Development of a cassava seed certification system in Rwanda: Evaluation of CGIAR contributions to a policy outcome trajectory

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Content

Acronyms and abbreviations

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ACDI-VOCA	Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance
AU	African Union
BMGF	Bill and Melinda Gates Foundation
CASS	Cassava Agribusiness Seeds System
CBSD	Cassava brown streak disease
CGIAR	Consultative Group on International Agricultural Research
CMD	Cassava mosaic disease
CRP	CGIAR Research Program
CRS	Catholic Relief Services
CIP	Spanish acronym for the International Potato Center
EQ	Evaluation question
EU	European Union
FAO	Food and Agriculture Organization
GLCI	Great Lakes Cassava Initiative
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture
INGABO	Rwanda Farmers' Trade Union
M&E	Monitoring and Evaluation
MINAGRI	Rwanda's Ministry of Agriculture and Animal Resources
NARO	(Ugandan) National Agricultural Research Organization
NGO	Non-governmental Organization
PSTA	Strategic Plan for Agriculture Transformation
QDS	Quality Declared Seed
QMP	Quality management protocol
RAB	Rwanda Agricultural Board
RALIS	Rwanda Agriculture and Livestock Inspection Services
R4D	Research for Development
RSB	Rwanda Standards Board
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SRF	Strategy and Results Framework
TAAT	Technologies for African Agricultural Transformation
TOSCI	Tanzania Official Seed Certification Agency
USAID	United States Agency for International Development

Glossary

Champion: Someone who sees value in an outcome trajectory and engages with decision-makers to strengthen it.

Generic (policy) theory of change: A theory of change that describes, from the peer-reviewed literature, in a general sense, how the policy change process works.

Initiative: Coherent sets of activities such as breeding, dissemination, policy engagement and technical support that may or may not be project-related.

Outcome: A change in behavior (practices, relationships) or policies (that influence behavior) of individuals, groups, organizations or institutions.

Outcome evidencing approach: An adaptation of outcome harvesting in which a case for a program is built and challenged as to whether it has contributed to one or more outcome trajectories.

Outcome trajectory: The pattern of interactions and causal links between actors, technologies and institutions that maintain and scale a coherent set of outcomes over time (e.g., the control of purple top disease).

Specified (policy) theory of change: The generic theory of change which is made specific to the instance of policy change being studied.

Executive Summary

Background and context. Since their inception in 2012, the CGIAR research programs (CRPs) on Roots, Tubers and Bananas (RTB) and Agriculture for Nutrition and Health (A4NH) have been generating innovations, testing interventions, and providing science-based evidence and advice to policy and decision makers at local, national and supra-national levels with the expectation that this advice will contribute to policy changes that in turn helps create an enabling environment for agri-food systems innovations. In 2019, the two CRP leadership teams commissioned a systematic assessment to validate four significant policy outcomes to which they had contributed.

This outcome relates to the development of a cassava seed certification system in Tanzania that has led to the passing into law of cassava seed standards for all seed qualities, from pre-basic to Quality Declared Seed (QDS). The development of the cassava seed certification system has been supported by the International Institute for Tropical Agriculture (IITA) with activities included under the RTB framework.

Purpose and scope. The purpose of this case study is to generate evidence and lessons learned on the contributions of CGIAR in stimulating policy changes that created an enabling environment for agri-food systems innovation. The objectives are:

1. To determine and document how and in what ways CGIAR interventions contributed to the development of a cassava seed certification system in Rwanda;
2. To identify other major actions/factors that contributed to the cassava seed certification system trajectory;
3. To generate findings to strengthen CGIAR contributions to the cassava seed certification system trajectory;
4. To contribute to a synthesis document that compares and contrasts the ways in which CGIAR actions have influenced policy in four cases.

Methods for the review. This case study is carried out as a CRP-commissioned independent evaluation using a version of outcome harvesting called outcome evidencing. Outcome harvesting is 'backward looking' in that it starts with an achieved outcome and works backwards to identify and understand the outcome trajectory that generated it, where an outcome trajectory is understood as the patterns of interactions between people, institutions and technology that contributed to produce the outcome, over time. This approach then seeks to identify the contribution made by CGIAR and other stakeholder institutions to the outcome trajectory. This is done by building a timeline of the outcome trajectory to help specify and test an existing theory – the Policy Window theory of change – that that describes how policy changes. The timeline and theory of change are used to answer the evaluation questions agreed at the start of the evaluation, after first being validated in a virtual workshop by interviewees and other key stakeholders. The draft report then went through two rounds of review to check facts and inferences with stakeholders.

Evaluation questions

The evaluation questions are:

1. How can the Policy Window theory of change be made more specific to the Rwanda cassava seed certification system trajectory?

2. What are the main outcomes resulting from the cassava seed certification system trajectory and how did CGIAR contribute to them?
3. Has CGIAR contributed to integration/consideration of gender in the cassava seed certification system trajectory and, if so, how?
4. Is the cassava seed certification system trajectory likely to be sustained and scaled over the long term?

Findings

Findings relevant to Evaluation Question #1

Finding 1: The threat posed by cassava viral diseases, in particular cassava mosaic disease (CMD) and cassava brown streak disease (CBSD), is generally well understood by farmer representatives, NGOs, the private sector and government institutions in Rwanda. CBSD and CMD have been present in East Africa for at least 85 and 110 years, respectively, although they have not always been seen as a major problem. IITA has been breeding disease-resistant varieties for CMD for the region for more than 40 years. In the last 25 years, both diseases have caused large-scale losses, currently amounting to more than USD 1 billion every year in East and Central Africa and are a threat to food and income security for over 30 million farmers. In Rwanda, a particularly severe and widespread outbreak of CBSD from 2012 to 2015 reduced cassava production and made it necessary for the Rwanda Agricultural Board (RAB) to import millions of cuttings from Uganda. Controlling the diseases is a political priority because cassava is the fourth most planted crop in the country, important both as a food security and cash crop. Media coverage of the CBSD outbreak in 2014, coupled with feedback from their constituencies, built political support to tackle the disease.

Finding 2: Research on CBSD and CBM has risen in response to serious outbreaks, highlighting the need for good phytosanitary practices together with making locally-adapted, disease-resistant and high-yielding varieties available. From 2007, three large initiatives worked on cassava seed systems in Rwanda from which it became well understood by trajectory actors that good phytosanitary practices need to be underpinned by locally-adapted, implemented and enforced regulations governing quality control. In 2017, the IFAD-funded, IITA/RTB-led CBSD Control project prioritized, advocated, supported development and received approval of cassava seed standards within a year of the start of the project. This reflects the priority given to the cassava seed certification system trajectory, good facilitation of the process by IITA, strong ownership by RSB (Rwanda Standards Board) who led the process as mandated and, not least, an example from Tanzania from which to work.

Finding 3: The challenge remains to make clean and disease-resistant cassava planting material available to farmers. The dominant social norm is that farmers keep their own cuttings from season to season, or source from neighbor at little or no cost. While certified seed multipliers do exist, more are needed. The IITA/RTB-led CASS project is currently identifying, developing and testing agribusiness models to deliver the seeds required. Similar work in Tanzania suggests that key issues to resolve will be: a) cost friendliness of the models, and b) matching supply to demand for clean planting material, given that cuttings cannot be stored for long and are bulky to transport.

Finding 4: The CBSD project was able to advocate for and support the development and approval of cassava seed standards in less than one year without the requirement for overt advocacy. The capacity to engage and support RSB was inherent in the project leadership, developed through years of experience of working effectively with national partners. The strategy that proved effective, in the process led by RSB, was to consult

widely and include relevant stakeholders in defining the problem and solution, enriched by learning about what had worked elsewhere, in particular in Tanzania. The capacity to convene effective meetings, through facilitation and budget, was key, as well has having one-on-one meetings between IITA and RSB to ensure key decision-makers and potential champions understood and bought into the process.

Finding 5: The positive experience of using QDS to source and multiply clean seed in response to the 2012 – 2015 CBSD outbreak likely contributed to QDS being included in the cassava seed standards from the outset, unlike in Tanzania where it took two additional years. More recently, the CBSD Control project has built capacity of all eight of Rwanda's seed inspectors and 15 out of 24 registered seed producers in the implementation of cassava seed standards. Experience from Tanzania suggests that much more capacity development will be required for the outcome trajectory to continue, including training more seed producers, if they are to be an effective backbone to a distributed and commercially viable cassava seed system. A Dutch Non-governmental Organization (NGO) specializing in youth capacity development is part of the relatively new Cassava Agribusiness Seed System (CASS) project to develop and test seed-supply business models.

Finding 6: A plausible hypothesis is that better market for cassava strengthens the support base for a cassava certification system because it encourages farmers to buy certified planting material and encourages seed producers to make it widely available. The government established the Kinazi cassava plant in 2012 to help develop the market for cassava. Recent donors – TAAT and the Dutch government – are supporting higher value uses of cassava flour and sustainable seed business models, respectively. IITA's successful project proposals have allowed the work to continue since 2017.

Finding 7: The generic policy windows theory of change was made more specific and relevant by identifying and describing what strategies contributed in practice to the model's three main outcomes– shift in social norms, change in capacity and strengthened support base. The main structural change in the model is to recognize that the three main outcomes are linked to each other and form a self-reinforcing loop that drives the outcome trajectory.

Findings related to evaluation question #2

Finding 8: The main outcome from the cassava seed standards trajectory has been the approval by the Rwanda Standards Board (RSB) in 2018 of cassava seed standards for publication and gazettement as Rwanda Standards. IITA/RTB has played a central role in creating, shaping and moving the trajectory forward, helped by strong working relationships with staff from RSB and RAB. The three organizations have been part of a larger regional- and global-level community of practice coordinated by RTB that has been guided by a common conceptual framework and an ethos of sharing experiences in improving seed systems for vegetatively propagated crops. This sharing contributed to Rwanda learning from Tanzania and passing cassava seed standards in less than a year compared to three years in Tanzania.

