Scaling project – 2020 Annual Report

Project title: Scaling RTB crop variety validation and diffusion using farmer citizen science in Ghana and Rwanda

Project start and end date: January 2020 - December 2021

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Project lead organization: Alliance of Bioversity International and CIAT: www.bioversityinternational.org, www.ciat.cgiar.org, www.rtb.cgiar.org.

Implementing Partners:

1. CSIR-Crops Research Institute
2. CSIR-Savanna Agricultural Research Institute
3. Ministry of Food and Agriculture/Department of Agriculture, Ghana
4. International Institute of Tropical Agriculture (IITA)
5. International Potato Center (CIP)
6. Reputed Agriculture 4 Development Stichting & Foundation (RA4D)
7. Rwanda Agriculture and Animal Resources Development Board (RAB)
8. One Acre Fund (OAF)

Countries of intervention: Ghana and Rwanda

Total budget: USD 967,891

Date of submission: February 2021

Progress and results

Outputs

Summarize the level of achievement of each output and briefly present the key milestones completed.

Refer to the list of deliverables reported for more details (see Annex 1).

Output 1. Tools for implementation of tricot in RTB crops - with gender as an important cross-cutting dimension.

Deliverable 1.1. Agreed protocol for potato. The protocol for potato was developed through an iterative process between the CGIAR centres, RAB, and OAF. The most problematic issue being agreeing on the traits to be collected. The protocol was subsequently delayed, this would have been easily resolved had in-person meetings been allowed, unfortunately, COVID-19-related restrictions prohibited that. The protocol served the planning, trials, and data collection well, providing a solid reference point. In some instances, minor *ad hoc* changes were made to adapt to the dynamic situation of COVID-19. These changes are now being addressed in an updated version of the protocol that will serve to guide the second season trials (cassava and potato) beginning in February-March 2021. We also developed a trait evaluation booklet to facilitate data collection with farmers. Following the learning from the team in Ghana, the Rwandan team made simple and easily understood guides that describe the tricot data collection process and what traits would need to be assessed by farmers. These booklets were made with images of the traits (Figure 1), allowing farmers to easily distinguish between the better and worst example of the trait. Receiving feedback from farmers we found that they were able to understand the traits.

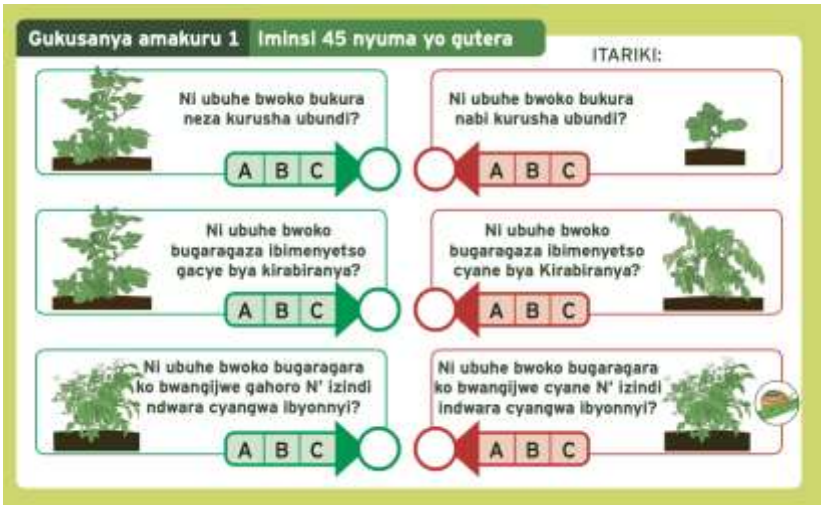


Figure 1. Example of characteristics for data collection, potato in Rwanda.

Deliverable 1.2. Agreed protocol for sweetpotato. The protocol/workplan for Ghana was developed in consultation with NARS breeding program partners, and with input from Department of Agriculture partners during the start-up workshop, and in subsequent discussions. It generally guided implementation in 2020, though certain elements of the protocol were not completely followed. Efforts were made to recruit female farmers to the extent possible. The protocol stated that a RHoMIS survey of participants would be conducted, but this was not in fact done, partly because of disruptions to plans caused by the COVID-19 pandemic. It was decided not to develop the evaluation cards for farmers as their added value was considered to be small and the issue would be better addressed by having extension agents implement a more intensive effort to gather the information through periodic farmer interviews (*Deliverable 1.5 Communication materials for sweetpotato*). The postharvest assessment stage of data collection was also not followed through to the extent initially envisaged. Thus, the protocol for 2020 deviated from the initially anticipated protocol on the basis of practical decisions made with partners during the process of implementation, and for 2021 is undergoing further revison based on lessons learned during implementation and during discussions with partners on the way forward. The final protocol for 2021 will be based on robust analysis of the combined results from 2020, and will be arrived at in discussion with parners. The agreed upon protocol will be incorporated in training materials for the 2021 growing season and will include farm and farmer characterization, preharvest, harvest and postharvest protocols for research and extension partners as well as illustrations of traits to facilitate evaluations by farmers. These will be adapted from the templates developed for potato and cassava in Rwanda.

Deliverable 1.3. Agreed protocol for cassava. The protocol for cassava was agreed in Q2 of 2020, with IITA and RAB generating a protocol similar to that of the potato, in terms of distribution, trial layout, and data collection. As with potato, there were extensive discussions on the characteristics to collect, but this was resolved more rapidly due to the decision being made between only two

institutes. The protocol has been largely adhered to in the distribution and trial set up, it is now serving as the basis for data collection which will continue into Q3 2021.

Deliverable 1.4 & 1.6 Communication materials for potato and cassava. Working with a graphic designer and artist, we developed a suite of images to facilitate, in the most visual manner possible, the steps for developing a tricot trial and how to assess the characteristics and record the data (Example Step in Figure 2). These were translated into Kinyarwanda and could easily be translated into other languages, if the trial layout was similar. These images and guides will be made available and editable on the ClimMob website to allow other users to develop their own guides.

Figure 2. Example of step presented in farmer guide, communication on how to set-up a tricot trial.

These were distributed to all farmers implementing trials for cassava and potato.

Output 2. Data from first rounds of tricot trials – with capacity building as important crosscutting element.

Deliverable 2.1. Training in Ghana. Orientation training for project partners on the project in Ghana was conducted in March 2020 along with discussions on protocol development and initial planning for trial implementation with CSIR breeders and Ministry of Food and Agriculture extension partners.

Training in Rwanda. Training of the implementation teams involved in the project from the partners (RAB and OAF) was performed in August 2020. The training involved discussions on tricot, how to set up a trial, characteristics to be collected, and data collection. Farmer facilitators (individuals who work in the rural communities to support farmers and provide RAB approved recommendations) who would support farmers with their trials were implemented in July 2020, with more than 40 farmer facilitators trained on the tricot approach, trial set up, and data collection.

