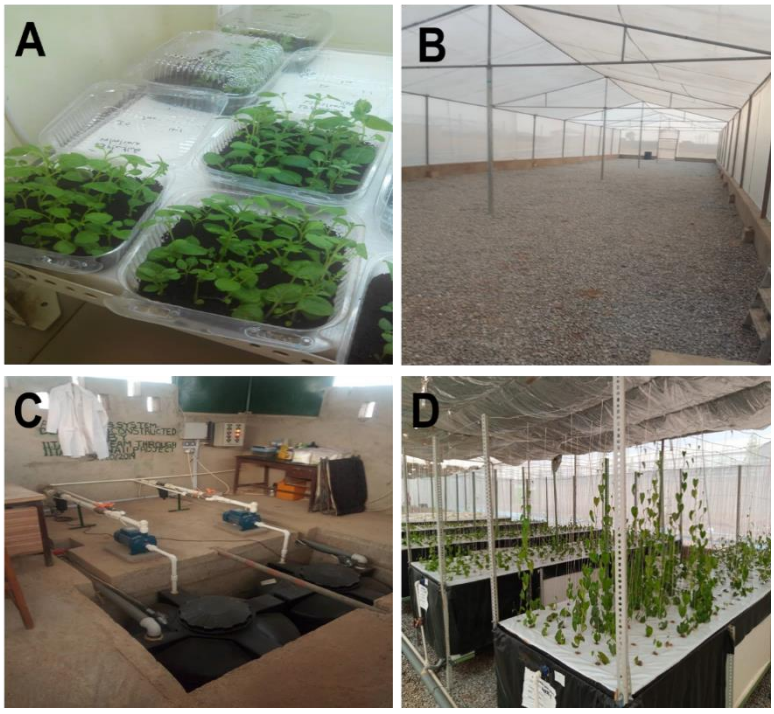
Transfer of CIP germplasm to Nigeria and center of excellence (CoE) for RAC production

For Nigeria, follow-up technical backstopping and advisory support were provided locally for the production of EGS, after hands-on training on RAC during October 2019 in Nairobi, Kenya. To start with the EGS, TC planting materials were needed. Mr. Stephen Yakubu Atar of DA-ALLGREEN Seeds Ltd, who had received RAC training in Nairobi, together with GPVCWG participants at Kaduna, Nigeria, requested TC materials of the 10 best CIP clones suitable to the Nigerian agro-ecology. A CIP potato breeder selected these clones and sent them to Mr. Atar. He is currently working on the production of yam EGS using aeroponics in collaboration with the International Institute of Tropical Agriculture (IITA) in Nigeria (Photo 7). Mr. Atar organized all paperwork and import permits to import TC plantlets of these 10 CIP clones. He is now collaborating with IITA to increase the number of *in vitro* plantlets so that he can use them to produce the EGS of these planting materials using aeroponics and the RAC technologies he

currently has for yam.

Discussion continues on how to boost the public-private partnership (PPP) among the National Root Crops Research Institute (NRCRI), Mr. Steve Bawa of Fruits and Veggies Global Ltd at Jos, Nigeria (GPVCWG focal person of Nigeria), and DA-ALLGREEN Seeds Ltd. At present, the laboratory facility for TC production at NRCRI is not functional. They have, however, a screenhouse to deploy RAC if they receive TC plantlets from IITA or DA-ALLGREEN Seeds, or even go with planting of RAC from DA-ALLGREEN Seeds. CIP's focal person is in discussion with them to fine-tune this collaboration.

Photo 7. A) TC plants of CIP clones at IITA–Nigeria using the semi-autotrophic hydroponics technique; **B)** at DA-ALLGREEN Seeds, Kaduna, Nigeria, recently constructed screenhouse for RAC and aeroponics establishment; **C)** nutrient solution and generator setup for aeroponics; and **D)** functional yam aeroponics unit.



GPVCWG Phase I supported the establishment of a CoE for RAC production in Nigeria. The CoE will train seed producers and researchers, within the country and abroad, on RAC production and maintenance as well as planting in soilless media and in the field. This will further showcase a profitable, high-quality seed potato production venture within the farming community by ensuring a sustainable supply of high-quality seed potato of desired varieties to the community. The CoE will also work with a decentralized network of seed producers as a part of the business model, and will offer training services through establishment of demo plots to promote use of quality seed and RACs. Fruits and Veggies Global Ltd (Jos, Nigeria) agreed to host the CoE for RAC production. To formalize this collaboration and working modalities, CIP signed a memorandum of understanding with Fruits and Veggies Global Ltd (link to MoU between CIP and Fruits and Veggies Global Ltd).

Deployment of RACs in Tunisia, January–February 2020

Dr. Sharma, together with GIZ staff and partners from the Technical Centre for Potatoes and Artichokes (CTPTA) and the National Institute of Agricultural Research of Tunis (INRAT), organized a follow-up visit to GIL (Groupement Interprofessional des Légumes/Interprofessional Vegetable Group, a semi-public institution http://www.gil.com.tn/fr/partenaire) and Mabrouka on RAC technology.