Findings related to evaluation question #3

Finding 9: IITA/RTB is leading a new project that will give special consideration to women and youth in the development of agribusiness models to provide farmers with clean disease-resistant planting material. This is in line with the Government of Rwanda's Strategic Plan for Agricultural Transformation 2018-24. Gender is not explicitly mentioned in the published cassava seed standards, which is not surprising because the RSB does not usually include gender considerations in such documents. RSB does have a policy of considering gender in the standards development process, in particular in the composition of working groups and technical committees

Findings related to evaluation question #4

Finding 10: It is likely that the cassava seed standards trajectory will be sustained and scaled over the long term given its momentum (see Finding 7). Respondents' views and experience from Tanzania suggest future progress depends on continuing to simultaneously build the commercial market for cassava, the availability of clean planting material and farmers' willingness to pay for it.

Conclusions

Conclusion 1: There has been a clear and on-going process of developing, approval and putting into use of cassava seed standards that began in earnest in 2017 and ended with standards published in 2018, as part of developing a cassava seed certification system. Progress has been made in building capacity to grow and certify clean planting material by seed producers and seed inspectors, respectively. Progress has also been made in increasing the market for cassava.

Conclusion 2: The Policy Window theory of change has helped understand how IITA/RTB contributed to the seed standards trajectory. IITA, and later IITA/RTB, has a long history of research on cassava in East Africa and has developed strong working relationships with national agricultural research and extensions systems. This has helped frame and clarify the impact of CMD and CBMD and the solution of making available to farmers clean planting material of high-yielding and disease-resistant varieties. IITA/RTB has also contributed to capacity development and creating an enabling environment for a sustainable seed system to take root and flourish in Rwanda. Perhaps IITA/RTB's greatest contribution to the trajectory has been to build and sustain a global coalition of researchers and key stakeholders working on seed systems that helped Rwanda develop and publish cassava seed standards in less than a year, once work began.

Conclusion 3: At national level, the coalition helped generate ownership of the trajectory by key individuals from key institutions such that overt advocacy for establishing seed standards was not necessary. Motivation came from recent memory of severe and widespread outbreaks of CBSD from 2012 to 2015.

Conclusion 4: Experience from Tanzania suggest that the scaling and sustainability of a commercial cassava value chain depends on farmers wanting to and being able to buy planting material that meets cassava seed standards. This depends on a number of factors that need to co-evolve including: increasing the market for cassava; training of, and a payment system for, inspectors; certified seed producers aware of the standards and able to meet them; and, farmers sufficiently trusting in the seed system to use it. The co-evolution is happening and is being supported by the recent CASS project.

Introduction to the case study and the broader evaluation

Since their inception in 2012, the CGIAR research programs (CRPs) on Roots, Tubers and Bananas (RTB) and Agriculture for Nutrition and Health (A4NH) have been generating innovations, testing interventions, and providing science-based evidence and advice to policy and decision makers at local, national and supra-national levels with the expectation that this advice will contribute to policy change that in turn helps create an enabling environment for agri-food systems innovation.

CGIAR is a global research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources. Fifteen research centers are part of this global network and work together towards the achievement of a common Strategy and Results Framework (SRF). The CGIAR works through CGIAR Research Programs (CRPs) and Research Support Platforms. CRPs are led by CGIAR Centers, some of which have been operating for more than 50 years.

This case study is one of four jointly commissioned by RTB and A4NH to understand how the respective program's research has contributed to policy change. The four cases (Table 1) were chosen in a consultation process prior to the start of the evaluation based on the information, documentation and interest of country teams that the cases be documented and analyzed. The four cases are on IITA/RTB and/or HarvestPlus/A4NH contributions to policy change in four outcome trajectories:

1. Mainstreaming of Biofortification in the African Union: evaluation of CGIAR contributions to a policy outcome trajectory
2. Control of potato purple top in Ecuador: evaluation of CGIAR contributions to a policy outcome trajectory
3. Development of a cassava seed certification system in Tanzania: evaluation of CGIAR contributions to a policy outcome trajectory
4. Development of a cassava seed certification system in Rwanda: evaluation of CGIAR contributions to a policy outcome trajectory

This case study is on the fourth outcome trajectory – the development and approval of a cassava seed standards (the policy) in Rwanda as part of the development of a cassava seed certification system. The case was chosen by RTB leadership because it represents a significant and on-going policy outcome to which RTB has contributed together with the CGIAR Centre that has and is leading the work -- the International Institute for Tropical Agriculture (IITA). Specifically, the causal claim is that IITA/RTB contributed significantly to the development and approval of cassava seed standards in Rwanda, launched in February 2019.

The objectives of this case study are:

1. To determine and document how and in what ways IITA/RTB interventions contributed to the development and approval of cassava seed standards in Rwanda;
2. To identify other major actions/factors that contributed to the approval of cassava seed standards and the broader cassava seed certification system trajectory;
3. To generate findings to strengthen IITA/RTB contribution to the trajectory;
4. To contribute to a synthesis document that compares and contrasts the ways in which CGIAR actions have influenced policy in four cases.

The primary intended users are decision-makers in the CGIAR, particularly respective CRP management units and committees, Flagship Project leaders, Cluster Leaders and Project Leaders and the CGIAR System Organization. Secondary intended users are donors; other CRPs or Research for Development (R4D) programs working to improve the enabling environment for agri-food systems and/or wanting to assess/evaluate their role in changing the enabling environment; national partners and stakeholders.

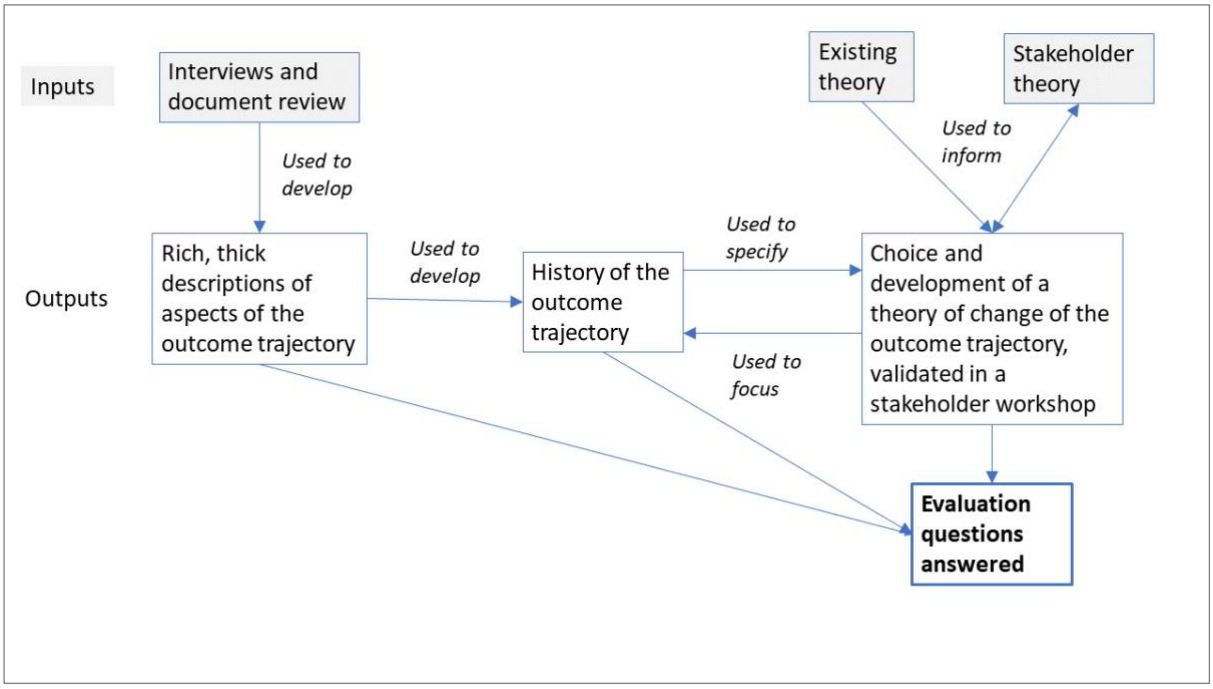
Methodology

This case study and the overall evaluation uses a version of outcome harvesting called outcome evidencing (Paz and Douthwaite, 2017). Outcome harvesting is 'backward looking' in that it starts with an outcome and works backwards to identify and understand the patterns of interactions between people, institutions and technology that contributed to it, over time. This slow-changing pattern is called an 'outcome trajectory.' The approach then seeks to identify the contribution made by the IITA/RTB to the outcome trajectory. In contrast, most program evaluations model how program activity and outputs are contributing to outcomes. They do not acknowledge an outcome trajectory as a mediating mechanism and as a result tend to over emphasize the role of the program, and underplay the role of other actors and on-going processes, from local to global level.

The study was carried out between April and October 2020 and followed a series of steps shown in Figure 1. The people interviewed and who participated in a virtual validation workshop are listed in Appendix 2.

Three methods were used to develop the outputs: document review, interviews, and a verification workshop. The theory of change of the seed standards trajectory is based on a 'formal' theory from the literature selected to be the best fit to participants' understanding of how change happened in the first case study carried out – on biofortification – and then applied to the other three. The theory is used to help focus the development of a timeline of key processes, activities and events that constitute the trajectory. The material the timeline draws upon is the rich, thick descriptions of aspects of the seed standards trajectory captured in interviews, and available documentation. The first evaluation question is how the theory of change is manifest in the historical timeline. The answer is used to make the formal theory of change, which is necessarily generic, specific to the seed standards trajectory. The specified theory of change is then checked with stakeholders in a virtual workshop before being used to help answer the remaining evaluation questions.