Deliverable 2.2. Trial design and seed multiplication - potato. The trial design was developed through collaborative discussions beginning in the kick-off meeting in Kigali between the CGIAR, RAB, and

OAF. RAB agreed to be the multiplier for the project. 13 varieties were selected, which were of interest for RAB. 11 of these were novel and 2 selected as controls (those already recommended by RAB and the Ministry of Agriculture). Trials were set up so that each farmer received 40 tubers of each variety. Farmers were then instructed to plant 10 tubers per row, with 4 rows. Full trial design can be found in the deliverable document.

Deliverable 2.3. Trial design and seed multiplication - sweetpotato. In consultation with partners, Extension Directors from Regions which had been identified during preparation of the project proposal were engaged and Districts to be targeted were identified. The list of genotypes evaluated included 11 already released varieties and 6 advanced genotypes in the pipeline for release. Two approaches were taken to planting material multiplication; in the North, an effort was made to decentralize multiplication, engaging with 4 trained commercial vine multipliers, while in the south, multiplication for trials was centralized at the CSIR-Crops Research Institute. Both strategies had their pros and cons, with only one of the northern vine multiplication sites ultimately producing most of the planting material used in the North. Both the North and South ran into delays due to Covid-19 lockdown (till mid-June), followed by drought during most of the month of July. There was a strong consensus among stakeholders that a more concerted effort on decentralized multiplication will help to ensure timely delivery of trials in 2021. Based on the discussion between RA4D and CSIR-CRI, the scaling partners, in mid-January 2021, we agreed to establish tricot multiplications with two already existing and well-trained sweetpotato multipliers in the South to fulfil the needs for vines as well as to resolve the problem of the planting material availability in-timely manner. This will give into a consequence of additional funding on supervision, visit and traveling to assure the vine multiplication management according to a QDPM protocol introduced under the CIP-led project "Jumpstarting OFSP in West Africa through Diversified Markets".

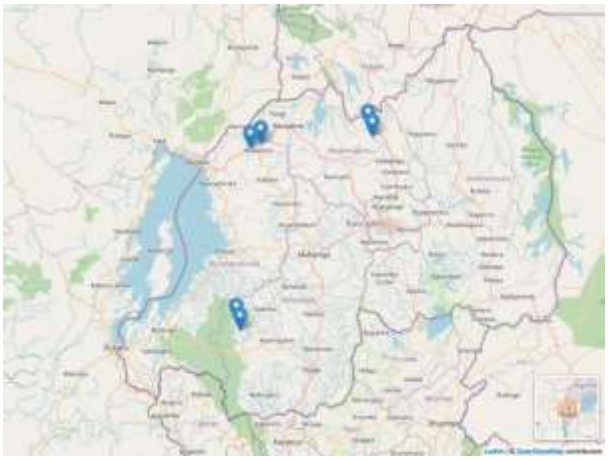
Deliverable 2.4. Trial design and seed multiplication - cassava. The trial design was developed through collaborative discussions beginning in the kick-off meeting in Kigali between the CGIAR and RAB. RAB agreed to be the multiplier for the project. 8 varieties were selected, which were of interest for RAB. 6 of these were novel and 2 selected as controls (those already recommended by RAB and the Ministry of Agriculture). Trials were set up so that each farmer received 40 cuttings of each variety. Farmers were then instructed to plant 10 cuttings per row, with 4 rows. Full trial design can be found in the document uploaded to MEL.

Deliverable 2.5.1. Trial package distribution, farmer training and data collection (sweetpotato) – year 1. Status of trial packages distributed and data collection in both the main rainy season and the southern "minor" season are presented deliverable uploaded to MEL. Trials were established in 7 regions, with varying numbers of Districts participating per region. In the North, the Northern Region had higher numbers of farmers because of its proximity to SARI and the CIP office, and the need to restrict movements during the Covid-19 lockdown, but ultimately 1281 packets were distributed across 7 Regions in the main rainy season and 268 trials were registered in the minor season. The dates of planting of trials are presented in the Table and show that in most cases, trials were planted later than anticipated in the work plan (June to early July). Training of extension partners on data collection using the ODK app was conducted at the time of planting material distribution in each Region. Numbers of agents trained in each region, by gender, are presented in the document uploaded to MEL. Numbers of farmers registered for trials show that women were a minority across all Regions, but that roughly 30% of the trials were registered to females. Losses

during establishment or during crop growth due to a variety of reasons including drought, theft and animal grazing resulted in roughly 23% of main season trials being lost by harvest, but this still resulted in final data from 915 trials harvested. There was also significant attrition during establishment of the minor season trials, especially in the Central Region. Postharvest assessment was neglected somewhat in the protocol, due to the feeling that tricot assessment can easily be done at the market level, as had been successfully demonstrated in the previous season. Only after the collection of harvest date was it realized that greater efforts should have been made to collect postharvest (storability and taste) data. As this had not been explicitly pursued in combination with the collection of harvest data, it proved difficult to retrospectively collect postharvest data, as reflected in the table.

Map of sweetpotato tricot trial locations (communities) in Ghana.

Deliverable 2.5.2. Trial package distribution, farmer training and data collection - potato. For potato, packages were distributed to 230 farmers, with 150 trials managed by RAB and a further 80 managed by OAF. Farmers were distributed across 7 districts, including the key potato growing regions. Packages were distributed at the start of September 2020, with all trials established within a week of distribution. At distribution farmers were trained on the basics of the project, tricot, trial set up, and data collection. To support this, farmers were provided with the farmer guide as well as the characteristic booklet. Data has been successfully collected for all pre-selected time step (pre-harvest, harvest, post-harvest) for all trials. There was noted to be some losses in some trials, with some impacts of thieves. Data collection was completed by both partners in February 2021, with analysis to begin in Q1 of 2021. During the course of the trial, a RHoMIS-core survey was performed on each of the 230 heads of household. Plans are now being implemented for distribution of packages to farmers for the second season, scheduled for March 2021.



Map of potato tricot trial locations (communities) in Rwanda.

Deliverable 2.5.3. Trial package distribution, farmer training and data collection - cassava. Packages were distributed to 160 farmers across 4 districts in western Rwanda. Packages were distributed in September 2020, with all trials established within two weeks of farmers receiving their package. At distribution farmers were trained on the basics of the project, tricot, trial set up, and data collection. To support this, farmers were provided with the farmer guide. Unfortunately, the characteristic booklet was not completed in time and will be distributed to farmers in February 2021. Data has so far been collected for the first data collection in the pre-harvest period. A further 6 data collections will be performed before harvesting in August/September 2021. Distribution of packages to farmers for the second season will begin in February 2021.

Map of cassava tricot trial locations (communities) in Rwanda.

Deliverable 2.6. Data analysis and report preparation – year 1. Data analysis for individual tricot projects from the major season trials in Ghana was analyzed using Climmob and preliminary results presented to participants in evaluation and learning workshops held in December 2020. Initial combined analysis of the analysis (across projects) has been completed and will be shared with breeders and extension partners during February 2021, as well as provide a more comprehensive assessment of results to be given to farmers and extension agents who participated in each District or Region. Initial results are presented in the figure below, and indicate superior performance of two recently released varieties. These feedback sessions will take place with stakeholders during

February or early March 2021, and will be critical to planning of work this year, including scaling of the tricot method and dissemination of selected varieties (complementary technologies) under this project.

