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Partnerships for Seed Technology Transfer in Africa (PASTTA) Final performance report

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Acronyms

AATF	African Agricultural Technology Foundation
ACIAR	Australian Center for International Agricultural Research
CGD	Context Global Development
CEMAPI	National intellectual property office
CIP	International Potato Center
COVID-19	Coronavirus Disease - 2019
DARS	Department of Agricultural Research Services
DLB	Demand-Led Breeding
ECOWAS	Economic Community of West African States
EGS	Early Generation Seed
FTF	Feed the Future
GDA	Global Development Alliance
IARC	International Agricultural Research Centre
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
IAR	Institute for Agricultural Research
IER	Institut d’Economie Rurale (Malian NARS)
IITA	International Institute of Tropical Agriculture
ISRA	Institut Sénégalais de Recherches Agricoles (Senegalese NARS)
JMI	Jatropha Mali Initiative
KALRO	Kenya Agricultural and Livestock Research Organization
KEPHIS	Kenya Plant Health Inspectorate Service
M&E	Monitoring and Evaluation
MoU	Memorandum of Understanding
NARO	National Research Agricultural Organization
NARS	National Agricultural Research Service
NCE	No-Cost Extension
NGO	Non-Governmental Organization
NML	New Markets Lab
NPT	National Performance Trials
PAM	Product Advancement Meeting
PASTTA	Partnerships for Seed Technology Transfer in Africa
PCN	Potato Cyst Nematode
PPPs	Public Private Partnerships
PVP	Plant Variety Protection
S2B	Seeds to Business Program (Seeds2B)
SIL	Soybean Innovation Lab
SFSA	Syngenta Foundation for Sustainable Agriculture
SME	Small and Medium Enterprises (SMEs)
TPP	Target Product Profile
USAID	United States Agency for International Development

I. PROJECT OVERVIEW

Program Name	Partnerships for Seed Technology Transfer in Africa (PASTTA)
Activity Start Date and End Date:	September 30, 2017–September 30, 2022
Name of Prime Implementing Partner:	Syngenta Foundation for Sustainable Agriculture (SFSA)
Cooperative Agreement Number:	AID-OAA-A-17-00030 (US\$2,162,116.20)
Name of Subcontractors/Sub-awardees:	The African Agricultural Technology Foundation (AATF)
Major Counterpart Organizations	Syngenta Foundation for Sustainable Agriculture (SFSA) The African Agricultural Technology Foundation (AATF) New Markets Lab (NML) MyAgro International/National Agricultural Research Organizations (IARCs/NARS) Private Seed Enterprises Innovation Labs Public Universities Public Regulatory Institutions
Geographic Coverage (cities and/or countries)	Kenya, Malawi, Mali, Senegal and Uganda
Reporting Period:	September 30, 2017–September 30, 2022

2. EXECUTIVE SUMMARY

The Partnership for Seed Technology Transfer in Africa (PASTTA, or the project) was originally a three-year, US\$4.2 million Cooperative Agreement between USAID and the Syngenta Foundation for Sustainable Agriculture (SFSA). This Global Development Alliance (GDA, or project) initially ran from September 30th, 2017, to September 29th, 2020, and was extended by an additional two years to September 30, 2022, for a total project value of US\$8.5 million. The initial focus countries were Kenya, Senegal, Mali, Malawi, and Uganda. It narrowed its focus on Senegal, Mali, and Kenya during the extension.

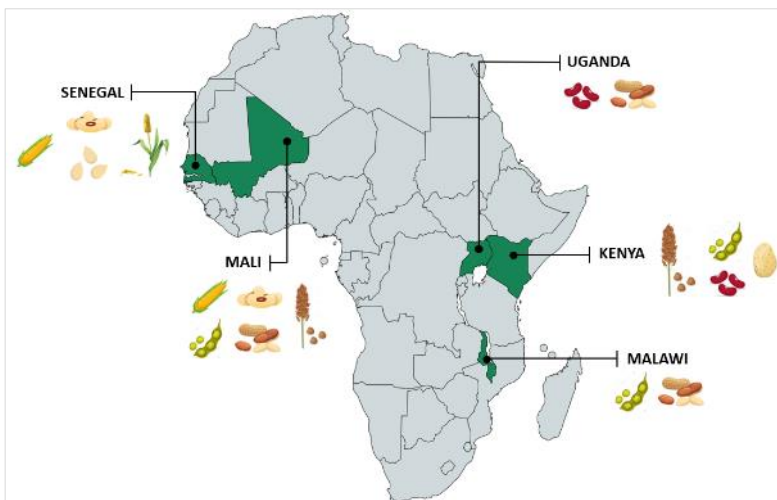
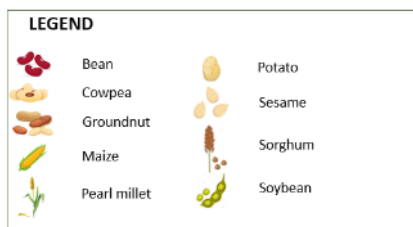
The project’s goal was to increase farm incomes of both male and female smallholder farmers. The achievement of this high-level goal was as a result of reaching the project’s key objective of improving access to quality and affordable seeds of improved varieties for the crops that smallholder farmers need. We believe that developing and implementing sustainable business models for technology transfer for public institutions to the private sector is part of the solution. SFSA and its international and local implementing partners have designed a project with business-process-led activities along the causal pathway, which will lead to the realization of these main project results. The project aligns its purpose and objectives with the Feed the Future (FtF) program, guided by the United States Government’s Global Food Security Strategy (GFSS, October 2017).

In summary, this project sought to: i) add value to Feed the Future (FtF) investments with USAID country missions and FtF Innovation Labs and other public-private platforms, ii) extend an existing, replicable and scalable seed technology transfer model (Seeds2B Africa’s services) from largely private breeding to kick-start an equivalent mechanism for public-private technology transfer of a wider range of publicly-bred seed technologies; iii) engage leading seed companies, civil society organizations and other actors involved in input supply and a wider range of downstream partners to better define the demand for seed; iv) develop business plans for Early Generation Seeds (EGS) (in the context of private delivery of public (and where appropriate private) material and v) assist regional bodies and member states in the practical and transparent implementation of regionally harmonized seed schemes.