Mabrouka is a private company (http://www.pepinieremabrouka.com/en/2-Products) that

produces high-quality planting materials of olive trees, strawberry, citrus, and other stone fruits, including potato minitubers and EGS of potato. It has a highly sophisticated *in vitro* laboratory on industrial scale in Tunisia and exports *in vitro* plants and produce to the international market. One staff each from GIL and Mabrouka has deployed RAC in their facilities on potato variety 'Spunta', a widely grown and popular potato variety in Tunisia (Photos 8 and 9). Thanks to a hands-on practical training given in Nairobi, and some virtual technical backstopping, RAC was successfully deployed in their facilities.

Photo 8. Deployment of RAC technology at GIL, Tunisia. **A) and B)** TC facility at GIL, **C)** planted mother plants, **D)** RAC from the mother plants, and **E)** established RACs with developed root system.

PPPs between GIL, CTPTA, and Mabrouka to collaborate and strengthen their partnership to support the seed potato system for the country are being discussed. With that idea, CTPTA received the first batch of 300 RACs from Mabrouka (Photo 9G). Currently, GIL and Mabrouka are producing minitubers directly from TC plants that each yields four or five minitubers (Photos 8 and 9). The low productivity of EGS results in high production costs, which can be easily eliminated by RAC technology as it can produces 8–30 tubers per cuttings depending on the variety and environment. There are only three potato varieties that GIL and Mabrouka have the right to multiply. These varieties have long dormancy periods; are less adaptable to a wide range of agro-ecologies; and are susceptible to late blight, viruses, and bacterial diseases. Furthermore, these varieties are not suitable for processing (chips/fries/puree). Tunisian partners have expressed interest in CIP potato varieties/clones that offer those qualities, together with access to the TC plantlets. This will create additional opportunities to produce local seeds at lower prices with a fully flagged seed system of desired varieties. For this Mabrouka wants to take the lead. This will, however, need to be discussed further, along with the plan to transfer the TC planting materials from Kenya to Tunisia and a transfer agreement of planting material and import and export permit.

Photo 9. Deployment of RAC technology at Mabrouka, Tunisia. **A and B)** TC facility, **C)** planted mother plants, **D)** RACs from the mother plants, **E)** RACs planted in a bench, **F)** RAC planted in pots, and **G)** RACs planted in the field at the CTPTA with drip irrigation.

Subtopic: Seed quality assurance

Seed quality control for root and tuber crops (RTCs) is different from crops with "true" seeds for two important reasons. First, the vegetative parts used for the multiplication of RTCs are important carriers of diseases, much more than the true seeds of grain crops and pulses, for example. The second important difference is the low multiplication rate and, hence, the need for several generations of multiplication as well as the perishability of planting material. Because of this, seed multipliers of RTCs can usually only serve a limited number of customers and in their own vicinity. Seed QA is a service that helps to distinguish themselves from less professional—or plainly opportunistic—seed sellers and producers. The availability of reliable external seed QA contributes to the professionalization of the seed sector and increases accessibility of high-quality planting material to large farming communities.

Developing both rapid and robust procedures for phytosanitation and health certification, as well as seed QA services to generate the virus-free stocks of clonally propagated crops, is crucial for providing early generation material to the seed value chain. Seed QA in field generations is usually even more cumbersome as the seed is often grown by large numbers of scattered seed multipliers. This leads to high transaction costs for field inspection and laboratory testing. At the same time, the build-up of diseases over generations from the re-use of planting material of RTCs, called seed degeneration, results in serious yield losses, even total crop losses, depending on the crop and disease. Reliable seed QA is therefore an important element in the quest to improve

productivity and resilience of smallholder farming systems. Still lacking, however, are affordable and robust QA systems adapted to specific needs in African countries. Seed QA systems need to be cost-effective and justified by higher yields and reduced risk from pest and disease spreads.

CIP and the Kenya Plant Health Inspectorate Service (KEPHIS), through support from the GIZ-BMZ-funded project Improved Diagnostics and Genetic/Molecular Diversity of Ralstonia from Kenya and Uganda, have optimized and validated the field-based assay to detect *Ralstonia solanacearum* from soil, stem, and tuber samples. *Ralstonia solanacearum*, the causal agent of bacterial wilt (BW) of potato, is a quarantine pathogen with zero tolerance in certified seed production in Kenya and elsewhere in the world. The pathogen spreads via latently infected tubers (physically, tubers look healthy but carry the pathogen which can develop disease symptoms after planting under favorable weather conditions). A validated field-deployable LAMP assay for on-site detection of *Ralstonia* is sensitive, rapid, and robust. It enables more accurate, rapid diagnosis of *Ralstonia* without the need to send samples to the laboratory with long waiting times. It has the potential to be adopted for seed QA services and certification purposes. Use of the new field-based assay by national phytosanitary authorities and private diagnostic clinics will improve the efficiency of seed potato certification process and a seed quality control mechanism, thus increasing the availability of certified or quality assured seed.