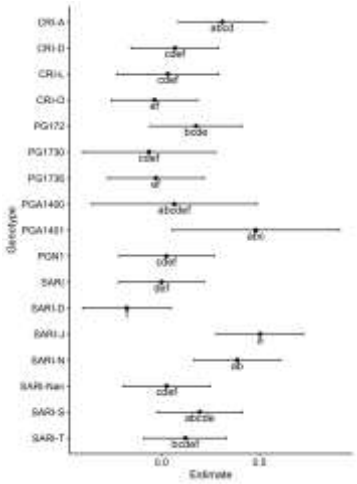


Figure. Illustrative statistical results: 'overall performance' (worth estimates) from the tricot tests. Clear statistical groups are evident. Two recently released varieties show superior performance.

Output 3. Knowledge on how best to conduct tricot and framework on how to embed it institutionally.

Deliverable 3.1. Report on evaluation and learning workshop round 1 – Ghana (lessons learnt and refined scaling strategy and action plan). The report of the two workshops held in December in Ghana is linked above. The meetings generated considerable constructive discussion, and reflected general enthusiasm of the extension and research partners for the tricot methodology. It also highlighted that application of tricot to sweetpotato in Ghana is a work in progress, and there is a need during year 2 of the project to refine and adapt the method to the institutional situation in Ghana in order to successfully embed tricot within the research and extension systems.

Deliverable 3.2. Evaluation and learning workshop round 1 - Rwanda (lessons learnt and refined scaling strategy and action plan). Unfortunately, these were delayed due to the impacts of COVID-19. Meetings were performed with RAB-potato and OAF in February 2021 via digital meetings, due to the distribution of season 2 packages to cassava farmers, the learning meeting with RAB-cassava has been delayed until March 2021. Following this, all results will be collated into Deliverable 3.2.

As a project, we plan to have a cross-country learning online workshop between Ghana and Rwanda in March 2021, so that teams and partners can co-learn on what has and has not worked in their respective countries.

Outcomes

Present a quantitative assessment of the results achieved and explain any difference with the expected targets. Refer to the project proposal for the complete list of research and development outcomes.

Indicate what was the project contribution in institutionalizing capacities to foster the scaling process (what organizations/groups are capable of taking this forward beyond the scaling project – in terms of knowledge, interest, and means to do so; with some supporting evidence for claiming this).

Present other effects (positive or negative) that were not foreseen beforehand (e.g. new partnerships which came into existence that also have a positive contribution to other things than scaling that particular innovation; changes in the policy environment that show increased government interest in particular crops, integrated agricultural/livelihood approaches, etc.; unexpected negative environmental trade-offs of intensification practices; unexpected social or gender-related biases related with components of the innovation package or scaling strategy).

Research and Development outcomes under this project are aggregated across both Ghana and Rwanda.

The Research outcomes are:

1. The analysis of 1-2 seasons of farm-level data are being used to improve the targeting of variety dissemination and feed back into breeding program priority setting. This outcome has **gender** as in important crosscutting dimension; the targeting will involve an analysis of gender and socio-economic heterogeneity.

2. A customized on-farm variety evaluation / dissemination scheme in Ghana and Rwanda that develops variety recommendations based on an experimental network of at least 10,000 farms in each country has been established, improving variety recommendations for an area covering 100,000 farming households.

3. Institutional support of tricot as an approach that improves targeting of RTB varieties, evidenced by mainstreaming efforts across organizations in Ghana and Rwanda, has been generated

The development outcomes are:

1. Demand for improved varieties expressed by at least 50,000 households; and

2. Validated and tailored variety recommendations made available to 100,000 households.

In this interim report definitive evidence of the institutionalisation or mainstreaming of tricot within project partners' workflows and frameworks is sparse. However, during the course of the first year of the project there is clear evidence of a shift in perceptions of the methodology within both One Acre Fund (OAF) and the potato program of the Rwandan Agricultural Board (RAB). In the case of OAF there have been increasing calls for not only methodological evidence of the superiority of tricot to their current system (tricot trials versus traditional on-farm trials) but also financial evidence. OAF are pretty open in the fact that they will only implement tricot if it is effective and cost efficient. We are now in the process of developing a methodology for estimating cost-benefit analysis of tricot versus their current system of variety selection. A similar process has been noted within the potato program of RAB, where the lead says he sees the methodological superiority of tricot, but to convince his superiors will need to demonstrate that tricot is more resource-efficient. Provision of evidence for the financial and methodological benefits of tricot seem to be one of the few impediments for mainstreaming tricot in both entities. This claim can be supported by OAF Tanzania communicating with OAF Rwanda who recommended tricot and have begun their own

independent trials, demonstrating the institutional interest in tricot by an organisation serving more than one million farmers in Africa.

Unfortunately, in the case of the RAB cassava program, there seems to be a lot less scientific interest in tricot. The CGIAR centers have had to lead every step of the development of the trials and data collection. This is disappointing as the project offered an opportunity to apply tricot on a crop with a long cycle for the first time. However, this also is an important lesson, in that there should be evident buy-in from partners before implementing and then scaling methodologies like tricot. For the cassava program in RAB cassava, it seems that only a top-down approach would work for embedding, rather than a desire coming from the staff working on the project and selling tricot to their superiors, as is the case with potato. Fortunately, the RAB potato team is very interested, so institutionally, there is still a good chance that RAB will adopt the approach.

In Ghana, significant progress was made during the first year of the project, starting around June 2020, despite challenges presented by both the Covid-19 pandemic (which resulted in CIP and government office closures and hampered implementation at all levels due to travel restrictions). A further challenge was the decision by CIP was to close its office in Ghana, by 1 November 2020, at the end of 2020 resulting in some disruptions to project implementation and supervision at all staff levels. The project implementation was successfully transferred to Reputed Agriculture 4 Development Foundation. Despite these challenges, during the first year of the project, in collaboration with Ghanaian sweetpotato breeders and government extension partners (over 90 agents were involved), planting material was multiplied and tricot comparisons of 17 released or advanced sweetpotato genotypes were conducted at over 1,500 farms (approximately 30% female) across 7 Regions (4 in the North and 3 in the South). Analysis of results is ongoing, but preliminary results are exciting and will likely strengthen confidence in the performance of some recently released varieties. Results from 2020 may also contribute to the development of a variety release dossier for one or more of the advanced lnes evaluated. Feedback from partners, including farms, so far indicates a high level of engagement and interest, and willingness to work to embed the approach within the Research-extension environment in Ghana. Results of analysis of 2020 trials and continuing engagement with partners for planning of 2021 work will continue to guide us with respect to achieving the project's research and development outcomes.