During the first phase of the project, PASTTA activities focused on Senegal, Malawi, Mali, Kenya and Uganda. The table below lists the crops of focus by country:

Senegal	Potato	Maize	Pearl Millet	Vegetables (cabbage, eggplant, okra, watermelon)			
Mali	Cowpea	Groundnut	Potato	Maize	Soybean	Sorghum	Vegetables (eggplant, okra, tomato)
Malawi	Cowpea	Groundnut	Pigeon Pea	Soybean	Tomato		
Kenya	Beans	Potato	Sorghum	Soybean			
Uganda	Beans	Groundnut	Soybean	Tomato			

During the second phase of the project, we reduced the crop and country focus of this project, as highlighted in the Year 4 and 5 Implementation Plan (Kenya, Mali, and Senegal), as well as the no-cost extension with AATF (Uganda, Malawi), as shown in this map:



Despite challenges related to COVID-19 and political challenges (for example military coups in Mali), the project has achieved or surpassed most of its targets and hence contributed to improve availability and accessibility of performing varieties to farmers through stronger seed value chains. The main achievements, listed in the table below, show that the project had a significant impact on building seed stakeholders’ capacities and developing strong PPPs to deliver seeds to farmers at scale.

9,264 MT of seeds sold	≈15 million USD of seeds sales
≈200,000 Hectares of land using improved varieties	≈350,000 Farmers who planted seeds of improved varieties supported by PASTTA
517 seed companies and public institutions impacted to access seeds of improved varieties	83 Active licensing deals (cumulative)
49 varieties officially registered	≈1,500 varieties trialed and commercialized
>1,500 Trial sites implemented for adaptation, marketing, agronomy trials	>45,000 seed value-chain actors reached during field days and B2B events to catalyze awareness
60 Varieties moved to commercialized stages (Varieties 7 & 8)	

Note: detailed numbers can be found under section **PMEP 5-Years: key results and discussion** of this report.

Beyond these figures, the project has also worked on key transversal topics to develop sustainable and equitable seed ecosystems, such as:

- **Seed policy** in partnership with New Markets Lab. This was done through a number of capacity building workshops, case studies and diagnostic reports that allowed us to better understand and address policy bottlenecks in our focus countries and regions.
- The **development of last mile delivery channels** to deliver improved varieties to farmers through collaboration with organizations such as myAgro, Human Practice Foundation and One Acre Fund. These organizations play a great role in aggregating local seed demand thereby increasing investment from the private sector on seed production and marketing.
- **Gender mainstreaming** in partnership with CIP. This was conducted in order to build the implementation team's capacity to purposely adapt their variety commercialization efforts using a gender lens.

In order to maximize our impact, we developed a wide network of national, regional, and international partners including research institutions, FtF innovation labs, seed companies, regulators, and development organizations. The program supported the development of several digital tools that were used to coordinate, monitor, and track our activities and impact. These include the Field Trial Application, Impact Model, and Smartsheet data collection forms. We also started the development of a toolkit on variety advancement and commercialization.

3. PIPELINE OVERVIEW AND EVOLUTION

The Seeds2B pipeline follows the variety advancement process. It starts with the first stage of Seeds2B's activity (stage 5) and ends with the last (stage 8). The graph explains names and activities at each working stage.

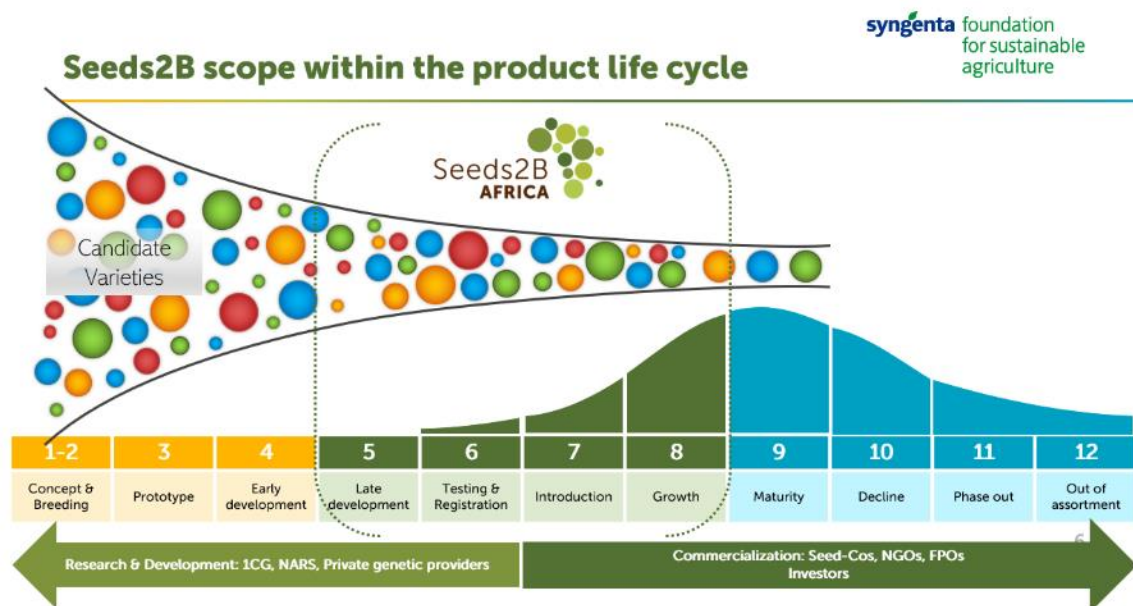
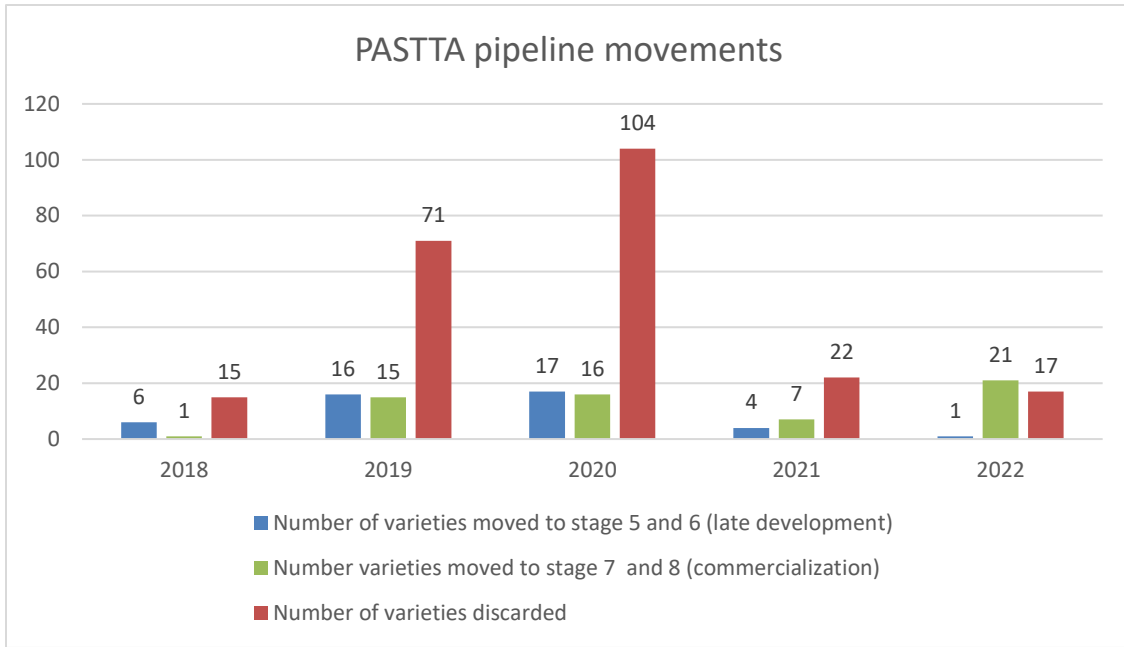