Below we describe the support on LAMP technology and other topics of seed QA advisory support that GPVCWG partner countries received.

LAMP assay training offered to Mali, Nigeria, and Tunisia

Hands-on practical training on LAMP technology was offered to 11 participants (four each from Mali and Tunisia, three from Nigeria) on 18 October 2019 in Nairobi (Photo 10) (Annex 2). Participants were from public and private sectors who are engaged in seed potato production, seed QA services, and TC laboratories. Dr. Demo, CIP's regional director for Africa, welcomed the training participants and explained the need for rapid, cost-effective, sensitive diagnostic tools for a seed potato QA program. A background presentation on *Ralstonia* diagnosis and LAMP assay was given by Dr. Sharma and Mr. Abdulwahab Abdurahman (link to Presentation on LAMP assay), and was followed by practical training on the use of LAMP assay in *Ralstonia* diagnosis from soil, tuber, and stem samples of potato. Through this training participants became aware of this new technology in *Ralstonia* diagnosis from such samples. They found this technology very relevant for their home countries to support the seed certification and QA services. They were surprised to see that the instrument is portable (i.e., field deployable) and provides test results within 25 minutes after sample processing. Participants agreed that LAMP assay can replace the routine laboratory testing of *Ralstonia* that employs enzyme-linked immunosorbent assay tests, which need at least five days to give results, as well as being very tedious and laborious.

Photo 10. LAMP assay training for Nigeria, Mali, and Tunisia of participants in the GPVCWG program on 18 October 2019 in Nairobi. **A)** presentation on LAMP assay by Mr. Abdurahman, **B)** LAMP assay amplification curve from Gene III instrument, and **C)** participants of the LAMP assay training.

LAMP assay orientation offered to India

Dr. Sharma advised on the procurement of a LAMP machine to our Indian partners of GPVCWG and gave the general overview and orientation of LAMP assay in the detection of latent infection of *Ralstonia* from potato tubers on 29 October 2020 (link to the presentation). There were about 15 participants drawn from academe, GIZ–India, CIP–India, research stations, and seed multipliers.

Technical and policy advisory support on seed certification standards and procedures for Uganda

Dr. Sharma provided technical and advisory support for Uganda on seed certification standards and procedures via the GPVCWG program. The current seed certification standards and procedures for seed potato in Uganda have been adopted from cereal crops, which have not considered potato—a bulky and perishable crop—as a living planting material in the form of tubers. In addition, seed degeneration, seed quality, and seed health have been a huge concern during seed storage and seed potato production. This must be factored into seed certification standards, protocols, and guidelines. Similarly, the finding of potato cyst nematode (PCN) in Uganda is very serious, and growers are urged to test their fields to make sure they are free of PCN before planting seed potato. PCN is a seed- and soil-borne pest of quarantine nature. But seed-testing facilities in Uganda have neither the technical capacity to conduct PCN tests nor the lab equipment to test for PCN. Going for quality declared seed, which is a common practice in Uganda, is risky when PCN and *R. solanacearum* (causal agent of BW pathogen) are present in the soil. There was a need to revisit Ugandan Quality Declared Seed standards and guidelines. Dr. Sharma had met once with Mr. Erongu Moses Edward, head of the seed testing unit at the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), and Mr. Issac Wamatsembe, field inspector at MAAIF, Uganda, in Nairobi in October 2019. They discussed the seed regulation and certification procedures for vegetatively propagated crops, especially for potato. MAAIF is very willing to enlist CIP's support in revising these current seed regulation and certification procedures. Dr. Sharma organized a one-day meeting in February 2020 with MAAIF's National Seed Certification Services (NSCS), together with the GPVCWG of Uganda, the International

Fertilizer Development Center (IFDC), and the Integrated Seed Sector Development (ISSD) program to advocate for the revised certification guidelines and protocols for certified seed potato production (Annex 3). On the basis of these discussions, a task force was formed. Dr. Sharma and Dr. Evans Sikinyi (a CIP consultant) led the task to revise the current seed potato certification guidelines and protocol to ensure that the key areas of application for seed production, EGS production and inspection, field inspection, lot inspection, and sampling protocols were adequately covered. The reviewed draft was then shared with the NSCS for their comments and inputs in August–September 2020. After several back-and-forth sessions between CIP and the NSCS team, the refined document was then shared with the wider taskforce in September–October 2020. After comments were incorporated, the first draft was ready for presentation to the stakeholders.

Owing to the COVID-19 pandemic, the initial plan to meet in person in Uganda for further input, ownership, and validation of the draft among the important potato stakeholders, donors, and partners did not happen. Instead, one stakeholder virtual meeting was held on 25 November 2020, involving most potato stakeholders in Uganda. The agenda included a session for presentations by NSCS on the certification, seed policy, and legislative environment in Uganda (link to NSCS presentation). CIP presented key elements of the protocol (link to CIP presentation). The second session had group discussions on three key topics: potato varieties access and EGS production; field seed inspection; and diagnostics and testing in potato. A final draft protocol with stakeholder inputs was presented to MAAIF for ratification and internal process on 10 December (link to the final draft). The way forward is piloting the certification protocol together with task force and potato stakeholders in order to evaluate its effectiveness and to fully operationalize the seed certification protocol so as to involve all the inspectors in Uganda. Moreover, the role of quality declared seed class to bridge the gap between certified seed and farm-saved seed potato used by most farmers needs to be reconsidered.