Impact

Present a qualitative and, as far as possible, quantitative assessment of the contributions toward the expected impact (e.g. indications that achieved outcomes contributed and will contribute to changes in livelihood, food and nutrition security, business opportunities, resilience to climate shocks, sustainable management of resources) and explain any difference with the expected targets. Refer to the project proposal for the initial impact statement.

The project document states that by the end of 2022: "In Ghana, we expect 30,000 farmers to adopt improved sweetpotato varieties. In Rwanda, we expect 10,000 farmers to adopt improved cassava varieties, and 10,000 farmers to adopt improved potato varieties by 2022. This will result in improved RTB varieties adopted by at least 50,000 farming households in Ghana and Rwanda (2022). For Ghana, we will put special emphasis on the inclusion of women and youth along the sweetpotato value chain, from the production of planting material of the new, improved varieties to the production for specific markets and the processing of roots for urban markets. The tricot data collection will thus not only include the farmer growing the improved varieties, but also the processors of sweetpotato, to make sure that the varieties being scaled are preferred by end-users and consumers." To achieve our expectation by the end of 2022 as we stated above, the scaling process of the Tricot technology should be done in 2021. Therefore, we have slightly modified the RTB Tricot Scaling Partnerships in Ghana as seen in the figure below.

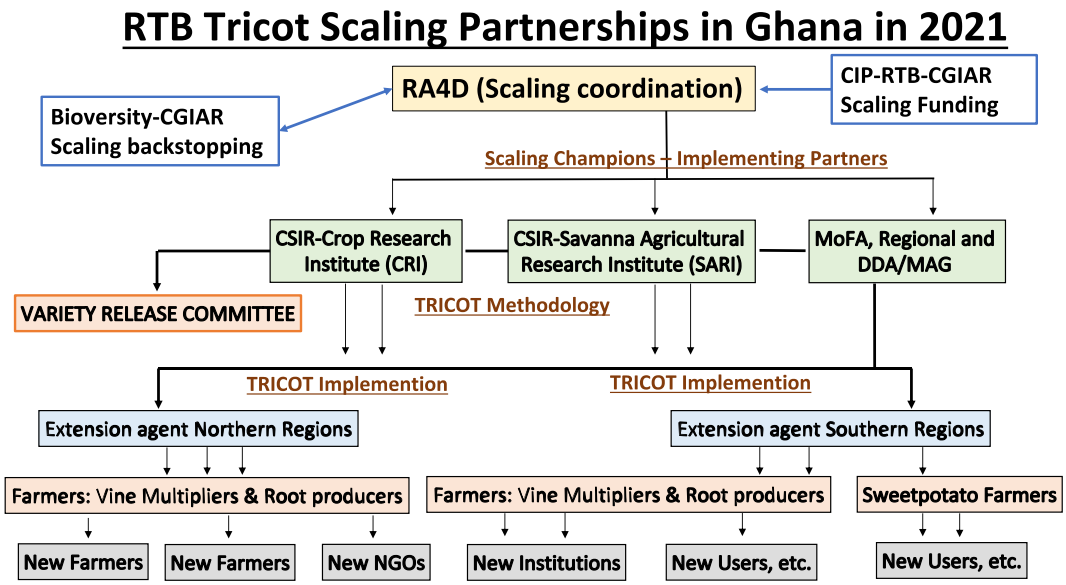


Figure. A slight modified structure of Tricot Scaling Partnerships during the Scaling Process in 2021

As the first round of results is now available, we can confidently confirm that the experimental results are robust. The insights into the performance of already released and advanced sweetpotato genotypes have been successful in all the major production environments of Ghana and will therefore be able to inform decisions relevant for the majority of producers. In 2021, the Scaling process should occurs as we shift the Scaling champion from the CIP-Ghana office into the national partners. For instances, the NARS, i.e. CSIR-CRI and CSIR-SARI are the Scaling Champions for Tricot Technology and MoFA, Regional and DDA/MAG Scaling Champion for Implementation (Fig). While the process of refinement, adaptation and validation of the core innovation (tricot method) will continue in 2021, efforts to scale the complementary technology of superior varieties identified in 2020 will receive attention. A cost-benefit study conducted in northern Ghana in 2020 showed that tricot can outperform current approaches. In 2021, we will work to ensure the next steps to follow our Theory of Scaling, which should lead to institutional confidence in the tricot approach and its results and lead to mainstreaming the approach by demonstrating its effectiveness though impact.

Also, for potato in Rwanda we have robust data that show the validity of tricot. A preliminary cost-benefit study (which will be finished in 2021 following our plan) shows that tricot can outperform current approaches. In 2021, we will work to ensure the next steps to follow our Theory of Scaling, which should lead to institutional confidence in the tricot approach and its results and lead to mainstreaming the approach. We are still confident that the project can lead to the impact described in the original proposal.

In Rwanda, we are still yet to complete the first season of data collection. This will be completed during the course of February for potato and August for cassava. However, early results are encouraging with the results surprising RAB colleagues, with novel varieties outperforming the 'gold standard' varieties for certain characteristics. The Rwanda team is discussing with OAF a methodology for evaluating cost-benefit of tricot for them, RAB-potato have also voiced interest in performing a similar analysis. As mentioned previously, the efficiency and cost-effectiveness of tricot is how OAF will judge whether to further trial tricot and eventually, if found to be effective and cost-efficient, implement across Rwanda.

Documentation and reflections on scaling and Scaling Readiness

Under this section we would like to capture (1) some strategic and key outputs of the scaling strategy development, implementation and monitoring using Scaling Readiness, and (2) reflections on the use of Scaling Readiness as a roadmap for more impactful scaling of RTB innovation. We will follow the logic of the 5 Steps of Scaling Readiness.

More detailed compliance with the Scaling Readiness implementation is captured through the compliance matrix.

Step 1: Characterization

Innovation package

- Describe the innovation package as defined in the project proposal.
- Explain which were the main changes that have been made in the innovation package and the reasons/ processes that have determined these changes.
- Explain whether and how the innovation package's core and complementary innovations were (re) defined
- Explain whether and how the innovation package was updated/ tailored for the different locations where the Scaling Fund project has activities
- Explain if and how the changes have enhanced or will enhance the scaling potential and /or the technical, economic, social and environmental viability of the innovation package.
- Explain whether and how the Scaling Fund project characterized the scaling context (other projects, stakeholder networks, etc.) in the locations where scaling is aspired.

Remarks/ comments/ feedback on Step 1:

Provide short update on how Scaling Readiness was applied and supported the characterization of the innovation and scaling context.

The innovation package was determined at a very early stage, including a workshop *before* the project started in Wageningen in August 2019. This helped to create a clear common vision and a comprehensive view of the different elements that needed attention for the success of the project. This was reflected in the project proposal and working plans for 2020. For example, it brought to the foreground elements that could have been easily overlooked, such as a cost-benefit analysis, which has already proven to be a crucial element to convince partners to adopt the tricot approach. The innovation package was reviewed again in the workshop in Kigali in February 2020 but was not fundamentally changed at that time.