Figure 1: Seeds2B offer positioned between R&D and marketing - PLC Stages 5-8

Typically, the pipeline has a large number of varieties entered at stage 5, then with screening there are fewer at stage 6 and a smaller number still at stage 7 as the advancement process continues. The selection process is important in order to avoid having too many varieties at this point in the commercial process as the market cannot adopt several varieties simultaneously.

During the project's five-year period, we adapted this Seeds2B process to ensure a robust advancement of many farmers' demanded varieties. This was done through consultative decisions made during product advancement meetings (PAMs). The chart below presents a synthesis of the decisions made during these PAMs to advance varieties to later stages or discard those that did not meet target product profile requirements. (See the next section of this report).



Note: This chart is not exhaustive with regards to the pipeline of varieties assessed. There are a number of varieties that entered the pipeline in stage 5 or stage 6 based on the availability of the material we found with breeders. These varieties are not all displayed in this chart if they didn't move to the next stage or were discarded.

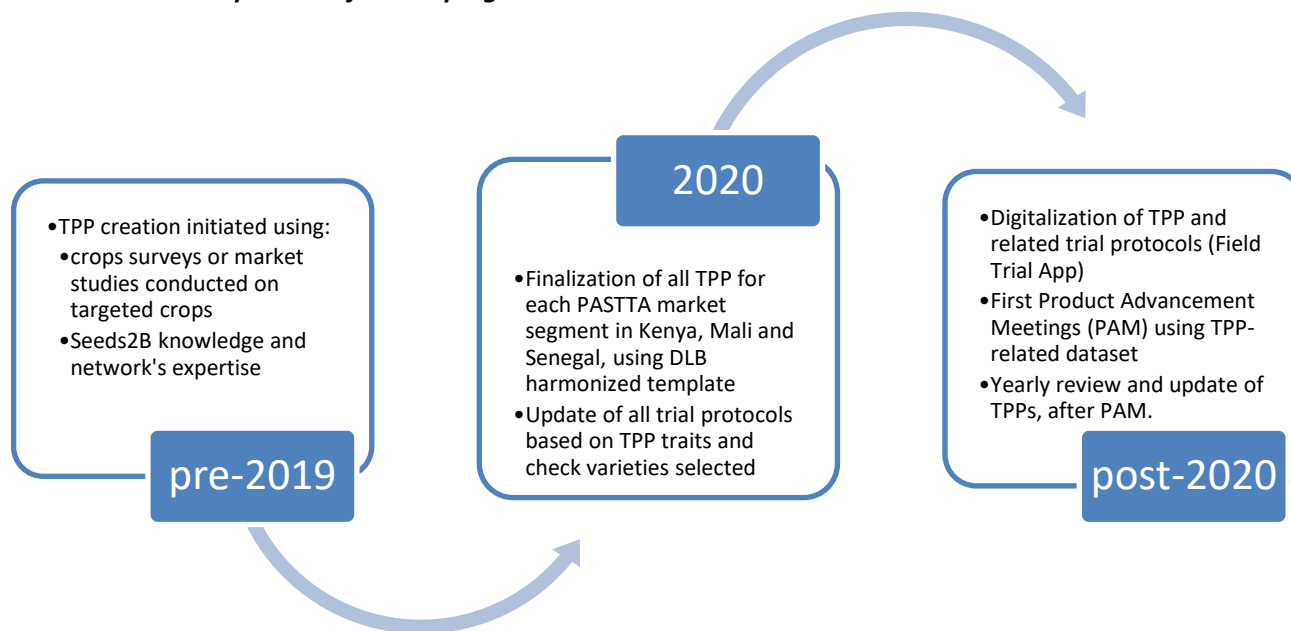
4. TARGET PRODUCT PROFILES

What is a Target Product Profile (TPP)?

The Seeds2B's process involves progressing a variety from the development stage to the commercial stage. A variety can move from one stage to the next at the point when it can be shown to have achieved certain specific and desired traits. In this process, SFSA uses Target Product Profiles (TPP). A TPP is a strategic document used in the Seeds2B process of variety advancement, in order to match varieties selected according to market demand. A TPP lists the traits, any measurable feature that describes a variety, according to customers' preferences, market priority, and differentiation. Each TPP is disaggregated by country (and more specifically agroecological zone), crop, and market segment.

TPP drafting addresses the Demand-Led Breeding (DLB)¹ approach, launched and coordinated by SFSA, in partnership with the Australian Centre for International Agricultural Research (ACIAR), the Crawford Fund, and many research institutes across Africa. It aims to link the development of new varieties to meet changing market requirements in Africa. Indeed, Demand-Led Breeding orients the breeding of varieties according to market needs by addressing farmers' and value chain actors' expectations.

What was the process of developing TPPs?



¹ <https://www.demandledbreeding.org/>

What benefits came from the creation and use of the TPPs?

Before, without TPP	Now, with TPP
<ul style="list-style-type: none"> ● Trial data not adapted to the decision-making process 	<ul style="list-style-type: none"> ● Trial data collected following TPP-based protocols ● Focused effort leading to improvement of data quality ● Critical data available for decision making ● Optimized use of the resources

As of 30th September 2022, the final list includes seven TPPs in Kenya, six in Mali, five in Senegal, two in Malawi and two in Uganda. These TPPs are presented in Table 1 below.