Figure 1: Flow diagram of the evaluation approach used



The evaluation questions are:

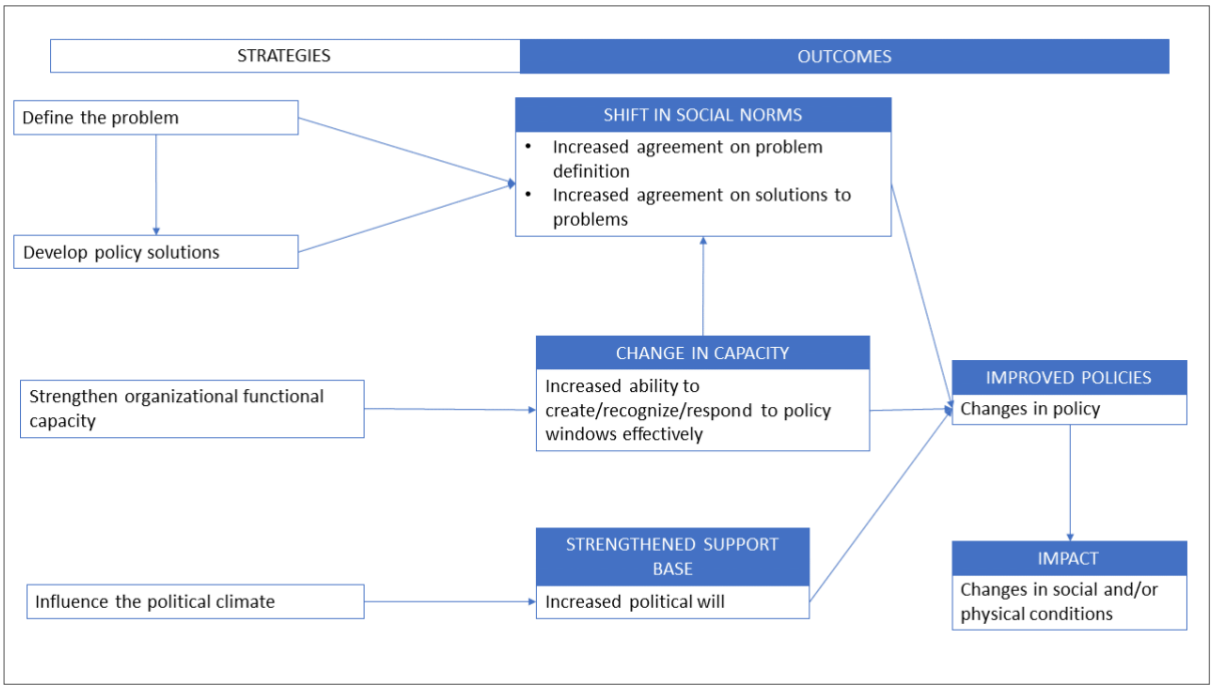
1. How can the chosen generic theory of change be made more specific to the seed standards trajectory?
2. What are the main outcomes resulting from the seed standards trajectory and how did the CGIAR contribute to them?
3. Has the CGIAR contributed to integration/consideration of gender in the seed standards trajectory and how?
4. Is the seed standards trajectory likely to be sustained and scale over the long term?

The outcome claim that this case study explored is that IITA/RTB contributed significantly to the development of a seed standards for cassava in Rwanda as a central part of a cassava seed certification system.

Description of the generic theory of change chosen

The generic theory of change chosen is the Policy Windows theory that comes from Political Science, developed by Kingdon (1995). The model proposes that policy changes during *windows of opportunity* which help advocates successfully connect two or more components of the policy process. The components are: the way a *problem* is defined; the *policy solution* to the problem; and, the *politics* surrounding the issue (Stachowiak, 2013; Sabatier and Weible, 2007). Windows of opportunity are moments when progress can be made. They can be created by natural events such as pandemics, droughts or earthquakes, for example, the latter is an opportunity to change building regulations. They can be man-made events like spikes in air pollution that lead to changes in clean air regulations. They can also be changes in government, budget cycles or landmark meetings and summits held as part of on-going national, regional and global processes. Policy windows are often short in duration and may be predictable or unpredictable.

Figure 2: Policy window theory chosen as the best fit to describe how changes are happening (redrawn from Stachowiak, 2013)



Stachowaik (2013 p. 7) made a number of qualifying statements with respect to the theory of change:

- Often there are many competing ideas on how to address problems. To receive serious consideration, policy solutions need to be seen as technically feasible and consistent with policy maker and public values;
- The way a problem is defined makes a difference as to whether and where the problem is placed on the agenda. Problem definition also has a value or emotional component; values and beliefs guide decisions about which conditions are perceived as problems;
- Advocates can attach their solution to an existing problem that has gained prominence on the agenda, even if that prominence is independent of their efforts;
- To effectively recognize and take advantage of open policy windows, advocates must possess knowledge, time, relationships and good reputations;
- Policy is translated into action plans and implemented.

The main limitation to this evaluation is that COVID-19 has prevented any field visits or face to face interviews – all the interaction with key informants has been virtual. A second limitation is that the resources available to carry out the study have been relatively modest. Thirdly, given that this is a learning-focused evaluation, and the assumption that the change process is complex, the evaluation does not attempt to value contributions made. Systems theory suggests that when outcomes are driven by interactions of people, institutions and knowledge, one is dealing with a non-linear phenomenon for which it is not possible to know the exact worth of one entity's action compared to another. [1] For example, how does one value the expensive actions that brought a system to a tipping point versus the modest action that finally triggered it? Moreover, seeking to attribute outcomes of collective effort to the action of individual organizations can endanger trust and the positive feedback loops required to drive outcome trajectories in the first place.

[1] Axelrod & Cohen, 1999

Findings

The findings come from answering the evaluation questions, as described in the Methodology Section (see Figure 1).

EQ1: How can the chosen generic theory of change be made specific to the cassava seed certification system trajectory?

The generic Policy Window theory of change is made more specific by identifying what strategies identified in the timeline provided in Appendix 1, contributed to the model's three main outcomes. The three main outcomes are:

- *Shift in social norms*, understood as increasing shared agreement between responsible organizations on the severity of the disease threat to cassava production in Rwanda and the necessity for clean seed standards to help control it as well as improving farmers' access to quality seed of improved resistant varieties;
- *Change in capacity*, understood as increased capability among 'champions' to individually and collectively advocate for cassava seed standards and a certification scheme as well as for seed inspectors and seed producers to know how to identify disease and certify and produce clean seed;
- *Strengthened support base*, understood as more enabling political and financial environment for a seed certification scheme to be developed and implemented.

The three main outcomes together lead to improved policies, understood to be a set of cassava seed standards developed and met.

EQ1.1 How does the 'shift in social norms' manifest itself in the outcome trajectory?

Finding 1: The threat posed by cassava viral diseases, in particular cassava mosaic disease (CMD) and cassava brown streak disease (CBSD), is generally well understood by farmer representatives, NGOs, the private sector and government institutions in Rwanda. CBSD and CMD have been present in East Africa for at least 85 and 110 years respectively, although not always seen as a major problem. IITA has been breeding disease-resistant varieties for CMD for the region for more than 40 years. In the last 25 years, both diseases have caused large-scale losses, currently amounting to more than US$1 billion every year in East and Central Africa and are a threat to food and income security for over 30 million farmers. In Rwanda, a particularly severe and widespread outbreak of CBSD from 2012 to 2015 reduced cassava production and made it necessary for the Rwanda Agricultural Board (RAB) to import millions of cuttings from Uganda. Controlling the diseases is a political priority because cassava is the fourth most planted crop in the country, important both as a food security and cash crop. Media coverage of the CBSD outbreak in 2014, coupled with feedback from their constituencies, built political support to tackle the disease.

The timeline in Appendix 1 shows that the cassava seed standards trajectory in Rwanda has been driven by outbreaks of cassava mosaic disease (CMD) and cassava brown streak disease (CBSD) in Rwanda and the broader region. Both diseases were first reported in Tanzania with which Rwanda shares a long eastern

boarder: CMD was reported in the late nineteenth century[2] and CBSD in 1936. According to yieldgap.org and based on FAO data, cassava is the fourth most planted crop in Rwanda by area, behind beans, bananas and maize.[3]

In response to CMD, and other cassava diseases, colonial authorities established cassava research programs in a number of African countries from the 1930s, of which one was the Amani Research Centre in Tanzania. After independence, the newly formed governments pursued other priorities and the research programs generally lapsed. The International Institute for Tropical Agriculture (IITA) was established by the Ford and Rockefeller Foundations in 1967 in Ibadan, Nigeria, in particular to support national agricultural research and extension systems. IITA established a cassava research program in 1971, in main part to breed disease-resistant varieties. CMD-resistant hybrids developed at Amani research station between 1935 and 1957 served as a foundation for this work.[4] IITA also worked to encourage the governments of the main cassava producing countries to establish and strengthen their own cassava research programs, in part so as to test and disseminate IITA-bred improved germplasm.

The push to strengthen support to cassava breeding in Uganda received a major boost in the late 1980s with the emergence and rapid spread of a virulent form of CMD. Multiplication of IITA's CMD-resistant varieties (TMS 6014, TMS 30337 and TMS 30572) began in Uganda in 1991.[5]

An IITA-FOODNET project carried out a CMD survey in Rwanda in 2001 and found CMD in six cassava-producing prefectures in Rwanda with an average incidence of 30%. Symptoms were generally severe. The survey also found that the main cause of infection was the use of CMD-affected planting material.[6]

From 1936 to the mid-1990s, CBSD was restricted to low-altitude areas[7] along coastal East Africa and lakeshore districts of Malawi. From the early 2000s, CBSD emerged further inland, in areas around Lake Victoria and then spread to many East and Central African countries, including Rwanda, causing high yield losses.

The timeline shows that Rwanda experienced a particularly severe outbreak of CBSD from 2012 to 2015 with incidence reaching 69% in 2015 leading to major crop loss and shortage of cuttings for replanting. Farmers in the worst-affected districts in the south of Rwanda complained of losses of thousands of dollars, loss of employment, inability to pay school fees, loss of savings and hunger. As a result of shortage of cassava in Rwanda, by April 2015 cassava flour prices were more than 45 percent higher than the five-year average.[8]

The shortage of CBSD resistant varieties made it necessary for RAB to import millions of cuttings of the NASE 14 variety from Uganda with support from FAO projects. The cuttings were multiplied in isolated clean fields, called home gardens, in 12 districts before being distributed to larger number of farmers in 2015. The Kwitura concept was established in which farmers gave back to RAB the same number of cuttings they received so others could plant clean material.[9]

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[2] Warburg (1894) as reported in https://www.cabi.org/isc/datasheet/2535#:~:text=Although%20the%20primary%20host%2C%20cassava,studied%20(Storey%2C%201936%3B%20Storey

[3] http://www.yieldgap.org/rwanda

[4] http://www.fao.org/3/a0154e/A0154E02.htm

[5] http://www.fao.org/3/a0154e/A0154E02.htm

[6] Sseruwagi et al., 2005. See https://www.tandfonline.com/doi/abs/10.1080/09670870400016750?src=recsys&journalCode=ttpm20

[7] <1000 m above sea level (masl)

[8] http://www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/1208321/

[9] From validation workshop

One respondent[10] said that the Quality Declared Seed (QDS) protocol was used by RAB and FAO in sourcing the planting material in Uganda and multiplying it, and proved extremely valuable. QDS standards were included in the cassava standards approved in October 2018, unlike in Tanzania where QDS standards were approved more than two years after standards covering other seed categories (i.e., pre-basic through to commercial). QDS allows for registered and trained seed producers to declare the quality of their own seed after a visual check by a seed inspector. It also helps to prevent the distribution and use of diseased planting material.