The innovation packages as such were not updated during the first phase of the project, but emphases have changed. For example, in Ghana, seed production has found to be a challenge in the sense of its location – often far from the locations were materials had to be handed out. This element was deemed to be more "ready" than originally thought. In the second round of trials, more attention to engagement of vine producers in more decentralized locations will be given careful attention. Those same vine producers will also be partners in the dissemination of the

complementary innovation/technology (improved varieties). This step is enabled by the results of year 1, which are contributing to a more mature (or validated) innovation package as we go forward in 2021.

In Rwanda, the "institutional configuration" has been more on the foreground as the collaboration bridges the public and private sector. This part of the innovation package has been undergoing major shifts during the project. We expect that the trust-building process between RAB-potato and OAF will enhance the viability of collaborations around variety testing in the future.

Step 2: Diagnosis

Identification of bottlenecks for scaling for each of the locations

- Explain how the innovation package was assessed for (i) innovation readiness and (ii) innovation use for the different locations where scaling is aspired.
- Explain who assessed the (i) innovation readiness and (ii) innovation use of the different core and complementary innovations in the package
- Explain whether the identified bottlenecks differed across the locations where scaling is aspired
- Explain whether the identified bottlenecks differed from those that were identified in the Scaling Fund project proposal.

Remarks/ comments/ feedback on Step 2:

Provide short narrative update on how Scaling Readiness was applied and supported the diagnosis of bottlenecks for scaling.

In the kick-off workshop a rapid assessment was done with the main partners, which guided the workplan in both countries.

In Ghana, a Scaling Readiness questionnaire was prepared by the Ghana team at an early stage. However, the questions were not very precise. Furthermore, the questionnaire was administered in group sessions during the first year feedback/learning workshops. The stakeholders were grouped by region,but group discussions proved challenging and results were inconclusive. The results are available, but there is a need for further analysis.. The stakeholder engagement plan developed for Ghana by the CIP scaling champion is presented below (Fig). It is probably safe to say that the simply by engaging with partners during 2020 and producing interesting results, we have overcome bottlenecks associated with lack of familiarity with the method, and are starting to demonstrate its cost effectiveness and its potential power as a tool for broad engagement with partners and for dissemination through strengthened seed system capacity.

A key bottleneck that has emerged during the course of 2020, is the challenge of getting promised financial commitment from the regional extension directors. While letters of commitment offered promises of significant support, the reality has been otherwise, with partners (particularly extension) almost completely dependent on project funds. This element of financial commitment is one we must confront directly in order to really have an honest assessment of the scaling potential

of tricot primary innovation and the complementary technologies (varieties and seed system strengthening). We will know we are on the way to success when partners begin to actually commit to the approach.

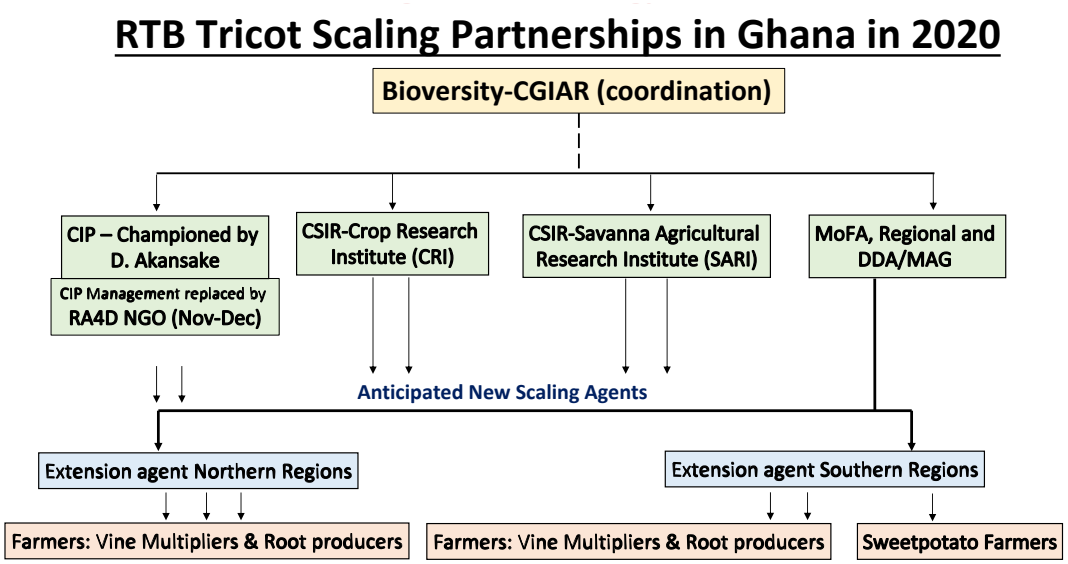


Figure. A stakeholder engagement plan was developed for Ghana by the CIP Scaling Champion for 2020.

Some highlights from the strategy are the need for face-to-face meetings and additional training on the tricot approach to assure the buy-in of partners. These insights have modified the priorities for 2021. Also, we have developed a more tailored questionnaire to gauge the experience of extension agents, as their opinion about the practicalities of the approach was deemed crucial to provide evidence. Overall, the experience was very positive (see Table below). One of the challenging aspects was the logistics of planting materials.

Table. Extension agents experience with tricot in Ghana (n=59). An important question was about comparing tricot with current approaches. Such benchmarking was deemed to be crucial in the project to create evidence.

Compared to other on-farm experimentation approaches that you are familiar with; how do you rate the tricot approach?	Much worse	0	0.0
	Worse	0	0.0
	Same	12	20.3
	Better	28	47.5
	Much better	14	23.7
	Not applicable (could not rate)	5	8.5

RA4D will lead a workshop which we plan to be conducted in Feb 2021, before the second year project to be implemented. In this workshop, the theory of scaling will be more emphasized. It will be based on the already prepared Theory of Scaling, shown in this report. We have also developed

a monitoring plan. We will closely consult the RTB scaling team to set our MLE including the research questions and the scaling measurement tools.

In Rwanda, a similar approach has been developed with a rapid assessment of bottlenecks and barriers to scaling performed in the kick-off meeting. Initial plans had been for a more in-depth assessment to be made through stakeholder engagement to understand their perspectives of tricot and ClimMob and the bottlenecks associate with them. We had planned to follow the lead of the Ghana team and use their modified questionnaire.

However, the planning and implementation of across two crops and the simultaneous need for distribution for the second season trials of both potato and cassava packages have stretched the human resources available to the project and have delayed this work. We will however engage with implementing partners and their staff on the ground to generate a better understanding of th bottlenecks after two seasons of implemtnation .

Step 3: Strategize

Scaling strategy

- Present the scaling strategy defined at the beginning of the project
- Explain which strategic option was selected (substitute, outsource, develop, etc.) to overcome the bottlenecks for scaling in the different project locations
- Explain how the decision of how to overcome the scaling bottlenecks was taken by the project and the key stakeholders.
- Explain how the (re)assessment of the innovation package, identification of bottlenecks, selection of strategic options influenced resource allocation under the Scaling Fund project
- Explain what new activities were invested in based on the assessment and decisions on strategic options.