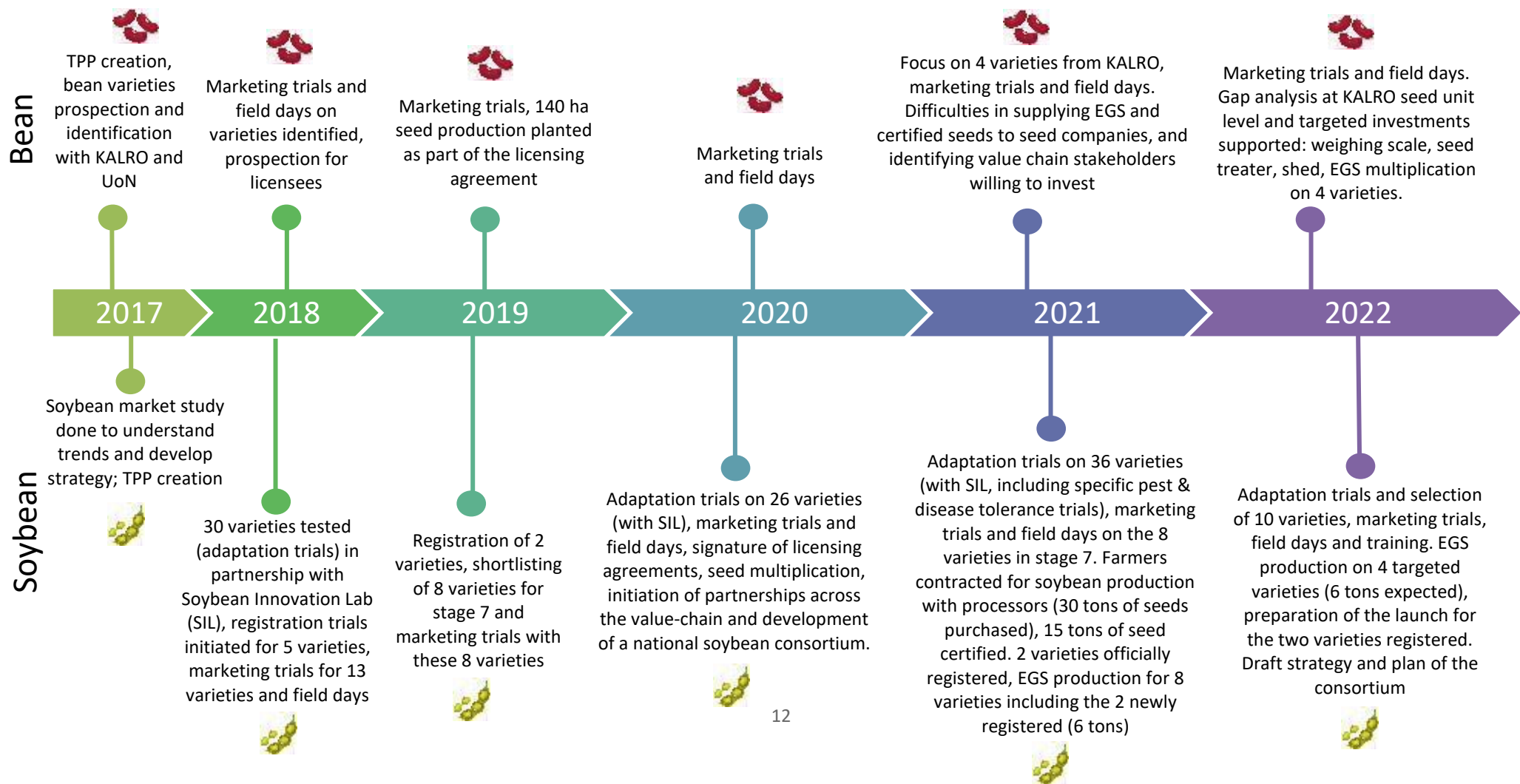
Table 1: List of TPP by country

Country	Crop	Segment
Kenya (7 TPPs)	Potato	1. Crisping 2. Chipping 3. Table
	Bean	4. Biofortified
	Soybean	5. High oil and protein content
	Sorghum	6. Processing 7. Forage
Mali (6 TPPs)	Cowpea	1. White grain
	Groundnut	2. Processing and dual-purpose grain/fodder
	Sorghum	3. Dual purpose grain/fodder 4. High-yielding hybrid
	Soybean	5. High oil and protein content
	Maize	6. Yellow
Senegal (5 TPPs)	Cowpea	1. Home cooking
	Maize	2. Yellow
	Pearl Millet	3. Biofortified 4. Traditional
	Sesame	5. Export (white grain)
Malawi (2 TPPs)	Soybean	1. Processing
	Groundnut	2. Domestic consumption and processing (oil)
Uganda (2 TPPs)	Groundnut	1. Domestic consumption and processing (butter)
	Bean	2. Fresh market and processing

5. COUNTRY SUMMARY

5.1 Kenya

Main achievements and progress - Kenya



Main achievements and progress - Kenya

Potato

Market analysis: update and trends on potato, strategy update, TPP creation

Adaptation trials on 65 varieties, registration trials for 17 varieties, 3 varieties registered, marketing trials and field days

Development of production in the Samburu region (new potato production area) through marketing trials and field days, new licensing agreement signed to produce EGS and certified seeds, seed production

Marketing trials and field days with farmer training. Gap analysis at KALRO seed unit level and targeted investments supported: construction of greenhouse and rehabilitation of tissue culture lab, early generation planting material multiplication identification of PCN resistant varieties for adaptation trials.

First production in the KALRO greenhouse (mini tubers and vitro plants); marketing trials, field days and seed production in Samburu, agronomy trials, adaptation trials for PCN resistant varieties and selection of the best 3 for registration.

2017

2018

2019

2020

2021

2022

Sorghum

TPP creation, sorghum varieties prospection and identification with KALRO and ICRISAT

Adaptation trials on 25 varieties sourced from KALRO and ICRISAT

Drop of malting segment to focus on grain and forage market segments. Varieties previously tested not matching the Product Profile targets. Strategy refocused on 3 varieties already commercialized to support their development at larger scale to farmers. Marketing trials, field days and training on sorghum production

Agronomy trials, marketing trials and field days, seed sales of the 3 varieties in the pipeline

Marketing trials and field days for both forage and grain varieties, seed sales

Key impact numbers – Kenya

15k

Seed value-chain actors present at field days and B2B events

Seeds2B events brought together 15,181 participants during the 95 training events, 64 field days, 1 workshop and 13 informative meetings organized between 2017 and 2022 in the different regions of Kenya to create and catalyze awareness on improved varieties. Besides farmers, representatives of seed companies, NARS, and farmers' cooperatives also attended.

6k

Tons of seeds sold

Seed sales began in Year 1 with 824 tons of certified seeds. Potato remained the most produced crop during the 5-years of the project. We also supported the commercialization of 100 tons of certified sorghum seeds.

4.6

Million dollars of new seed sales

Seed sales started in 2017 with \$632,000, and we reached a peak in 2019 with more than \$1.7 million in annual sales, potato being the first crop contributing to seed sales. From 2021 onwards, new sorghum seed sales greatly contributed to this indicator.

22k

Hectares of land under improved varieties registered/commercialized

Potato and bean are the two major crops using the larger hectares under improved varieties.