According to participants in the validation workshop, political support for an improved cassava seed system has been built and maintained by the media, in particular by the New Times national newspaper. For example, four articles were run in September 2014 with the following titles:

- Cassava farmers wary as viral disease ravages crops[11]
- It is a race against time as government bids to salvage fortunes of cassava farmers[12]
- Tame deadly cassava disease now[13]
- Cassava virus dents farmers hopes.[14]

Respondents thought the articles were effective because they contained farmer testimony which tallied with information politicians were receiving from some of the villages they were representing.

Finding 2: Research on CBSD and CBM has risen in response to serious outbreaks, highlighting the need for good phytosanitary practices together with making locally-adapted, disease-resistant and high-yielding varieties available. From 2007, three large initiatives worked on cassava seed systems in Rwanda from which it became well understood by trajectory actors that good phytosanitary practices need to be underpinned by locally-adapted, implemented and enforced regulations governing quality control. In 2017, the IFAD-funded, IITA/RTB-led CBSD Control project prioritized, advocated, supported development and received approval of cassava seed standards within a year of the start of the project. This reflects the priority given to the cassava seed certification system trajectory, good facilitation of the process by IITA, strong ownership by RSB (Rwanda Standards Board) who led the process as mandated and, not least, an example from Tanzania from which to work.

In the 1990s and 2000s, the number of research papers on CBSD increased fourfold from 75 in 1990 to more than 350 in 2010.[15] This reflects a large increase in research on the causes and nature of CBSD and other cassava diseases including CBSD in Africa, including Rwanda. This growth was motivated by the severity and size of outbreaks in the region such that both diseases increasingly became seen as a major threat to food security, particularly for subsistence farmers.

The research established the importance of both breeding resistant varieties and phytosanitary health to prevent the spread of disease through infected cuttings and tubers. This was particularly the case for CBSD because of the partial nature of the resistance. It was the increasing realization of the importance of healthy cuttings and the need to control the movement of possibly-infected planting material that has provided the main push for the development of cassava seed standards and certification in Rwanda and East Africa.

[10] Respondent 9
[11] https://www.newtimes.co.rw/section/read/78117
[12] https://www.newtimes.co.rw/section/read/181209
[13] https://www.newtimes.co.rw/section/read/181222
[14] https://www.newtimes.co.rw/section/read/181448
[15] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5947582/

Early progress towards standards was made in 1997 when IITA and the Ugandan National Agricultural Research Organization (NARO) developed a quality management protocol (QMP) to make sure that cassava planting material distributed to farmers was disease free. This work was carried out as part of the Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI-VOCA)[16] project, funded by the United States Agency for International Development (USAID).

The need to provide cassava farmers with clean planting material of disease-resistant varieties continued in the early 2000s. In response, the Bill and Melinda Gates Foundation (BMGF) funded the Great Lakes Cassava Initiative (GLCI). The Initiative ran from 2007 to 2012 to distribute planting material to 1.15 million farmers in Burundi, DRC, Kenya, Rwanda, Tanzania and Uganda. The project was led by Catholic Relief Services (CRS), with IITA responsible for the research component. The project made wide use of the ACDI-VOCA-project QMP developed ten years earlier. The adapted QMP was the precursor to the cassava seed inspection and certification protocol approved and published by the Tanzania Official Seed Certification Agency (TOSCI) in early 2017, [17] developed with the support of the IITA-led 5CP[18] project, which was a direct follow on from GLCI, also funded by BMGF.

In response to the transboundary threat presented by CBSD and CMD, in 2009 FAO launched the "Regional Cassava Initiative in Support of Vulnerable Smallholders in Central and Eastern Africa" that ran for 5 years to provide clean cassava planting material to 177,000 households in Burundi, Central African Republic, DRC, Gabon, Rwanda, Tanzania and Uganda. The project was funded by the European Union (EU). Like the GLCI, the project provided farming households with improved cassava varieties. It trained farmer focal points and Ministry of Agriculture and Animal Resources (MINAGRI) staff in Rwanda in cassava disease and pest identification; established farmer field schools to train farmers in seed multiplication and building capacities to manage cassava production; and, established national cassava coordination committees to regulate the movement of cassava vegetative material. The main difference between it and the GLCI was that it worked more closely with government, while the GLCI worked more with national and local non-governmental organizations.[19]

The severe outbreak of CBSD from 2012 to 2015 (see Finding 1) created a window of opportunity for IITA and RAB to successfully approach the International Fund for Agricultural Development (IFAD) to fund the Control of CBSD and CMD (CBSD Control) project[20] in Burundi and Rwanda, led by IITA and RAB in Rwanda.[21] The project, which began in 2017, was based on the 5CP project[22] in having a breeding component and a seed systems component. The project, which is still continuing, is building a clean seed system based on: a) decentralized network of commercialized basic cassava seed multipliers; b) cassava standards developed with RSB; and, c) seed quality certification scheme.

The CBSD project began with a large inception workshop in which the key stakeholders involved with cassava were invited to agree on project priorities. These included participants from RAB, RSB, Rwanda Agricultural and Livestock Inspection Services (RALIS), INGABO, NGOs, agro-dealers and cassava flour processors. The need for a better organized seed system underpinned by a set of seed standards emerged as important, together

[16] ACDI-VOCA is a global development design and delivery partner based in Washington, D.C. The organization has implemented economic and social development projects worldwide in agriculture, economic growth, resilience, finance and equity & inclusion. https://www.acdivoca.org/

[17] https://mel.cgiar.org/uploads/reporting/HzXJoXt3rKxIPkGBvW793djzhm7IhS.pdf

[18] Cassava Varieties and Clean Seed to Combat CBSD and CMD (5CP) Project

[19] Respondent 10

[20] 1342 IITA CBSD Proposal 20161006 final.pdf

[21] http://bulletin.iita.org/index.php/2018/05/05/cbsd-control-project-in-rwanda-and-burundi-commended-by-partners/

[22] https://www.iita.org/news-item/iita-led-5cp-project-reports-great-strides-regional-exchange-improved-cassava-varieties/

with the realization of the critical role that RSB would need to take. The project leader subsequently sought a meeting with the Director General of RSB to discuss a way forward.[23] This led to two workshops in late 2017 with the stakeholders already listed. In the first workshop, participants discussed the problem and possible solutions, including how other countries were dealing with the same set of problems. The experience of Tanzania was particularly relevant because TOSCI, like RSB, had approved a set of cassava seed standards earlier in the year.

According to two respondents,[24] the two workshops proved very effective at advocating for a set of cassava seed standards. The workshops allowed participants to share and build their understanding of the threat and how it might be tackled, in part by reviewing what was working in other countries. As a result of the two workshops, and one-on-one meetings with RAB and RSB leaders, RSB showed ownership and strong leadership of the cassava seed standards trajectory.

RSB's first action was to convene a nine-member technical committee to develop the standards. The committee consisted of key individuals from IITA, RAB, RSB, Rwanda Agricultural and Livestock Inspection Services, INGABO, NGOs, agro-dealers and cassava flour processors. The technical committee met in February 2018 in a three-day writeshop in which they drafted a first draft of set of cassava seed standards that took as a starting point. An extended technical committee meeting was held in April before the draft standards went through a public consultation and review process, during which time they were notified to the WTO. The RSB Directors approved the standards that were published on 5 October 2018 under the reference number and title of " RS 275-7: 2018 Seeds — Requirements for certification — Part 7: Cassava seeds," less than a year from the beginning of the project. Members of the technical committee reflected that everything happened on time,[25] as planned, and attributed this to collective ownership of the process and facilitation by IITA through the IFAD-funded CBSD Control Project.

Finding 3: The challenge remains to make clean and disease-resistant cassava planting material available to farmers. The dominant social norm is that farmers keep their own cuttings from season to season, or source from neighbor at little or no cost. While certified seed multipliers do exist, more are needed. The IITA/RTB-led CASS project is currently identifying, developing and testing agribusiness models to deliver the seeds required. Similar work in Tanzania suggests that key issues to resolve will be: a) cost friendliness of the models, and b) matching supply to demand for clean planting material, given that cuttings cannot be stored for long and are bulky to transport.

With the approval of the cassava seed standards, the next step is to make clean and disease-resistant cassava planting material available to farmers in Rwanda, who then make use of it. Clean and certified planting material is being produced by some seed multipliers. At least two respondents[26] said that the only farmers buying clean planting material were the ones involved in commercial production and marketing of fresh roots to Kinazi Cassava Plant (also see Finding 6) and other mid-level flour processors, or elsewhere. The great majority of farmers continue to keep their own cuttings from one season to the next, or obtain them at little or no cost from neighbors. The predominant social norm is not to pay for planting material – few are willing to pay the USD 0.01 for a single 30cm-long cutting. Also, the supply is limited, and if available may be at some distance from the potential customer, requiring extra transport cost. Matching supply to demand through a well decentralized network of multipliers or cost-effective business model has become a major issue because

[23] Respondent 8
[24] Respondents 7&8
[25] Respondent 7
[26] Respondents 4&9

the main market for certified cassava cuttings are NGOs and government organizations that place or cancel large orders, sometimes with little notice.[27]

Experience from Tanzania[28] suggests that increasing supply of clean planting material will require building a decentralized network of seed multipliers of both basic and certified categories operating with cost effective models. At present there are just eight seed inspectors for the whole of Rwanda, responsible for seed quality of all the crops. Seed inspectors are needed to register, inspect and certify cassava seed crops. This requires them to be able to identify and diagnose the major pests and diseases. One respondent[29] thought the number of inspectors would have to increase, ideally having inspectors dedicated to specific crops.