Partnership strategy

- Present the network of partners that have been involved in the scaling projects. Explain how partners and partner modalities were identified.
- Explain how partnerships are fit-for-purpose for overcoming the key bottlenecks for scaling
- Describe if and how the network changed (for example new partners, changes in the roles, strengthened capacities).
- Present the key lessons learned in terms of partnership management and its importance for the scaling process.

Remarks/ comments/ feedback on Step 3:

Provide short narrative update on how Scaling Readiness was applied and how this influenced the project capacity of strategizing towards overcoming key bottlenecks for scaling the innovation package?

In the case of Rwanda, one of the key lessons from the first year is the importance of partnership buy-in. A key bottleneck in Rwanda has been the reliance of RAB-cassava to depend upon the CGIAR teams to move project work forward, rather than taking ownership and seeing the real benefits of

the work. How to address this seems to be complicated and would need to be done case-by-case. In response to this, the Rwanda team have decided to continue with the cassava trials, but shifiting human resources and workload from this side of the project. In particular, the RHoMIS-core work planned for Q2 2021 with cassava farmers will no longer be implemented. We believe shifting the considerable funds from this work to support the trials in general in Rwanda provides better value for the project. However, we will continue to perform the RHoMIS work with RAB-potato and OAF.

The RAB-potato team has seen the benefits of tricot and are more or less independently leading the work. The differences are not institutional but individual. Retrospectively, it would have been difficult to predict this, so fortunately the project does not rely on a single crop for its success. In contrast, OAF have been entirely independent in the development of their work and have only come back to the project team with very specific problems or queries. On reflection, this is most likely due to the considerable difference in the capacities of staff within each institution. This would be a further lesson learnt, identification of capacities and managing to that level, rather than having a standardised approach. In terms of partnerships, this means that we will focus more on potato than on cassava in 2021 and use the lessons from potato to convene stakeholders to draw lessons for wider institutional change (adopting tricot as a general trialing methodology in RAB and OAF).

As a result of the kick-off workshop in early 2020, collaboration with the AKILIMO project was established. The tricot approach has been used for a fertilizer potato trial in Rwanda. This shows potential synergy between projects and potential for wider use of the tricot approach, beyond variety trials. A detailed evaluation of this trial is underway (early 2021).

In the case of Ghana, the stakeholders found that the tricot approach worked well and are generally enthusiastic. There were differences in quality in the work between different extension agents, however. In 2021, the best-performing extension agents will be asked to participate agan, and we will also engage with the district management structures where these enthusiastic extension agents are, rather than taking the shot gun approach to engagement which we used in year 1. To be able to reach anticipated targets in 2021 it will be necessary to engage with additional partners. Partnership with vine producers was excellent but the distance from vine producers to farmers generated logistical difficulties – vines need to be transported within a very short time window after harvesting to reduce mortality rates. For 2021, it has been decided to decentralize vine production further to facilitate transport. Contact has been sought with AGRA and other opportunities will be identified to expand beyond sweetpotato in the future. Also, as CIP decided to withdraw from Ghana, activities were taken over by Reputed Agriculture 4 Development Foundation. This arrangement worked well for the final months of 2020 and will be continued in 2021.

An Actor-centered Theory of Change in the Scaling Process and its impact pathway (Fig) has been drawn to strategize towards overcoming key bottlenecks for scaling innovation package. This diagram will be deeply discussed with the Tricot Stakeholders at our first workshop in 2021. The objective is to bring the implementing Tricot Scaling Partners to understand about this innovation

technology very well. In this way, we hope that the innovation technology will reach wide areas as we expected.

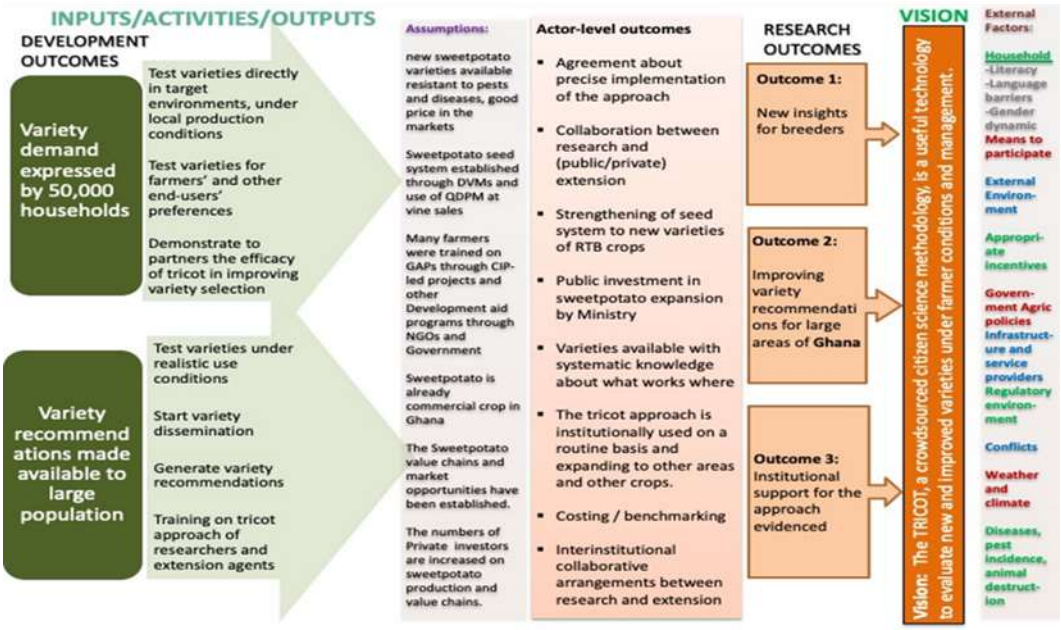


Fig. Actor-centered Theory of Change in the Scaling Process and its impact pathway.

In Rwanda, we have yet to develop a scaling theory for either potato or cassava. It is still not clear when in the project cycle this could have or should have been developed. Guidance from the Scaling Readiness team may be needed to point us in the right direction on this.

Step 4: Agree

- Explain how the draft Scaling Strategy was shared and discussed with the broader stakeholders in the different locations where the project is active
- Explain whether and what changes were made to the location-specific scaling strategies (e.g. exploring new strategic options) based on stakeholder consensus seeking and negotiation
- Explain the implications of the changes to the location specific scaling strategies for the overall scaling ambitions of the project
- Explain how the scaling strategy was operationalized into a scaling action plan.
- Explain whether and how any reallocation of budget and roles were made and agreed upon with the main project partners and stakeholders
- Explain how overall agreement on the scaling strategy and action plan were documented.

Remarks/ comments/ feedback on Step 4:

Provide short narrative on how Scaling Readiness was applied and supported the stakeholder negotiations and development of the scaling action plan in the scaling fund project.