Technical and policy advisory support on cross-border seed trade harmonization among Eastern African Communities (EAC)

The CIP focal person was invited to give a talk on "Seed Potato Cross-Border Trade From Seed Health Prospective, example from quarantine pathogen, *Ralstonia solanacearum* spread via latently infected tubers in EAC" to contribute to the Eastern African Community Seed Potato Cross Border Trade Harmonization workshop, on 14 November 2019 (link to Seed potato cross border trade from seed health prospective). The talk provided both the science-based evidence on the movement of epidemiological *Ralstonia* strains causing BW of potato in East Africa and evidence-based recommendations for policymakers on seed movement and to develop more effective prevention and BW management strategies. In addition, the presentation was a good reference to the team to not only understand the prevailing risks, intensity, and potential intricacies in the disease transfer from one country to the other, but also to discuss risk-minimizing opportunities. With the support from another project on the development of *Ralstonia* diagnostic tools, CIP offered series of trainings on the use of the "field-deployable LAMP assay in *Ralstonia* diagnosis to seventy-eight participants (participant were from seed regulatory and phytosanitary authorities, researchers, and private diagnostic clinic personnel) from nine African countries (Ethiopia, Kenya, Mali, Malawi, Nigeria, Rwanda, Tanzania, Tunisia,

and Uganda) in Kenya. A total of 11 participants from Uganda (the inspectors of NSCS; MAAIF; and to the technical staff of Abi Zonal Agricultural Research and Development Institute, Buginyanya Zonal Agricultural Research and Development Institute, Kachwekano Zonal Agricultural Research and Development Institute, National Agricultural Research Laboratories–Kawanda, and Rwebitaba Zonal Agricultural Research and Development Institute, were trained on the use of LAMP assay in Kenya. Their mandate is field inspection and EGS potato production. This was timely and well connected to seed certification and QA topics under EGS production of the GPVCWG's SEWOH partner countries.

1.2.2 GAP

GAP technical and advisory support to GPVCWG and partners in Tunisia

Cost of potato production in Tunisia is high because of expensive seed, high input use (89% of the land area is under drip irrigation), and storage costs. Moreover, yield varies a lot between seasons and year (14–18 t/ha, FAOSTAT 2019). A major factor of yield instability and low yield is smallholder farmers with small land holdings (i.e., 80% of the farmers are smallholders with 0.5–0.8 ha), and their returns remain relatively low, making investment risky. The major constraints contributing to low yields are critical shortage of clean seed potatoes, shortage of suitable varieties, suboptimal agronomic practices, and biotic and abiotic stresses. Diseases like late blight, soft rot, viruses (e.g., potato virus Y), Fusarium wilt, and nematodes are challenging. Management options available are minimal. CTPTA is a platform for technical knowledge transfer, training of extension agents and producers, variety selection and promotion, and technical-economic studies. But the support is limited to theoretical–technical approaches, and practical backstopping is currently lacking and very narrow.

Smallholder yields in Tunisia and elsewhere have been shown to realistically reach 35–45 t/ha. This yield gap highlights a significant opportunity to increase potato productivity, overall production, and wellbeing of potato farmers and their families. Productivity improvement, therefore, is a top priority in meeting the increasing demand for food as expanding land under production becomes difficult because of growing populations. Potato is one of the crops with highest potential to increase productivity if constraints to its production are properly overcome; therefore, large opportunity exists for yield gains.

CIP's advisory support was planned and executed in Tunisia from 28 January to 1 February 2020. The goal of this advisory support was to help Tunisian partners develop the specific guidelines for structuring GAP needs for the seed and ware potato in production.

During the four days of CIP's advisory support in Tunisia during 2020 (Annex 4), Dr. Sharma also joined a one-day contract farming workshop organized by the GIZ-IAAA (Innovations for Agriculture and Agri-food) program and planned a one-day follow-up visit on RAC technology at GIL and Mabrouka. Personnel from GIL and Mabrouka learned RAC techniques in Kenya during training organized by CIP and GPVCWG in October 2019, and are currently deploying the technology in their facility. The follow-up visit provided further technical backstopping in deploying the technology in their own environment.

On the first day the CIP advisory support started with the introduction and meeting with

relevant personnel of the national potato group from CTPTA, INRAT, Mabrouka, directorate-general for agricultural production (DGPA), GIL, Tunisian Union of Agriculture and Fisheries (UTAP), Bureau d'etudes de conseils et de services agricoles (BECOSA), and GIZ–Tunisia at CTPTA's Tunis facility (Photo 11). Dr. Sharma gave a presentation on (1) best practices for integrated late blight management in potato (link to PPT); (2) improving productivity in potato-based farming systems: an approach to link research, extension and smallholder farmers (link to PPT); and (3) steps in developing and conducting a farmer field and business school (link to PPT). Discussions among the participants and presenter followed after individual presentation.