>350

Improved varieties trialed (including checks)

7

Varieties officially registered

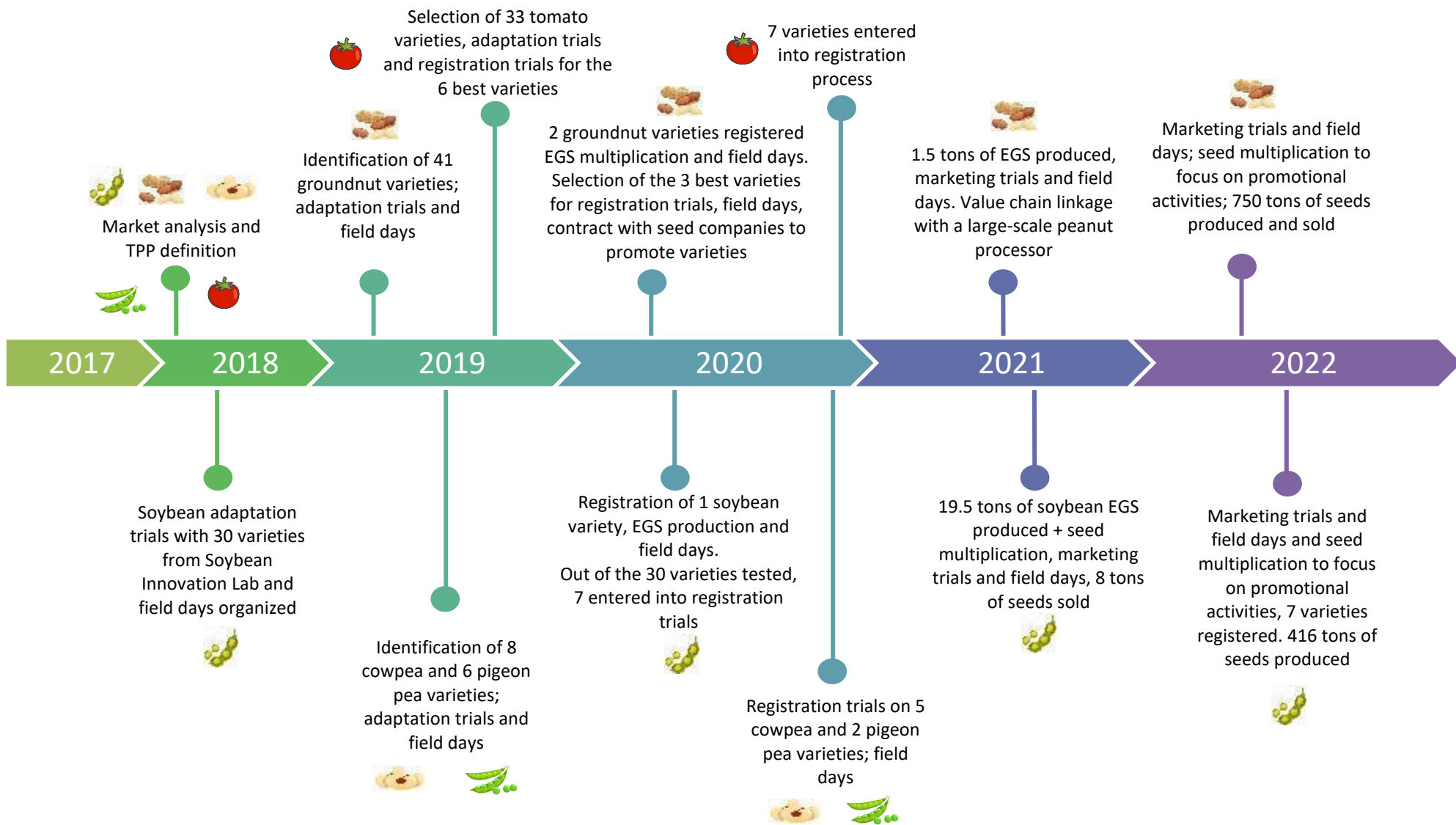
Out of the 7, 5 are potato varieties and 2 are soybean varieties shortlisted from the best varieties from the PATs in partnership with the Soybean Innovation Lab.

Pictures - Kenya



5.2 Malawi

Main achievements and progress - Malawi



8k

Seed value-chain actors present at field days and B2B events

Seeds2B events brought together 8,006 participants during the events organized to create and catalyze awareness on improved varieties. Besides farmers, representatives of seed companies, NARS, and farmers' cooperatives also attended.

1.2k

Tons of seeds multiplied and sold

The project supported the sales of 787 tons EGS of groundnut and 418 tons EGS of soybean. DARS and several seed companies were involved, but the main part is related to the partnership with Pyxus initiated in Year 4 and implemented in Year 5.

3

Million dollars of new seed sales

In Year 5, seed sales reached an amount of \$3 million with \$2 million for groundnut and \$1 million for soybean.

14k

Hectares of land under improved varieties registered/commercialized

Acreage of improved varieties have continued to improve, starting from 17 ha in 2020, 135 ha in 2021 to 13,637 ha in 2022. Groundnut was the major crop accounting for the largest acreage under improved varieties.

>120

Improved varieties trialed (including checks)

10

Varieties officially registered

8 soybean and 2 groundnut varieties.