One indication of the positive effect that the widespread availability of clean cassava cuttings could have was provided by the One Acre Fund.[30] The Fund works with 600,000 out of a total of 1.7 million households in Rwanda, providing interest-free loans to grow a number of crops through a network of about 1300 field officers. The Fund contributed to the public consultation on the cassava seed standards. A respondent indicated that the Fund would provide loans to grow cassava to households if clean planting material was widely available. [31]

Work is on-going to increase seed availability. In April 2019, a Dutch Government funded Cassava Agribusiness Seed System (CASS) project began, led by IITA/RTB and implemented together with SPARK (an NGO that nurtures business for youth and women), Wageningen University, as well as respective national research organizations in Rwanda and Burundi. As the name of the project suggests, its main objective is to identify, develop and test viable agribusiness models to deliver quality cassava seeds of improved varieties with preferred end- users in Rwanda and Burundi.[32]

EQ1.2 How does the 'change in capacity' outcome manifest itself in the outcome trajectory?

Finding 4: The CBSD project was able to advocate for and support the development and approval of cassava seed standards in less than one year without the requirement for overt advocacy. The capacity to engage and support RSB was inherent in the project leadership, developed through years of experience of working effectively with national partners. The strategy that proved effective, in the process led by RSB, was to consult widely and include relevant stakeholders in defining the problem and solution, enriched by learning about what had worked elsewhere, in particular in Tanzania. The capacity to convene effective meetings, through facilitation and budget, was key, as well has having one-on-one meetings between IITA and RSB to ensure key decision-makers and potential champions understood and bought into the process.

As Finding 2 shows, cassava seed standards were developed and approved within a year of the start of the CBSD project, using a strategy described in Finding 3, without the need for explicit advocacy on the part of IITA or RAB leadership. The reason for the success was due to RSB defining the policy solution within its mandate and taking ownership of the process and showing strong leadership in pushing the drafting and approval process through such that "everything happened as is should have happened."[33] RSB took the leadership after two workshops that allowed a broad set of participants to help decide on and define the policy solution based

[27] Respondent 4
[28] See the sister report "Development of a cassava seed certification system in Tanzania: Evaluation of CGIAR contributions to a policy outcome trajectory."
[29] Respondent 2
[30] https://oneacrefund.org/
[31] Respondent 5
[32] https://www.iita.org/iita-project/cassava-agribusiness-seed-systems-cass/
[33] Respondent 7

on learning what had worked elsewhere. The capacity for the CBSD Control project to hold the initial inception workshop and the subsequent two workshops on seed systems was inherent in the project leadership, built through years of experience about how to work effectively with national partners.

Finding 5: The positive experience of using QDS to source and multiply clean seed in response to the 2012 – 2015 CBSD outbreak likely contributed to QDS being included in the cassava seed standards from the outset, unlike in Tanzania where it took two additional years. More recently, the CBSD Control project has built capacity of all eight of Rwanda's seed inspectors and 15 out of 24 registered seed producers in the implementation of cassava seed standards. Experience from Tanzania suggests that much more capacity development will be required for the outcome trajectory to continue, including training more seed producers, if they are to be an effective backbone to a distributed and commercially viable cassava seed system. A Dutch Non-governmental Organization (NGO) specializing in youth capacity development is part of the relatively new Cassava Agribusiness Seed System (CASS) project to develop and test seed-supply business models.

The need for Rwanda to source clean planting material from Uganda and multiply it in farmers' fields meant that RAB staff learned to use the QDS protocol. One respondent said that QDS, saved them in helping to make clean planting material of CBSD tolerant varieties available quickly for many farmers. The capacity that was built, and this positive view of QDS, likely contributed to the protocol being included in the Rwanda cassava seed standards from the outset, unlike in Tanzania. In Tanzania, it required a second amendment to the Seeds Act to include QDS, more than two years after cassava seed standards for other categories were signed into law.

The timeline shows that the CBSD Control project has carried out initial capacity building to help with the implementation of standards. The project trained the eight seed inspectors in Rwanda as well as 15 of the 24 registered seed producers. IITA carried out a 5-day training for cassava flour processors in processing and use[34] as part of leveraging support to on-going activities by IITA-led Technologies for African Agricultural Transformation (TAAT) Cassava Compact[35] working in 15 countries in Africa. This will potentially help increase the market and price for cassava.

Experience from Tanzania suggests more capacity development is needed. The standards[36] are being translated into Kinyarwanda on the request of the Minister of Agriculture. However, one respondent said that farmers will also require training in the need for clean planting material what the standards mean to them. More generally, the intent is for Rwanda to follow the Tanzania model of greater provision of clean seed through a distributed network of profitable seed enterprises. This will require building capacity of seed producers as well as among NGO and other institutional buyers of planting material to buy from certified suppliers. The intention is to adopt SeedTracker in Rwanda, to help link demand to certified supply.[37]

The IITA-led Dutch-funded CASS project began in 2019, with RAB as the main national partner in Rwanda.[38] One of the main objectives of the project is to develop and test different seed supply business models (i.e., government-led, private-sector-led and cooperative-led). One of the project partners is SPARK, a Dutch NGO that specializes in building the capacity of young people to succeed in regions afflicted by conflict, climate crisis

[34] https://www.iita.org/news-item/iita-trains-cassava-processors-and-bakers-in-rwanda/
[35] https://taat-africa.org/cassava/
[36] BOOKLET ON CASSAVA SEEDS.pdf
[37] Respondent 8
[38] https://www.iita.org/iita-project/cassava-agribusiness-seed-systems-cass/

and displacement.[39] SPARK's role in the CASS project is to "strengthen the capacity of farmers, cooperatives and partner organizations through gender and youth-sensitive training and coaching."[40]

EQ1.3 How does the 'strengthened support base' outcome manifest itself in the outcome trajectory?

Finding 6: A plausible hypothesis is that better market for cassava strengthens the support base for a cassava certification system because it encourages farmers to buy certified planting material and encourages seed producers to make it widely available. The government established the Kinazi cassava plant in 2012 to help develop the market for cassava. Recent donors – TAAT and the Dutch government – are supporting higher value uses of cassava flour and sustainable seed business models, respectively. IITA's successful project proposals have allowed the work to continue since 2017.

As Figure 4 shows, the goal of the cassava standards trajectory is to contribute to a functioning and sustainable cassava seed system in Rwanda. For the goal to be achieved under private-sector led system depends on there being a market for cassava such that farmers can afford to pay for clean seed to achieve increased productivity, and such that seed producers can make sufficient profit to pay for certification and inspections.

In an effort to accelerate the commercialization of the cassava value chain in Rwanda, the government supported the construction of the Kinazi cassava plant in 2012, at a cost of USD 10 million. The plant, with an anticipated capacity of 120 tonnes of cassava a day,[41] was unable to source sufficient raw material during the CBSD outbreak in 2015/2016 and some of what it could buy came from neighboring countries. Long travel distances led to a 3-fold increase in the cost of cassava flour produced by the plant.[42] In 2019, the plant committed to increasing cassava purchased from Rwandan farmers from 5500 tonnes to 28000 tonnes,[43] after securing a government grant to upgrade equipment. To put this figure into context, 28000 tonnes represents less than 3% of Rwanda's annual cassava production.[44]

The plant has had its certificate of registration approved by the United States Food and Drug Administration allowing the company access to the American market.[45]

As reported under Finding 5, the CASS project began in 2019 to develop and test seed-supply business models, including those led by the private sector. The TAAT Cassava Compact in collaboration with CBSD Control Project trained: a) cassava flour processors to improve quality of the produced flour for ugali and baking; and b) bakers on how to use cassava flour to replace a proportion of wheat flour in baking, as a strategy to diversify utilization and increase the high value market for cassava.

EQ1.4 Based on the answers above, what adaptations to the generic theory of change make it more relevant to the seed standards trajectory?

Finding 7: The generic policy windows theory of change was made more specific and relevant by identifying and describing what strategies contributed in practice to the model's three main outcomes– shift in social norms, change in capacity and strengthened support base. The main structural change in the model is to

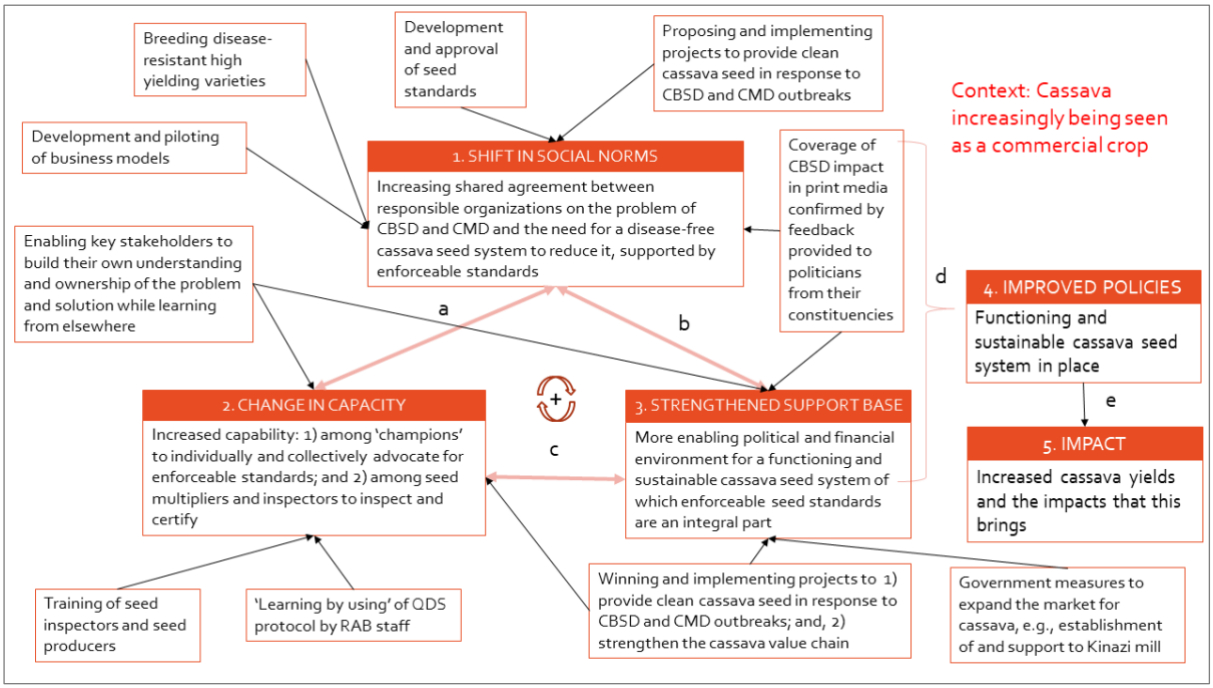
[39] https://spark.ngo/about-us/our-services/
[40] https://spark.ngo/programme/cass/
[41] https://www.newtimes.co.rw/section/read/66375
[42] http://www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/1208321/
[43] https://www.newtimes.co.rw/business/cassava-producers-turn-research-capacity-save-operations
[44] Based of FAOSTAT figures that indicate Rwanda produced 1 million tonnes of cassava in 2018.
[45] https://www.newtimes.co.rw/news/struggling-kinazi-cassava-plant-receive-govt-bailout