On the second day Dr. Sharma gave presentations on (1) soil conservation practices in potato production (link to PPT); (2) diagnosis and management of potato diseases caused by soft rot bacteria (link to PPT); and (3) PVY and Fusarium wilt management (link to PPT).

Photo 11. CIP advisory support for Tunisian partners at CTPTA's Tunis facility. **A)** introduction and meeting with relevant personnel of the program working group (PWG) from CTPTA, INRAT, Mabrouka, DGPA, GIL, UTAP, BECOSA, and GIZ–Tunisia; **B and C)** road map and entry points to develop GAP needs for the production of seed and ware potato.

On the third day a major workshop on contract farming organized by the IAAA program was held in Tunis to share the experience and lessons learned among all the stakeholders. It was a good venue for understanding the concept that was successfully implemented for the tomato value chain, then being deployed on the potato value chain. Currently, some farmers/growers are being contracted to produce ware potato as well, and to add value to the raw product other farmer groups are contracted that are producing fries and chips. (Tunis Fries Ltd is an example of contract farming where value is being added to the original produce.)

CIP's focal person is talking with Tunisian partners about identifying the real GAP needs, together with the delivery package for local partners and smallholder farmers, which is nicely reflected in GPVCWG Phase II.

1.2.3 Platform creation/advocacy/national strategy

Support for the formation of a potato stakeholder platform was selected as one of the highest

priority areas by Nigerian, Cameroonian, and Tunisian partners to help transform their respective potato industry. In these countries it is important for the main actors and players of the potato sector to organize as a platform to discuss and direct the transformation of the sector and provide input into a comprehensive potato policy to policymakers. In response, a south-to-south advisory support from the NPCK was planned to help them think through the establishment and operationalization of the potato platform in Nigeria and Cameroon. Accordingly, five days of advisory support from NPCK on potato stakeholder platform formation was planned and executed on 15–21 October 2019 in Nigeria (Photo 12) and 4–9 November in Cameroon (Photo 13).

Photo 12. Potato stakeholder platform formation meeting in Nigeria. **A)** Mr. Wachira Kaguongo of NPCK presenting the importance, formation process, and functions of NPCK; **B)** stakeholders discuss different entry points; and **C)** potato stakeholders forum launch in stakeholder workshop on 24 October 2019.

Photo 13. Potato stakeholder platform formation workshop in Cameroon. **A)** presentation on the importance, formation process, and functions of NPCK to the stakeholders (French translation by Mr. Ali Festus); **B)** presentation of vision, objective, structure, and the way forward for potato stakeholder platform formation in Cameroon; and **C)** the steering committee on the last day of workshop.

Nigeria and Cameroon. In both countries the support started with individual meetings with relevant ministries to advocate for the importance of potato as a food security and cash crop and the need to have a functional stakeholder platform to bring all potato actors and players together to transform the potato industry. These meetings were followed by a stakeholders' meeting the next day to plan for the stakeholders' workshop, identifying roles for each stakeholder and exploring possible sources of funding for the platform. Stakeholders also discussed possible ways of partnerships between the private sector and government institutions. The committee came up with a proposed structure of the platform to be presented to the stakeholders for discussion and feedback during the meeting.

The next day, a large stakeholders' workshop was held in Jos, Nigeria, and in Bafoussam, Cameroon. More than 300 key actors and players in the potato industry attended in Jos and about 60 in Bafoussam. NPCK gave a presentation of the importance, formation, and functions of a multistakeholder platform. A second presentation was made on the status of the potato industry in Kenya and the formation and role of the country's potato platform. The proposed structure of the potato multistakeholder platform was presented to stakeholders in the meeting in both countries. Participants discussed pros and cons of the presented structure and functions of the platform, and gave their feedback about the expected roles of the platform. Challenges in the potato industry were also discussed. Finally, participants agreed on the expected role of the platform and on the staffing, location, and other issues of the platform's operationalization.

Tunisia. In January 2020, Dr. Sharma elaborated the initiative to form the potato stakeholder platform, with the example from NPCK Kenya (link to PPT1 and PPT2), to relevant personnel of the national potato group from CTPTA, INRAT, Mabrouka, DGPA, GIL, UTAP, BECOSA, and GIZ–Tunisia at CTPTA's Tunis facility to help Tunisian partners develop the specific plan and guidelines in structuring potato platform initiative.

The potato sector in Tunisia is complex, with many stakeholders and conflicts of interest.