Pictures - Malawi

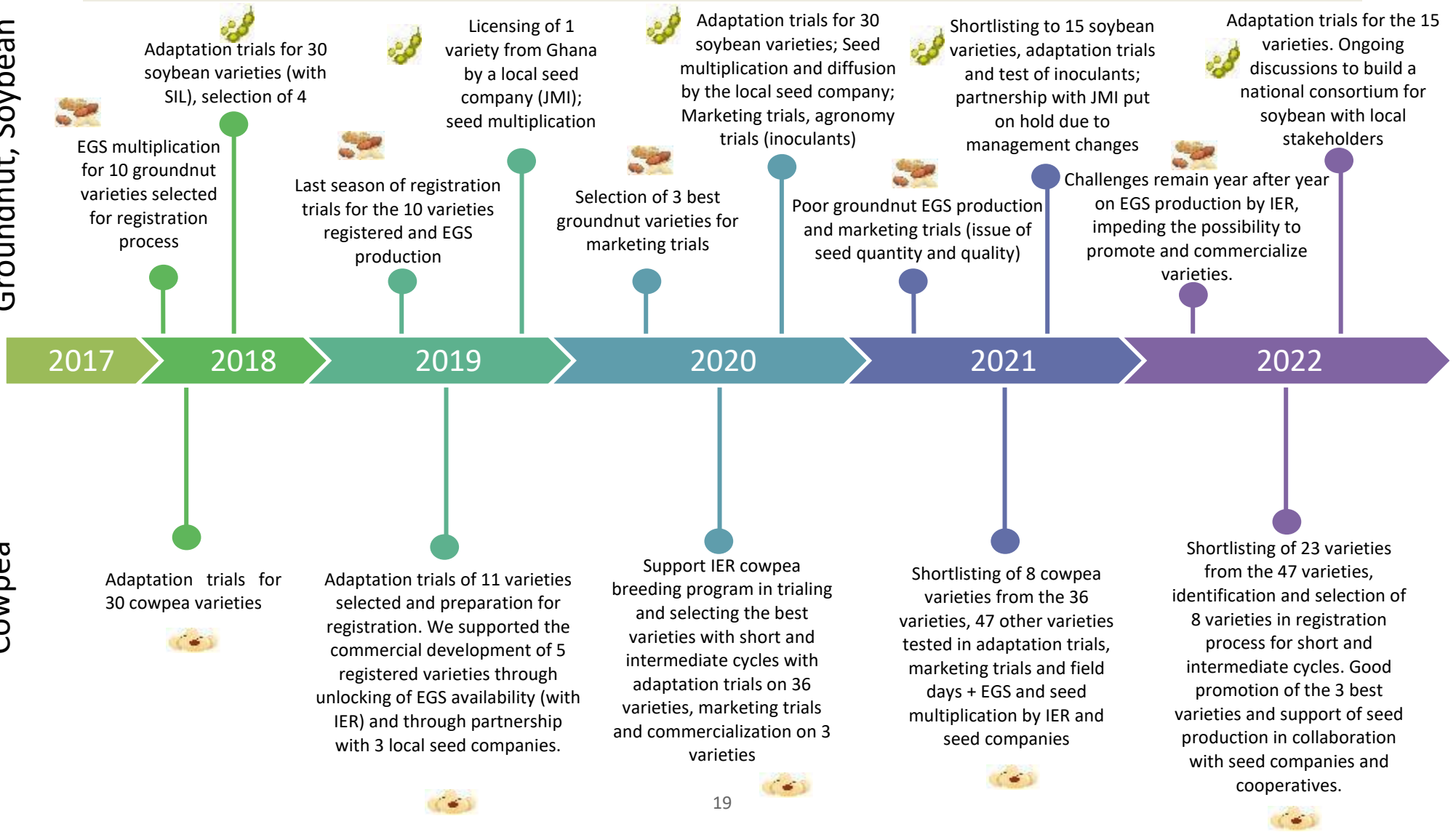


5.3 Mali

Main achievements and progress (legumes) - Mali

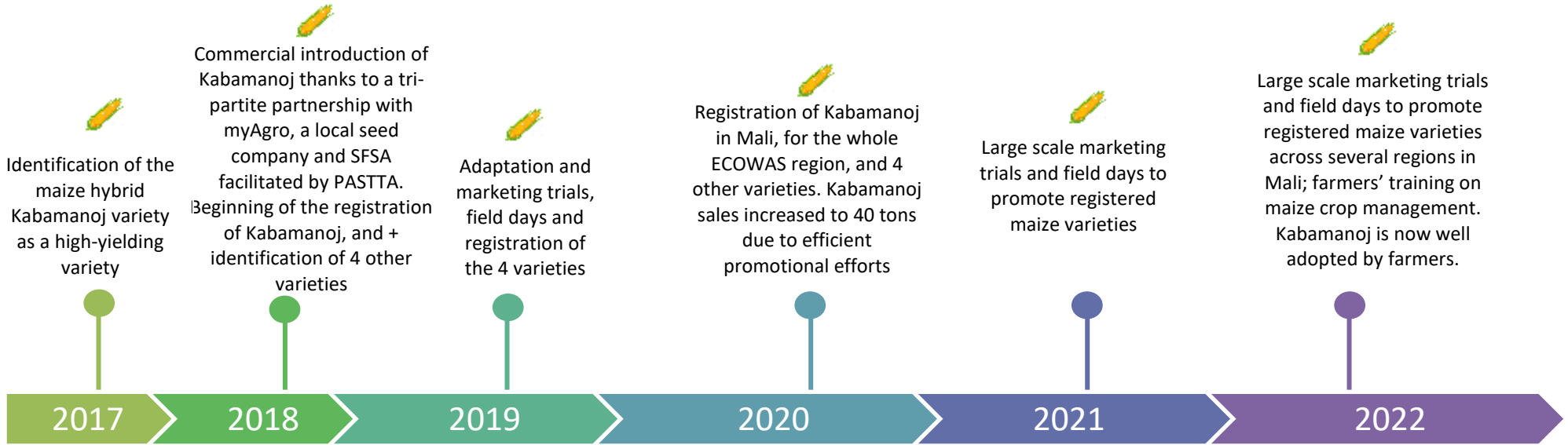
Groundnut, Soybean

Cowpea

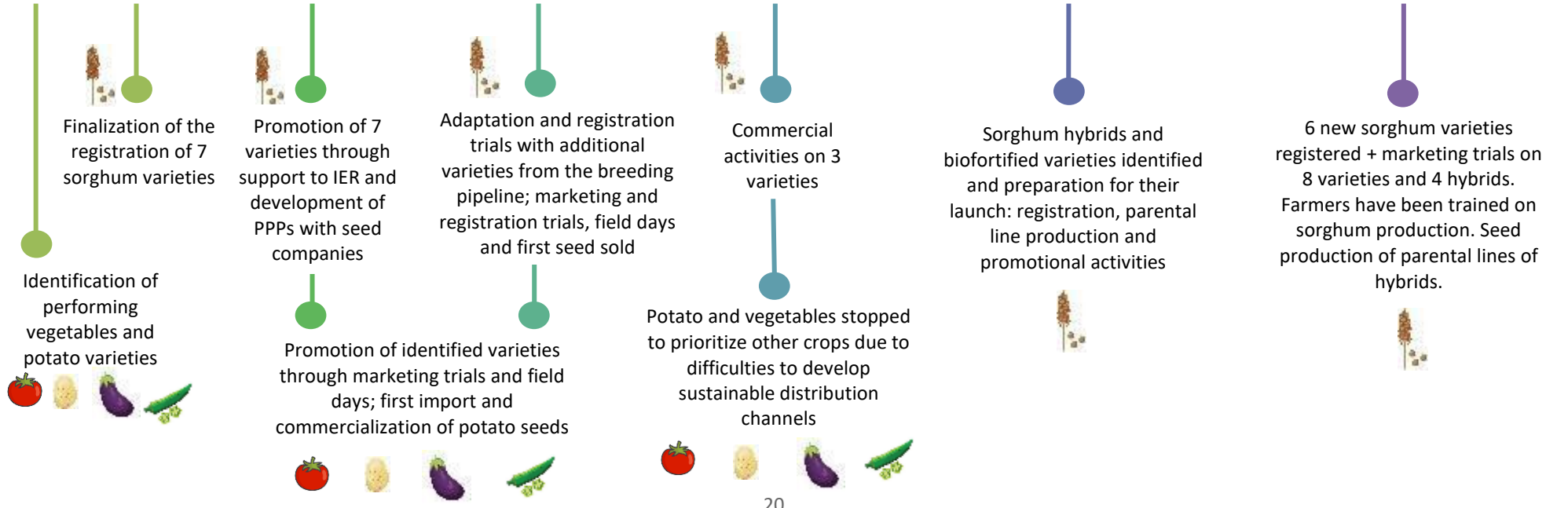


Main achievements and progress (cereals and vegetables) - Mali

Maize



Vegetables, Potato, Pearl Millet



13.6k Seed value-chain actors present at field days and B2B events

Seeds2B events brought together 13,619 participants during the 236 training events, 71 field days, 4 workshops and 37 informative meetings organized between 2017 and 2022 in the different regions of Mali to create and catalyze awareness on improved varieties. Besides farmers, representatives of seed companies, NARS, and farmers' cooperatives also attended.