recognize that the three main outcomes are linked to each other and form a self-reinforcing loop that drives the outcome trajectory.

The evaluation team held a verification workshop with key individuals involved in the outcome trajectory to review the generic theory of change and suggest and validate strategies that they and others have used to contribute to the three main outcomes and so help achieve a functioning and sustainable cassava seed system in Rwanda. The strategies identified (Figure 4) were carried out by IITA/RTB, RAB and RSB within the framework of the IFAD-funded CBSD Control project since 2017 and more recently leveraged by TAAT and the Dutch Government. The exceptions are the boxes 'Government measures to expand the market for cassava, e.g., establishment and support to Kinazi mill' and 'Coverage of CBSD impact in print media.'

The main adaptation to the generic theory of change is to show a positive feedback loop driven by the three main outcomes (shift in social norms; change in capacity; and, strengthen support base) stimulating and being stimulated by each other. Behind the virtuous circle is the collective memory of severe and widespread outbreaks of CBSD and CMD with the knowledge that such outbreaks will happen again unless action is taken. Disease outbreaks themselves can be understood as windows of opportunity as they make policy movement more likely.

Figure 4: Policy Window Theory of Change adapted to describe how seed standards were developed and are now being used in Rwanda



The causal assumptions underpinning the theory of change are indicated by letters in the diagram and are as follows:

a) The framing of the problem and solution motivates some key stakeholders to become champions. They play an important role in convincing others of the importance of the problem and solution, taking advantage of windows of opportunity.

b) The framing of the problem and solution motivates donors and responsible organizations create a more enabling political and financial environment for the emergence of cassava seed system. Actors' perception

of a more enabling political and financial environment reinforces the message that tackling a disease-free cassava seed system is possible and a high priority.

c) Seed system champions lobby donors and political leaders. At the same time leaders support champions in their role.

d) A positive feedback loop (shown in the center of the diagram) provides momentum to develop, implement and scale up a cassava seed system across Rwanda

e) The existence of a functioning and sustainable cassava seed system leads to higher cassava yields and the impact that this brings.

The evaluator found evidence to support the first four causal assumptions, at least by inference.

The specified theory of change shows the strategies that contributed to achieving the main outcomes. Table 1 provides examples of the strategies used, drawn from the descriptions of the cassava seed certification system trajectory.

Table 1: Examples of strategies carried out within the cassava seed certification system trajectory that contribute to the three main policy window outcomes

Strategy	Example
1. SHIFT IN SOCIAL NORMS	
Development and approval of seed standards	Development and gazettement of cassava seed standards by RSB – see Finding 8
Breeding disease-resistant high-yielding varieties	CBSD Control project launched in Burundi and Rwanda, funded by IFAD to breed CBSD and CMD-resistant varieties
Coverage of CBSD impact in print media	Four New Times articles in September 2014 on the CBSD outbreak affecting the country at the time
Development and piloting of business models	CASS project began in 2019, led by IITA/RTB to identify, develop and test viable agribusiness models – see Finding 3
Learning from experiences elsewhere	Development of cassava seed standards informed by experience in Tanzania – see Finding 2
2. CHANGE IN CAPACITY	
Enabling key stakeholders to build their own understanding and ownership of the problem and solution	The CBSD Control project facilitated a process through facilitating a workshop with key stakeholders and holding one-on-one meetings that supported RSB taking ownership and pushing forward the publication and gazettement of cassava seed standards – see Finding 4
Training of seed inspectors and seed producers	CBSD Control project has built capacity of all eight of Rwanda's seed inspectors and 15 out of 24 registered seed producers in the implementation of cassava seed standards
'Learning by using' of QDS protocol by RAB staff	The need for Rwanda to source clean planting material from Uganda and multiply it in farmers' fields meant that RAB staff learned to use the QDS protocol – see Finding 5
3. STRENGTHENED SUPPORT BASE	
Proposing and implementing projects	Winning the IFAD-funded CBSD Control project and the Dutch-funded CASS project, both led by IITA
Government measures to expand the market for cassava	Government support to the establishment of and support to the Kinazi cassava mill – see Finding 6

EQ2: What are the main outcomes resulting from the cassava seed standards trajectory and how did IITA/RTB contribute to them?

Finding 8: The main outcome from the cassava seed standards trajectory has been the approval by the Rwanda Standards Board (RSB) in 2018 of cassava seed standards for publication and gazettement as Rwanda Standards. IITA/RTB has played a central role in creating, shaping and moving the trajectory forward, helped by strong working relationships with staff from RSB and RAB. The three organizations have been part of a larger regional- and global-level community of practice coordinated by RTB that has been guided by a common conceptual framework and an ethos of sharing experiences in improving seed systems for vegetatively propagated crops. This sharing contributed to Rwanda learning from Tanzania and passing cassava seed standards in less than a year compared to three years in Tanzania.

Cassava seed standards outputs and outcomes are shown in Table 2, together with the contributions made by IITA/RTB to achieving them. The main outcome was the approval by the RSB Standards Board in 2018 of cassava seed standards for publication and gazettement as Rwanda Standards.[46] The cassava standards join standards for six other crops approved in the same way – common bean, rice, wheat, peas, sweetpotatoes and vegetable seeds. IITA/RTB made a major contribution to the approval process in leading the CBSD Control project that proposed and supported the work and by providing an opportunity for RSB and RAB staff – key stakeholders in the process – to learn from a similar approval process in Tanzania, also supported by IITA (see Finding 4).

Table 2 shows that IITA has substantially contributed to the broader cassava seed standard trajectory since 1997 when IITA worked with NARO in Uganda to develop and a quality management protocol for cassava seed that was further developed as part of the GLCI and became the precursor to the regulations signed into law in Tanzania in 2017. The Tanzania cassava seed standards were used as a reference in Rwanda (see Finding 4).

This history shows that IITA/RTB staff have been convening and motivating a cassava seed system coalition, including researchers and leaders from RAB and RSB as well as from other countries in the region, in particular Burundi and Tanzania. The coalition also includes farmer representatives and quality regulators and has been driving the seed standards trajectory. Being part of the coalition provided RAB and RSB researchers and leaders access to experience and knowledge that allowed Rwanda to approve cassava seed standards in less than a year. A similar process, from which Rwanda learned, took three years in Tanzania, from initial discussion with TOSCI (the Tanzanian equivalent to RSB) in 2014 to gazettement in 2017.

The timeline shows that IITA/RTB has supported the coalition in Rwanda by proposing successful projects that have allowed the work to continue in a coherent and logical manner since 2017, following a similar path to that was taken in Tanzania. Tanzania has the advantage of having a single donor – the BMGF – that supported seed systems development work since 2012. IITA has managed to create a *de facto* seed systems development program through linking together projects from different donors, i.e., IFAD, TAAT and the Dutch Government.

RTB, as a CGIAR Research Program to which IITA belongs, has and is playing a core role in the coalition. In 2013, RTB published an early draft of a framework to guide intervention in root, tuber and banana seed systems.[47] The framework was developed to help policy makers, researchers and other implementing

[46] BOOKLET ON CASSAVA SEEDS.pdf
[47] https://cgspace.cgiar.org/handle/10568/72975

stakeholders (i.e. private sector, government organizations, farmer organizations, etc.) to think strategically and plan practically. On one axis, the framework identifies critical RTB seed system features:

- Availability – seed has to be available at the right quantity and quality
- Accessibility – seed has to be known about, at the right price and accessible in time and proximity
- Variety quality – the varieties on offer must meet users' needs and market preferences
- Seed quality – the seed/planting material has to be healthy and in good physical condition.

On the other axis the framework identifies the different stakeholders involved in seed system development.

The framework provides a common conceptual grounding for a platform to link together researchers working on RTB seed systems. The platform is Cluster 2.1 on Access to Quality Seed/Varieties.[48] According to one respondent,[49] the Cluster has provided a forum for discussion and sharing of ideas among researchers working on seed system development globally. The Cluster has also been successful in winning relatively small amounts of 'earmarked' RTB funding explicitly for working across countries and learning common lessons across efforts to improve seed systems for vegetatively propagated crops.

With respect to learning from other countries, the CBSD Control project has gained a great deal from experience in Tanzania through mechanisms such as a field trip that Rwanda researchers made to Tanzania in 2018. The two main IITA proponents of the seed standards trajectories in Rwanda and Tanzania are both part of RTB and Cluster 2.1 and interviews with them clearly show they brought Cluster 2.1 thinking into their contributions to the work.

The influence of the conceptual framework is also evident in the scope of the work being carried out by trajectory actors. As in Tanzania, Rwanda is building a cassava seed system that delivers against the four critical features of the framework. In both countries, work began with developing seed standards that address availability and seed quality and now both countries are implementing projects to develop and test seed-supply business models. The latter help address accessibility and seed quality.