Because of this complexity it has not gained the strategic importance enjoyed by cereals, olive oil, dates, and the like. Nor are there institutions or credit lines that specifically finance the potato sector. Involvement of three ministries—namely the Ministry of Agriculture and Water Resources and Fisheries, the Ministry of Trade, and the Ministry of Industry and Technology—in the potato sector has further complicated the coordination and structuring of the sector. A presentation on "Potato Stakeholder Platform Forming Initiative" sparked some serious discussion among the stakeholders, including the challenges in the potato industry. Participants emphasized the need for a harmonized potato multistakeholder platform for an efficient and organized potato sector to bring together the different stakeholders, professionals, and potato value chain actors to add value for all stakeholders and an economic dynamic in potato production. Participants also discussed PPPs within the sector that could stimulate and initiate this platform and ensure its moderation. At the end, participants agreed to organize one potato value chain stakeholder meeting to advocate the importance of potato and the need to have a functional stakeholder platform to bring all potato actors and players together to transform the potato industry. It was also agreed to develop a national potato strategy and submit it to the new government for approval. Participants agreed to identify roles for each stakeholder, explore possible sources of funding for the platform, and identify possible ways of strengthening PPPs.

1.2.4 Others

CIP's focal person is in discussion with the Mali focal person of GPVCWG about advisory support to develop a potato sector strategy for Mali, together with international potato consultants and technical advisors from different countries with experience from Mali. A "write shop," to be held either in Belgium or Bonn, had been planned, first for late 2019 then postponed to 2020. Owing to COVID-19, however, it has now been cancelled.

CIP advisory support was also planned for India, Mali, and Nigeria in March–May 2020 to support them in EGS and GAP needs for seed and ware potato production. But after being postponed because of the coronavirus pandemic, it has been now cancelled and resources diverted to support the CoE for cuttings in Nigeria.

Needs-based specific interventions were discussed for GPVCWG Phase II, which were nicely presented in the GPVCWG Phase II proposal (December 2020–October 2022, 22 months).

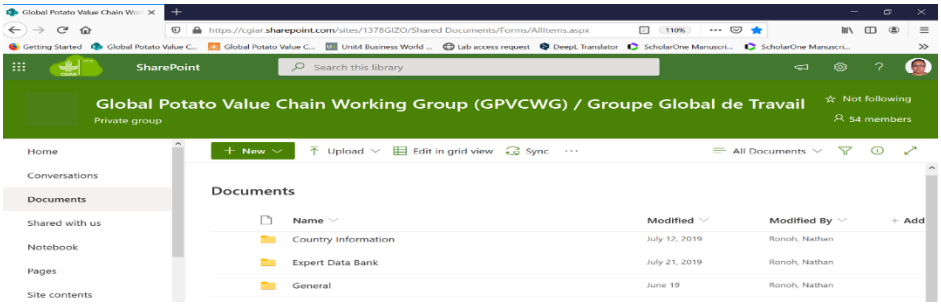
1.3 Regular communication and information exchange

The CIP and GIZ focal persons are in regular communication via Teams, Skype, or email. A Potato Knowledge Repository, in the form of a SharePoint site (Figure 2) has been created. SharePoint site was introduced and presented to the participants on the last day of the Nairobi GPVCWG workshop. Currently, the CIP IT team is refining the SharePoint site to make it more user-friendly. With these changes, the SharePoint site would be able to serve as a platform for regular communication and information exchange among the GPVCWG, the GIZ in-country focal persons and specialists from the national programs of SEWOH partner countries, and the CIP and GIZ focal persons.

GIZ GPVCWG has also developed a SharePoint and knowledge repository web (https://green-innovation-wiki.net/index.php?title=Special:UserLogin&returnto=Main_Page&returntoquery=). It also contains information about the GPVCWG.

GIZ GPVCWG networking, virtual meeting, and exchange to the members of partner countries have also been facilitated for GPVCWG within the GPVCWG Teams-Room by Microsoft-teams. Two meetings took place: the first on 7 September 2020 to discuss the road map and entry points across GPVCWG partner countries for the CIP advisory service for GPVCWG Phase II (link to GPVCWG Phase II support activities by CIP); and the second on 1 December 2020. The CIP focal person gave the overview of advisory services given by CIP under GPVCWG Phase I (link to GPVCWG Phase I support activities by CIP).

Figure 2. Screen shot of SharePoint site for GPVCWG. Visit https://cgiar.sharepoint.com/sites/1378GIZO/Shared%20Documents/Forms/AllItems.aspx



2. Concluding remarks

A road map with different entry points for Cameroon, India, Kenya, Mali, Nigeria, Tunisia, and Uganda was agreed during the GPVCWG workshop in Nairobi. Three very high priority areas were identified: (1) capacity building for EGS production, (2) formation of a potato stakeholder platform, and (3) country-adapted GAP in potato production, based on knowledge and evidence. The road map with different entry points for the three high priority areas were further discussed, identified, and mapped out in the Second GPVCWG annual workshop in Tunis for Cameroon, India, Mali, Nigeria, Tunisia, and Uganda. As SEWOH partner countries are at different stages of the implementation of these three high priority areas, the design of interventions would be country specific. Both workshops were instrumental in designing and refining the demand-driven services of CIP's advisory and technical support for the GPVCWG partner countries.