803 Tons of seeds sold

Seed sales were mostly on maize, sorghum, and cowpea. We started with 96 tons in 2017 and increased this to 322 tons in 2022. The numbers were low for groundnut due to lack of capacity at the NARS especially on production, irrigation, and storage. As a result, the NARS was unable to deliver EGS of the right quality and quantity to meet seed company demand.

3.46 Million dollars of new seed sales

Seed sales steadily increased over the years: \$213,000 in 2018, \$232,000 in 2019, \$422,000 in 2020, \$1.30 million in 2021 and a record of \$1,34 million in 2022. Maize was the first crop contributing to an increase in sales as a result of the promotional efforts for the Kabamanoj maize variety in different parts of Mali.

65k Hectares of land under improved varieties registered/commercialized

Sorghum and maize accounted for the largest acreage under improved varieties. We reached a peak in acreage under seed production in 2020 with 193 ha for certified seeds and 125 ha for EGS.

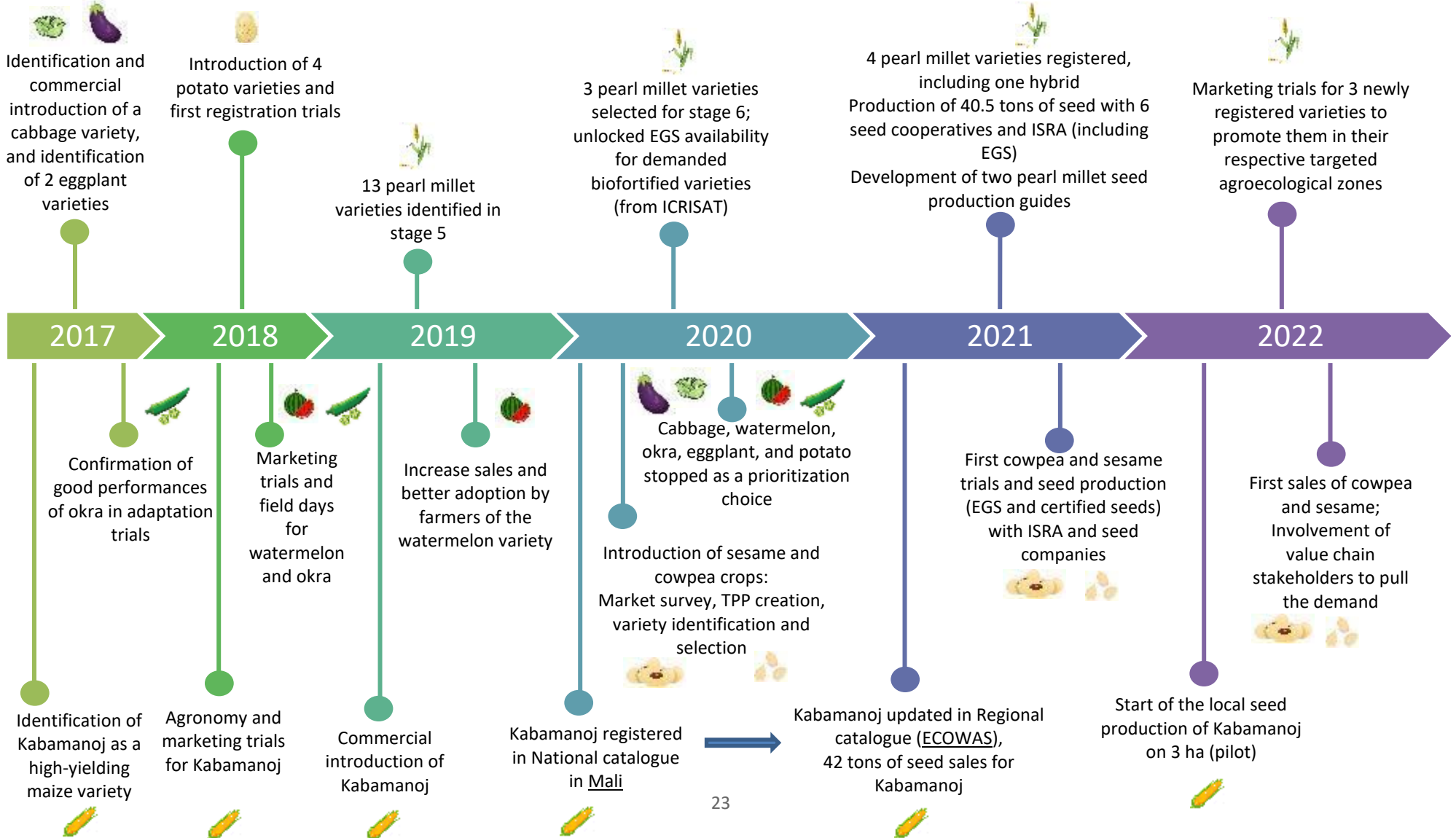
>380 Improved varieties trialed (including checks)

29 Varieties officially registered

15 sorghum, 10 groundnut, 4 maize.

5.4 Senegal

Main achievements and progress - Senegal



Key impact numbers – Senegal

5.1k

Seed value-chain actors present at field days and B2B events

Seeds2B events brought together 5,149 participants during the 35 training events, 39 field days, 2 workshops and 6 informative meetings organized between 2017 and 2022 in the different regions of Senegal to create and catalyze awareness on improved varieties. Besides farmers, representatives of seed companies, NARS, and farmers' cooperatives also attended.

815

Tons of seeds sold

Seed sales began with the importation of 89 tons of potato seeds in 2018 that continued for a further 3 years. Maize seed sales steadily increased from 2019 to 2022. At the beginning of the project, pearl millet sales were low but increased to 82 tons in 2022. We introduced sesame and cowpea in 2020 and the first seed sales were in 2022 with more than 86 tons for cowpea and 20 tons for sesame.