In both countries workplans were discussed in an initial workshop. These have been submitted as deliverables. Since the work follows the agricultural cycle, not much room for negotiation exists during the cycle. At the beginning, there were some issues with seed availability, especially for potato in Rwanda. Quantities were negotiated after carefully explaining the goal of the trial. Especially the need for a trial following the conventional participatory testing was important to emphasize, as OAF needed a comparison between the two approaches to justify a switch. Just implementing tricot would not have been enough. This increased the quantities of seed materials needed, but the team was able to explain the rationale to the RAB teams. This required careful negotiations and sticking to the scaling plan – just *executing* trials was not the goal of the project but making a change in *how* trials are executed.

In Rwanda, RAB has appropriated tricot for its potato trials, but not for its cassava trials. For potato, we are confident that we will not only see wider adoption of the approach for future trials, but also a platform for collaboration with outside partners. For 2021, RAB has seen the benefit of collaborating with OAF as data will be shared and has therefore overcome its initial reticence to supply OAF with sufficient amounts of potato planting materials. We think that doing an aggregate analysis in 2021 of all tricot trial results (both RAB and OAF) will reinforce the direct benefits of collaboration and will provide the basis for discussions about further institutionalisation, not only of tricot as the main approach for on-farm testing in RAB but also as the way forward to collaborate with NGOs and companies, such as OAF. It is clear that OAF sees the benefits of institutionalising tricot into their workstreams. This is evident not only with communication with staff involved in the project, but also in the interest of OAF in Tanzania in applying tricot (for bean). This demonstrates an organic internal scaling of tricot within OAF. From conversations with OAF Rwanda, they appear to agree on the methodological benefits of tricot, but they need to see the cost-benefit analysis tricot vs randomized complete blocks designs (their current standard) to make an institutional decision to switch. Therefore, a step before agreeing on scaling for OAF is to do a cost-benefit analysis of institutionalisation of tricot in Rwanda. Once they have this, they will decide on a 'go-no go' decision on tricot. To support this, the project is looking to understand the criteria OAF will use for this cost-benefit analysis and will support the analysis.

In Ghana, the Scaling Strategy has been presented to some of the leaders in partner institutions. Also, a workplan was elaborated based on this. However, given the distributed nature of the Ghanaian system with which we were interacting, by the end of the year many collaborators were not familiar with the underlying concepts - theories of change and scaling. This information has been presented again in the learning workshops in December 2020 by the RA4D team so that the entire group of collaborators is aware of the underlying goals of the project, beyond just the implementation of trials. Agreements have been made explicit in this workshop and will be reinforced in further planning meetings in early 2021.

Step 5: Navigate

- Explain how scaling strategy and scaling action plan implementation was monitored
- Explain what kinds of changes were made to the scaling action plan in terms based on monitoring and evaluation and learning
- Explain how principles of reflexive learning were implemented as part of the projects MEL strategy

Remarks/ comments/ feedback on Step 5:

Provide short update on how Scaling Readiness was applied and supported the monitoring, evaluation and learning in the scaling fund project.

During 2020, the focus was very much on the implementation of a project workplan, which was solid due to good preparations in various workshops. Monitoring and evaluation of trial progress was facilitated by ClimMob itself, which has a dashboard that allows for monitoring farmer registration and data collection. Also, the technical team were in touch with the teams on the ground for support on ClimMob-related issues. This was also a good way to stay informed about different challenges. Reflexive learning was concentrated in the end-of-cycle evaluation and learning workshops. These were partly done online only (Rwanda) or done in a more minimalistic style in different locations (Ghana) adapting to the COVID-19 situation. Trial results were presented, as well as experiential learning based on the approach. Many lessons were more practical, part of a normal learning process of a new technical approach. We highlight two important “reflexive” lessons:

While in the case of OAF in Rwanda, the approach is very straightforward as it has been defined as a crisp decision. Regarding the public institutions, we think that more reinforcement will be needed to be persuasive. One crucial opportunity, it was realized, is that researchers working on other crops have shown interest in the approach. We realized that persuading a larger group of researchers about the benefits of the approach will improve the probability of a systemic change towards tricot in the institutions. Therefore, we will try to increase the awareness about tricot by offering a combination of self-paced online courses with interactive open online sessions to the NARES in Rwanda and Ghana.

In the case of Rwanda, the collaboration between RAB-potato and OAF will be crucial for the success of the work. OAF depends on RAB-potato for seed potato. But on the other hand, OAF co-invests in the trials, augmenting the data available to RAB-potato. We realized that RAB-potato did not fully realize this benefit being reticent about sharing their seed potato, perceiving OAF’s work as a distraction rather than a new way of collaborating. We can further reinforce the message that there are mutual benefits. We will do this by providing an aggregated data analysis (joining the datasets of the two trials) and present this back to the two groups in a joint meeting.

In Ghana, we are planning to thoroughly discuss with the implementing stakeholders about the scaling strategy and scaling action plan during our first Scaling Workshop to have planned as soon as possible in 2021. A pathway of Tricot Scaling Action Plan can be seen in Figure.

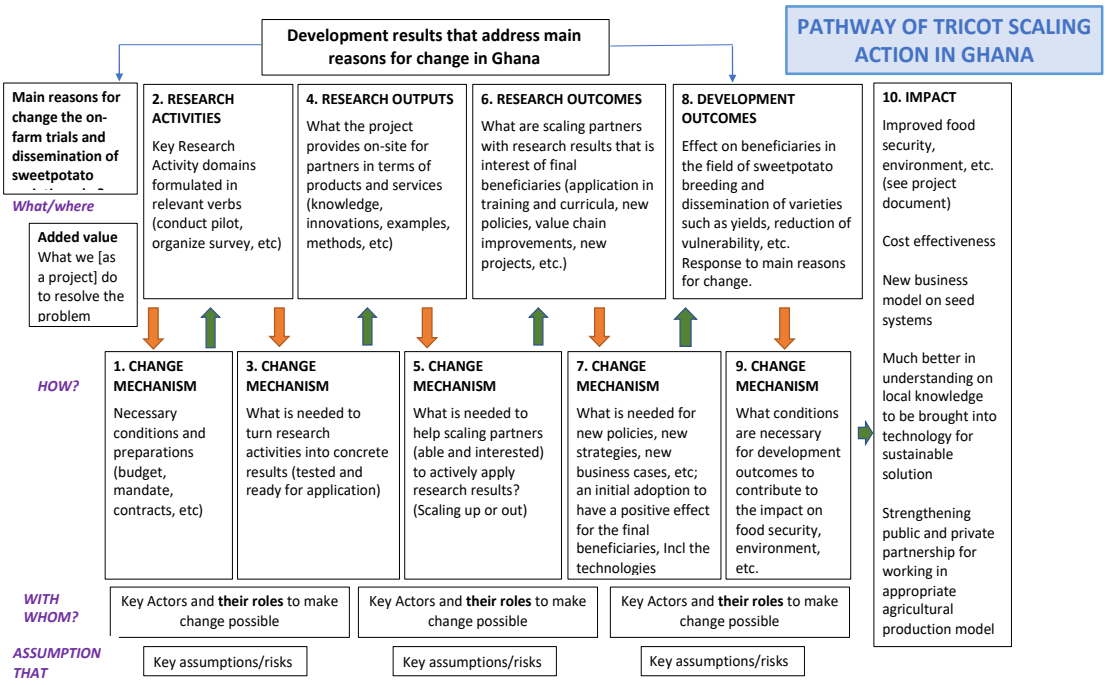


Figure. A pathway of Tricot Scaling Action in Ghana to be discussed in the coming workshop planned in Feb/March 2021.