Within the current project duration, CIP's support has been geared to capacity building of EGS production via RACs in India, Nigeria, and Tunisia. This technology can fast-track and transform the current trend of EGS production in SEWOH partner countries, where availability of quality assured EGS for further multiplication is the major bottleneck. More programmatic backstopping support needs to be planned to ensure the successful deployment of RAC technology by EGS multipliers. Together with the capacity building in EGS production via RAC, diagnostic tools to support the seed QA services was also promoted. In addition, CIP's focal person revised the seed

potato certification guidelines and standards for Uganda. This initiative is of importance to harmonize the seed potato trade across the EAC border countries, and is a key innovation to bring changes in the seed regulatory or policy framework related with advisory services provided to Ugandan partners via the GPVCWG.

It has been noted that domestic seed multiplication and retailing needs to be developed into a commercially sustainable and viable seed sector via a PPP approach. This requires seed producers to have the capacity to multiply its EGS for at least two to three generations—only then will seed producers be able to make a profit. These countries need support in sustainable seed business development and effective seed QA services. In addition, specific attention is required on GAP for both seed and ware potato production so that smallholder yields increase and close the current yield gaps. Low productivity is caused by a combination of use of poor-quality seed, suboptimal agronomy, and crop protection practices in these countries. A systems approach is needed to improve the technical abilities of these smallholder farmers in these three areas for sustainable potato production. Soon CIP, via the GPVCWG program, will provide further technical backstopping and advisory support in these areas to SEWOH partner countries.

The potato sector of SEWOH partner countries relies almost entirely on seed potatoes imported from Europe. European variety owners have not permitted the rights of these varieties for the TC plantlets for EGS production. Without the starter material, neither the potato variety nor development of a seed system development program are possible. There is a strong desire from SEWOH partner countries to reduce their dependency on the importation of seed potatoes. Importation of seed from Europe brings European pathogens, which should be avoided. A domestic seed system based on TC mother plants could completely avoid this risk and strengthen the local economy. Deployment of CIP germplasm in these countries could be a viable option for the variety and seed system development. Therefore, efforts are geared to this initiative as well.

Establishment of National potato platforms have been just started in different countries to bring together the key stakeholders of the sector and facilitate constructive dialog and collective action. The most prominent of these platforms is NPCK in Kenya. Advisory support on an initiative to develop a national potato platform in Cameroon, Nigeria, and Tunisia was instrumental to advocate the importance of potato, and the need to have a functional stakeholder platform to bring all potato actors and players together to transform the potato industry. This advisory support brought important stakeholders together so that they could understand the importance of such a platform—one of its major initiatives. Once established, a platform could serve as the forum for engagement, advocacy, solution search, and information management with the aim of transforming the potato industry. Importantly, the platform should not implement projects; it should only facilitate interactions and political advocacy, avoiding promoting itself as a project-dependent institution.

With the current COVID-19 pandemic and travel restrictions, the planned advisory consultations and technical backstopping have been postponed several times. Different contingency plans such as in-country consultancy option, virtual training, and backstopping options were looked at and implemented. This was well coordinated with the GPVCWG partner countries' respective focal person; virtual advisory support was planned accordingly (this applies to India, Tunisia, and

Uganda).

The success of the GPVCWG program depends on the timely demand of the services by SEWOH partner countries from CIP's focal person for the program. Because of the current pandemic, priorities have been changing. This has hindered not only the planning and design of the advisory services by CIP, but also the various logistic issues from a budgetary and contractual point of view between CIP and GIZ for this project. More coordinated support to SEWOH partner countries is planned for 2021 and onwards under GPVCWG Phase II project when lockdowns and travel bans are eased. The CIP team is looking forward to providing these support services for the development of a potato sector in the SEWOH partner countries.

Annexes

Annex 1. Program of Dr. Monica Parker of CIP on RAC technology for rapid seed potato multiplication to Indian partners in Bengaluru, India

Venue: College of Horticulture, UHSB, Bengaluru, 5–6 November 2019

Day 01, 05 Nov 2019		
Time	**Program**	**Facilitator**
9.15 AM	Registration	
9.30 AM	Welcome and Introduction	Ravindranath Reddy, CIP- Karnataka
9.40 AM	Opening Remarks	Dr. Samarendu Mohanty,
9.45 AM	Introduction- Apical Rooted Cutting Technology	Dr. Monica Parker, Senior Scientist, CIP
11.00 AM	Tea/Coffee	
11.15 AM	ARC Cont.	
12.00 Noon	Visit to Tissue Culture Lab and Screen House	Ravindranath Reddy
	Tissue Culture– Experience Sharing	India National Potato Program (Central Potato Research Institute), CIP, PTC and UHSB (University of Horticulture Sciences Bagalkot)
1.00 AM	Lunch Break	
2.00 AM	Hands-on Training to Produce Cuttings	Dr. Monica Parker
4.00 AM	Tea/Coffee Break	
4.15 PM	Hands-on Training Cont.	Dr. Monica Parker
5.00 PM	Closure	
Day 02, 06 Nov 2019		
9.30 AM	RECAP	Ravindranath Reddy
9.45 AM	Hands-on Training to Plant Cuttings Mother Bed Preparation, Spacing, Planting Care	Dr. Monica Parker
11.00 AM	Tea Break	
11.15 AM	Training Cont.	Dr. Monica Parker
12.00 Noon	Open Discussion	
1.00 PM	Lunch Break	
2.00 PM	Developing Roadmap: Integration of cuttings into seed system Action Plan preparation	Dr. Monica Parker Ravindranath Reddy
2.30 PM	Plenary	
4.00 PM	Tea/Coffee Break	
4.15 PM	Feedback and Wrap-up	