Table 2: Table of main cassava seed standards outputs and outcomes and IITA/RTB contribution to them

Date	Cassava seed standards outputs and outcomes	IITA/RTB contribution
1970s to present	IITA works across Africa to develop CMD-resistant varieties	Up until 2000s, success of IITA's disease - resistant varieties make good phytosanitary management seem less important, in particular given difficulty to implement
1997	ACDI-VOCA cassava project develops a quality management protocol (QMP) that is the precursor to inspection and certification guidelines published by TOSCI in 2017	IITA worked with NARO in Uganda to develop the QMP
2007 to 2012	Great Lakes Cassava Initiative leads to: - Further development and use of the QMP - Researchers realize that expecting planting material to by completely free of virus is unrealistic - The realization among cassava breeders and more widely that good phytosanitary	IITA was an implementing partner in the project, responsible for research. The project worked in Rwanda

[48] https://www.rtb.cgiar.org/research-areas/adapted-productive-varieties-and-quality-seed/
[49] Respondent 10

	practice is necessary to prevent spread of CBSD, even with disease-resistant varieties	
2017	Control of CBSD Control project launched in Burundi and Rwanda, funded by IFAD to breed CBSD and CMD-resistant varieties and develop a clean cassava seed system	IITA proposed and led the IFAD-funded project, based in part on the IITA-led 5CP project that began in 2012 in Malawi, Mozambique, Kenya, Tanzania and Uganda
2017	Cassava Seed Inspection and Certification Protocol published in Tanzania	Process supported and motivated by the IITA-led 5CP project. The protocol became the template for the Rwanda seed standards
2018	Rwanda cassava seed standards published by RSB in October and officially launched in February 2019	Process supported and motivated by the IITA-led CBSD Control project
2019	All eight national seed inspectors and 15 of 24 registered seed producers trained in the cassava standards	Training provided by the CBSD Control project
2019	CASS Project starts to develop different agribusiness models for providing clean planting material to farmers	IITA-led project funded by the Dutch government, with similarities to BEST Cassava project in Tanzania in which IITA is an implementing partner
2020	Five-day training of cassava flour processors in high value uses of cassava flour for baking	Training carried out as part of IITA-led TAAT Cassava Compact to develop the cassava value chain in Rwanda

EQ 3: Has IITA/RTB contributed to integration/consideration of gender in the cassava standards trajectory?

Finding 9:. IITA/RTB is leading a new project that will give special consideration to women and youth in the development of agribusiness models to provide farmers with clean disease-resistant planting material. This is in line with the Government of Rwanda's Strategic Plan for Agricultural Transformation 2018-24. Gender is not explicitly mentioned in the published cassava seed standards, which is not surprising because the RSB does not usually include gender considerations in such documents. RSB does have a policy of considering gender in the standards development process, in particular in the composition of working groups and technical committees

The main document associated with the cassava seed standards trajectory is the published standards. The evaluator reviewed the document and found no mention of gender or youth, which is not surprising given that the RSB does not usually include gender considerations in such documents. RSB does have a policy of considering gender in the standards development process, in particular in the composition of working groups and technical committees.[50]

According to the Strategic Plan for Agriculture Transformation (PSTA) 2018-24,[51] the Government of Rwanda, MINAGRI "will continue to make concerted efforts to mainstream gender and engage in gender-sensitive policy-making and programming." The document goes on to say that interventions should make specific gender-responsive provisions to target and include women, and design solutions that are tailored to their gendered needs and challenges. Special consideration should also be given to youth to stimulate to profitable engagement in agriculture and agribusinesses, through developing skills and promoting entrepreneurship.

Respondents were aware of gender differences in cassava production, for example that men are involved in more physically-demanding activities such as planting and harvesting and women in less physically-demanding

[50] Respondent 3
[51] http://www.fonerwa.org/sites/default/files/Rwanda_Strategic_Plan_for_Agriculture_Transformation_2018.pdf

ones such as weeding and peeling. They were also aware that most seed suppliers are men, that more women are involved in seed-producing cooperatives because of government guidelines and that project logframes should include gender-disaggregated targets requiring the collection of gender disaggregated data.

The most substantive response to PSTA 2018-24 in the seed standards trajectory has been the inclusion of a Dutch NGO called SPARK[52] as part of the CASS project that began in April 2019.[53] SPARK specializes in providing capacity development to women and youth. So far, on-line publications describing the project emphasize the objective of providing farmers with clean disease-resistant planting material rather than how women and youth might be engaged.

One respondent reflected that previously gender researchers in RTB carried out strategic research on issues such as how gender norms and agency influence men and women to adopt innovations.[54] This is yet to be further analyzed to answer practical questions that could help shape cassava seed standards policies and regulations.

EQ 4: Is the cassava seed standards trajectory likely to be sustained and scale over the long term?

Finding 10: It is likely that the cassava seed standards trajectory will be sustained and scaled over the long term given its momentum (see Finding 7). Respondents' views and experience from Tanzania suggest future progress depends on continuing to simultaneously build the commercial market for cassava, the availability of clean planting material and farmers' willingness to pay for it.

It is likely that the cassava seed standards trajectory will be sustained and scaled over the long term because:

- The importance of cassava in Rwanda and CBSD and CMD are windows of opportunity that keep momentum going (see Finding 7);
- A shared understanding of the need for a seed system that provides clean planting material;
- The strength of a coalition of researchers from IITA, RAB, RSB and based internationally, brought together by the work of RTB Cluster 2.1 on Access to Quality Seed/Varieties that are pushing the trajectory forward (see Finding 8);
- On-going financial support to the coalition from IFAD and the Dutch Government;
- The necessary seed standards have been written into law;
- Capacity to implement the cassava seed standards has been built among seed inspectors and seed producers.

Future progress will depend on continuing to simultaneously building the commercial market for cassava, the availability of clean planting material and farmers' willingness to pay for it. This will, in turn, depend on:

- Success or otherwise of agribusiness models to provide farmers with clean disease-resistant seed developed by the CASS project;
- Continuing efforts to develop a high-value market for cassava;

[52] https://spark.ngo/programme/cass/
[53] https://www.iita.org/iita-project/cassava-agribusiness-seed-systems-cass/
[54] Respondent 6

- Building a stronger connection between demand and supply, possibly with the future use of SeedTracker;
- Ensuring a good working relationship between RAB and the Rwanda Agricultural Livestock Inspection and Certification Services (RALIS) for who seed inspectors work. RALIS has recently been moved to the Ministry of Commerce to ensure the independence of the service;[55]
- Developing and adopting a harmonized regional standard that would facilitate exchange of clean disease-resistant varieties between countries.[56]

[55] Respondent 2
[56] Respondent 3

Conclusions

Conclusion 1: There has been a clear and on-going process of developing, approval and putting into use of cassava seed standards that began in earnest in 2017 and ended with standards published in 2018, as part of developing a cassava seed certification system. Progress has been made in building capacity to grow and certify clean planting material by seed producers and seed inspectors, respectively. Progress has also been made in increasing the market for cassava.

Conclusion 2: The Policy Window theory of change has helped understand how IITA/RTB contributed to the seed standards trajectory. IITA, and later IITA/RTB, has a long history of research on cassava in East Africa and has developed strong working relationships with national agricultural research and extensions systems. This has helped frame and clarify the impact of CMD and CBMD and the solution of making available to farmers clean planting material of high-yielding and disease-resistant varieties. IITA/RTB has also contributed to capacity development and creating an enabling environment for a sustainable seed system to take root and flourish in Rwanda. **Perhaps IITA/RTB's greatest contribution to the trajectory has been to build and sustain a global coalition of researchers and key stakeholders working on seed systems that helped Rwanda develop and publish cassava seed standards in less than a year, once work began.**

Conclusion 3: At national level, the coalition helped generate ownership of the trajectory by key individuals from key institutions such that overt advocacy for establishing seed standards was not necessary. Motivation came from recent memory of severe and widespread outbreaks of CBSD from 2012 to 2015.

Conclusion 4: Experience from Tanzania suggest that the scaling and sustainability of a commercial cassava value chain depends on farmers wanting to, and being able to buy planting material that meets cassava seed standards. This depends on a number of factors that need to co-evolve including: increasing the market for cassava; training of, and a payment system for, inspectors; certified seed producers aware of the standards and able to meet them; and, farmers sufficiently trusting in the seed system to use it. The co-evolution is happening and is being supported by the recent CASS project.