Financial update

Present financial data using the standard cost categories

Categories	Y1 Budget (USD)	Y1 Expenses (USD)	Y2 Budget (USD)	Y2 Expenses (USD)
Personnel				
Collaborator Costs – CGIAR Centers				
Collaborator Costs – Others				
Supplies and Services				
Training / Workshop				
Operational Travel				
Depreciation				
Sub-total of Direct Cost				
Indirect Costs/Institutional Overhead (15%)				
TOTAL – all Costs				

Present the level of co-investment mobilized

Categories	Main activities covered and geographical scope	Y1 Expenses (USD)	Y2 Expenses (USD)
Co-investor 1	*Short narrative*		
Co-investor 2			
Co-investor 3			
…			
TOTAL – all co-investors			

A financial report will be provided as part of the regular RTB reporting process. In addition to this, we will prepare a co-investment report. This was not ready at the moment of submitting.

Annex 1. List of deliverables reported

Output	Deliverable	Description	Status
1. Tools for implementation of tricot in RTB crops - with gender as an important cross-cutting dimension	1. Agreed protocol for potato	Protocol document describing trials.	Completed, but an updated version will be developed for the 2021 trials.
	2. Agreed protocol for sweetpotato	Protocol document developed by project team in Ghana, and used during first year trials	Completed, but undergoing refinement in light of first year experiences (Y1Q1)
	3. Agreed protocol for cassava	Protocol document describing trials.	Completed
	4. Communication materials for potato	Guides developed to assist farmers in the set-up, implementation, and data collection for potato trials.	Completed
	5. Communication materials for sweetpotato		
	6. Communication materials for cassava	Guides developed to assist farmers in the set-up, implementation, and data collection for potato trials.	Completed
	7. Updated version of ClimMob with library of communication materials, protocols, and predefined sets of questions per crop (linked to ontology)		
2. Data from first rounds of tricot trials – with capacity building	1. Training on the tricot method	Partner orientation and planning meeting: Ghana	Meeting held at CSIR-Crops Research Institute in January

as important crosscutting element		Multiple training sessions held with RAB and OAF staff (digital and in person) on tricot methodology and trial implementation. In field training given to farmer facilitators and farmers on trail set up and data collection.	Trainings held online, in the CGIAR office in Kigali, and across the country.
	2. Trial design and seed multiplication –potato	13 potato varieties were multiplied, with 40 tubers per variety, distributed to farmers. 230 farmers, supported by RAB, OAF, and CGIAR staff.	The first season is complete, in the process of organising the distribution of tubers to farmers for 2021B (second season). The same varieties will be distributed to both RAB and OAF. We expect similar numbers of farmers
	3. Trial design and seed multiplication – sweetpotato	Design and multiplication strategies in place to deliver trials to ~1500 farmers in selected Districts access 7 Regions in both the north and south of Ghana.	In the North a more decentralized strategy was used with decentralized commercial vine multipliers, and in the South a centralized strategy was used with multiplication at CSIR-CRI (Y1Q1)
	4. Trial design and seed multiplication – cassava	8 cassava varieties were multiplied, with farmers receiving 40 cuttings per variety, with varieties distributed 160 farmers across 4 districts.	The first season is on-going with the second data collection underway. We are also in the process of distributing cuttings to a further 112

			farmers for season 2021B (Feb-Feb).
	5. Trial package distribution, farmer training and data collection – year 1	Package distribution and agent training on ODK platform in 7 regions of Ghana, 4 in the North and 3 in the South. Experiments were set up at the district level in most cases.	Logistical constraints due to covid-19 quarantine restrictions from March through June, 2020 delayed multiplication and trial establishment in some cases. In the south, a Data collection was initially anticipated to include postharvest assessment, but this was not pursued rigorously as most of the genotypes had been assessed previously prior to release as well as in market-based consumer trials conducted in 2019 (analysis and report in prep). Anticipated Y1Q3, but continued into Y1Q4 and Y2Q1 for late-planted trials. Data collection for potato has been completed this month and is on-going for cassava.

		Packages were distributed for potato in august and cassava september. Farmers were trained in tricot as part of the distribution, given demonstrations, which referred to the Farmer Guides they were provided with.	
	6. Data analysis and report preparation – year 1	Experiments were planted at the District level, and as results come in reports are generated for each experiment on the Climmob platform.	Combined analysis across experiments is of interest to the primary users, the breeders and extension agents. This analysis is underway by Bioversity postdoc, Kaue, and results will be reported and discussed with breeders in early Feb 2021 in time to allow for regional feedback sessions with AEAs and farmers, and for planning of 2021 trials based on these results. (Anticipated Y1Q4 delayed into Y2Q1) Analysis will begin, with the assistance,

		Data analysis has yet to start as we've just completed data collection for potato and collection is on-going for cassava.	of the ClimMob team in Q1 of 2021 for potato and in Q3 in 2021 for cassava
	7. Trial package distribution, farmer training and data collection – year 2	Farmers are currently being identified for potato for the second season (2021B). Cassava farmers have already been identified (112), distribution and training will be completed by the end of February 2021. Trials will be performed on only 6, rather than 8 varieties due to issues with multiplication.	Distribution and training will be completed during Q1 for both potato and cassava.
	8. Data analysis and report preparation – year 2		
3. Knowledge on how best to conduct tricot and framework on how to embed it institutionally	1. Report on evaluation and learning workshop round 1 – Ghana (lessons learnt and	Workshops for northern and southern Ghana held in December to present results and have discussion and planning.	Completed workshops with good feedback and planning with partners, though results of all trials were not in.

	refined scaling strategy and action plan)		Recommendations of the workshops were an important step toward refinement of scaling strategy and action plan for 2021. (Y1Q4 but continued through consultations and planning in Y2Q1)
	2. Evaluation and learning workshop round 1 – Rwanda (lessons learnt and refined scaling strategy and action plan)	Workshops with partners (RAB and OAF) are scheduled for mid-February. These have been delayed due to the severe outbreak of COVID in Rwanda. We also plan to have a cross-country learning workshop so teams can co-learn on what has(n't) worked in their respective country.	To be completed by Q1 2021.
	3. Evaluation and learning workshop round 2 – Ghana (lessons learnt, tricot scaling framework)		
	4. Evaluation and learning workshop round 2 – Rwanda (lessons learnt, tricot scaling framework)		
	5. Peer-reviewed publication (draft) on the scaling experience and framework		