Annex 2. Participants of RAC and LAMP Assay training from Mali, Nigeria, and Tunisia on 16–18 October 2019, Nairobi, Kenya

SN	Country	Name	Gender	Email	Phone Number	Organization
1	Nigeria	Stephen Yakubu-Atar	Male	yakubuatar@yahoo.com		Da-all green Seeds Ltd
2	Nigeria	Lomak N Yakubu	Male	lomaknyam@gmail.com.	+234 811 567 0683	Fruits and Veggies Global Ltd
3	Nigeria	Ponchang Wuyep	Male	zhimak.wuyep@gmail.com	+234 803 450 3176	University of Jos
4	Mali	Abdoulaye Sidibe	Male	abdoulayesidibe@yahoo.fr	(+223) 76 31 04 40	IPR/IFRA de Katibougou
5	Mali	Moussa Abdoulaye	Male	kanfaro30@yahoo.fr	+223 65 70 85 26	IPR/IFRA de Katibougou
6	Mali	Binta Diallo	Female	bintasdiallo@yahoo.fr	(+223) 76 3039 84	LABOSEM DNA, MA
7	Mali	Sidy Diabate	Male	sidi.diabate@yahoo.fr	(+223) 66 95 43 04	Kati, Seminice
8	Tunisia	Mohamed Ben Mansour	Male	becosa.tn@gmail.com	+216 98349809	Société privée "BECOSA"
9	Tunisia	Haroun Ben Ammar	Male	harounbenammar@gmail.com	+216 97658686	Ministère de l'Agriculture
10	Tunisia	Kamel Arfaoui	Male	arfaouikamel808@yahoo.fr	21699141563	Ministère de l'Agriculture
11	Tunisia	Mohamed Fakhri Khouri	Male	mdfakhryfn@gmail.com	2162954834	Société privée "Mabrouka"

Annex 3. Meeting minutes of NSCS Namere, Uganda

Date: 10 February 2020
Venue: NSCU Namere, Uganda

Participants:

Mr. Joseph Bazaale, Head NSCS Uganda
Mr. Issac Wamatsembe, NSCS Uganda
Mr. Siraj Kamari Nyende, NSCS Uganda
Mr. Tugume Joab, NSCS Uganda
Mr. Bonny Ntare, ISSD Uganda
Mr. Komayombi Bulegeya, UPP Uganda
Mr. Pieter Wauters, CIP Uganda
Ms. Kalpana Sharma, CIP Kenya
Mr. David Hirst, IFDC Uganda

Meeting agenda:

- Need of standalone seed certification guidelines and procedure for seed potato considering different seed category
- Streamlining seed potato certification schemes (i.e., formal seed certification and QDS)
- Ratification of apical rooted cuttings into a seed act/norm/regulation
- Mapping important actors of potato value chain (seed, ware, processors, etc..) to develop a sustainable seed business model

Way forward:

- Draft doc for vegetatively propagated crops including potato is in progress by MIAAF, NSCS team will share it to Kalpana Sharma of CIP to review, edit and add needed information to the seed potato
- Share the protocol of apical rooted cuttings that has been endorsed in Kenya so as to establish the benchmark for RAC production
- Pieter needs to organize a quick field trip to visit two–three cutting producers together with NSCS team
- Mapping out of important potato stakeholders (Bonny, ISSD Kenya and Pieter, CIP Uganda)
- Stakeholder meeting for RAC and new revised standalone seed certification guidelines and protocol for validation and endorsement (financial support from ISSD, IFDC, CIP)
- Current manual for inspection of QDS in Uganda (December 2018) developed by IFDC/ISSD in collaboration with MAAIF to be used at field level while full potato specific guidelines are developed and endorsed.
- Share IITA report on Survey and Management of Potato Pest in Uganda including PCN

Taskforce: CIP, ISSD, IFDC, UPP, NSCS

Annex 4. Program of advisory and technical backstopping support of CIP focal person to Tunisian partners in Tunis, Tunisia

Date (2020)	Program
27-Jan	Arrival in Tunis
28-Jan	Developing GAP at CTPTA
29-Jan	Developing GAP at CTPTA (half day)
29-Jan	Working session on potato sector coordination/platform formation with national potato group at CTPTA (half day)
30-Jan	Workshop by IAAA program on contract farming
31-Jan	Follow up on apical rooted cutting: visit to GIL and Mabrouka
01-Feb	Departure from Tunis

CIP is a research-for-development organization with a focus on potato, sweetpotato and Andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems. Headquartered in Lima, Peru, CIP has a research presence in more than 20 countries in Africa, Asia and Latin America.
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