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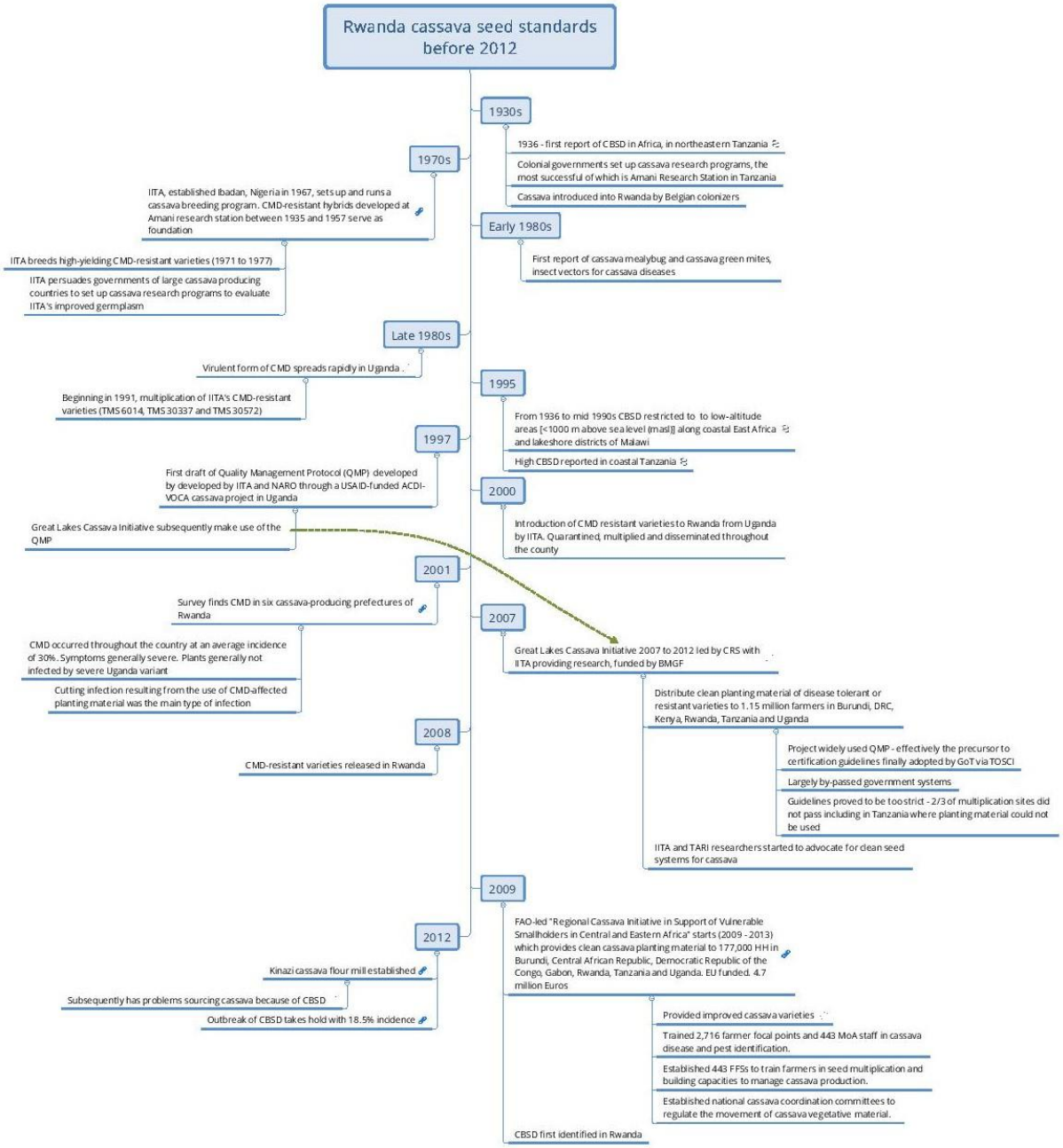
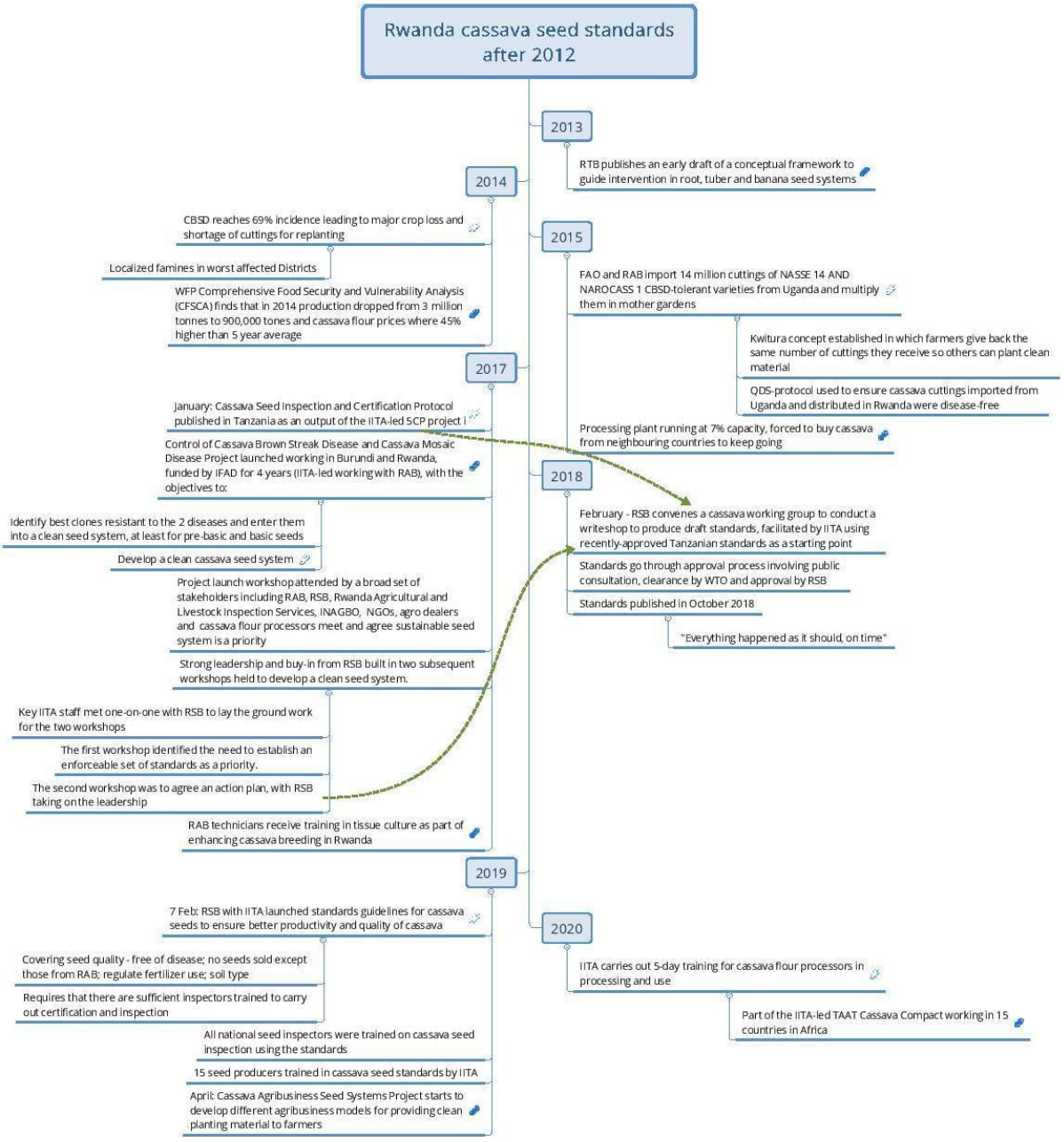
Appendices

Appendix 1: Timeline of the Rwanda cassava seed standards outcome trajectory




Rwanda cassava seed standards after 2012
2013
RTB publishes an early draft of a conceptual framework to guide intervention in root, tuber and banana seed systems
2014
CBSD reaches 69% incidence leading to major crop loss and shortage of cuttings for replanting
Localized famines in worst affected Districts
WFP Comprehensive Food Security and Vulnerability Analysis (CFSCA) finds that in 2014 production dropped from 3 million tonnes to 900,000 tones and cassava flour prices where 45% higher than 5 year average
2015
FAO and RAB import 14 million cuttings of NASSE 14 AND NAROCASS 1 CBSD-tolerant varieties from Uganda and multiply them in mother gardens
Kwitura concept established in which farmers give back the same number of cuttings they receive so others can plant clean material
QDS-protocol used to ensure cassava cuttings imported from Uganda and distributed in Rwanda were disease-free
Processing plant running at 7% capacity, forced to buy cassava from neighbouring countries to keep going
2017
January: Cassava Seed Inspection and Certification Protocol published in Tanzania as an output of the IITA-led 5CP project
Control of Cassava Brown Streak Disease and Cassava Mosaic Disease Project launched working in Burundi and Rwanda, funded by IFAD for 4 years (IITA-led working with RAB), with the objectives to:
Identify best clones resistant to the 2 diseases and enter them into a clean seed system, at least for pre-basic and basic seeds
Develop a clean cassava seed system
Project launch workshop attended by a broad set of stakeholders including RAB, RSB, Rwanda Agricultural and Livestock Inspection Services, INAGBO, NGOs, agro dealers and cassava flour processors meet and agree sustainable seed system is a priority
Strong leadership and buy-in from RSB built in two subsequent workshops held to develop a clean seed system.
Key IITA staff met one-on-one with RSB to lay the ground work for the two workshops
The first workshop identified the need to establish an enforceable set of standards as a priority.
The second workshop was to agree an action plan, with RSB taking on the leadership
RAB technicians receive training in tissue culture as part of enhancing cassava breeding in Rwanda
2018
February - RSB convenes a cassava working group to conduct a writeshop to produce draft standards, facilitated by IITA using recently-approved Tanzanian standards as a starting point
Standards go through approval process involving public consultation, clearance by WTO and approval by RSB
Standards published in October 2018
"Everything happened as it should, on time"
2019
7 Feb: RSB with IITA launched standards guidelines for cassava seeds to ensure better productivity and quality of cassava
Covering seed quality - free of disease; no seeds sold except those from RAB; regulate fertilizer use; soil type
Requires that there are sufficient inspectors trained to carry out certification and inspection
All national seed inspectors were trained on cassava seed inspection using the standards
15 seed producers trained in cassava seed standards by IITA
April: Cassava Agribusiness Seed Systems Project starts to develop different agribusiness models for providing clean planting material to farmers
2020
IITA carries out 5-day training for cassava flour processors in processing and use
Part of the IITA-led TAAT Cassava Compact working in 15 countries in Africa

Appendix 2: List of interviewees and participants in validation workshop

Name	Gender	Affiliation	Interview	Workshop
Speciose Kantenga	F	IITA Technical and Partnerships Officer	Y	Y
Silver Tumwegamire	M	IITA – leader of CBSD Control project	Y	Y
Athanase Nduwmuremyi	M	RAB – Cassava breeder and Head of Cassava Research Program	Y	Y
Oswald Tuyisenge	M	INGABO – Executive Secretary	Y	Y
Beatrice Niyokwizigirwa	F	Seed Inspector - RICA	Y	N
Jerome Ndahimana	M	RSB, Ag Dir. Food Agric. Control E (FACE)	Y	N
Serge Ganza	M	Seed producer - M.D AFS Ltd	Y	N
Milindi Sibomana	M	One-Acre Fund	Y	N
Vivian Polar (RTB)	F	RTB – workshop facilitator	N/A	Y
Claudio Proietti (RTB)	M	RTB – workshop facilitator	N/A	Y
Boru Douthswaite	M	Selkie Consulting Ltd. - Evaluator	N/A	Y