3.34

Million dollars of new seed sales

Seed sales have been increasing over the years: \$92,000 in 2018, \$275,000 in 2019, \$745,000 in 2020, \$518,000 in 2021 and a record of \$1,6 million in 2022. Maize was the first crop contributing to seed sales owing to strong promotional activities of the Kabamanoj maize variety across Senegal. Despite the late introduction of cowpea and sesame seeds, the project still managed to commercialize several varieties of these 2 crops.

76k

Hectares of land under improved varieties registered/commercialized

The acreage under improved varieties has steadily been improving, starting from 254 ha in 2018 to more than 42,551 ha in 2022. Maize and pearl millet account for the largest acreage under improved varieties.

>115

Improved varieties trialed (including checks)

4

Varieties officially registered

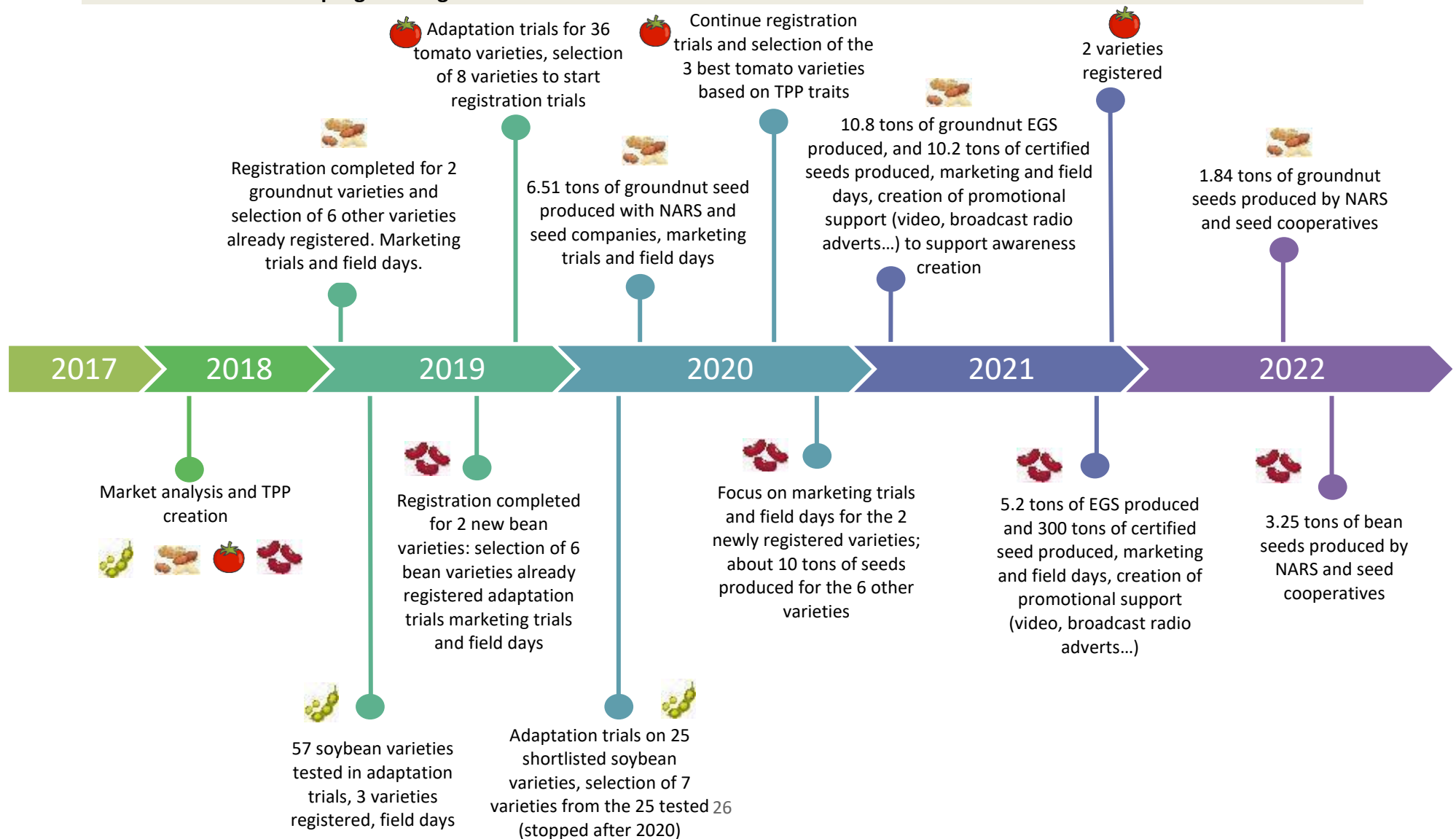
This only accounts for the pearl millet varieties (including the first pearl millet hybrid registered in Senegal).

Pictures - Senegal



5.5 Uganda

Main achievements and progress - Uganda



3.3k Seed value-chain actors present at field days and B2B events

Seeds2B events brought together 3,319 participants during various events such as trainings, field days and workshops organized between 2017 and 2022 in the different regions of Uganda to create and catalyze awareness on improved varieties. Besides farmers, representatives of seed companies, NARS, and farmers' cooperatives also attended.

254 Tons of seeds sold

Bean accounted for the most seed sold with more than 220 tons in Year 4. During Year 5, we only sold seeds for groundnut crop: 2 tons of EGS and 10 tons of certified seeds.

384k Dollars of new seed sales

Seed sales have steadily increased during the main phase of the project: \$26,000 in 2020 and \$305,000 in 2021. During the No-Cost Extension period, seed sales peaked at \$53,000. Bean and groundnut are the two most important crops sold.

5.2k Hectares of land under improved varieties registered/commercialized

Acreage under improved varieties has been increasing starting with 240 ha in 2020 and peaking at more than 4,500 ha in 2021. Bean and groundnut account for the largest acreage under improved varieties.

>230 Improved varieties trialed (including checks)

9 Varieties officially registered

Two groundnut, three soybean, two bean and two tomato varieties. Out of these nine varieties, only the groundnut and the bean varieties were commercialized. Tomato was dropped to prioritize field crops. Three soybean were commercialized by the variety owner – SeedCo company.

Pictures - Uganda



6. PMEP 5-YEARS: KEY RESULTS AND DISCUSSION

This section presents five years of cumulative PASTTA project performance between 2017 to 2022. The project, powered by the slogan of *creating access (both physical and economic) to seeds of improved varieties of seeds* of neglected climate resilient crops, has produced a highly successful seed access drive over the last 5-years. Reflecting on the 5-years performance of the project key indicators, we believe that this landmark USAID-SFSA GDA commitment has spared no effort to free smallholder farmers from food and nutrition insecurity through their access to improved crop varieties.

Reviewing table 2 below (end of this section), the project reported on a framework of ten key performance indicators. Table 2 presents the targets against actual achievements for each country (sum of the five years) and shows the deviation between actual and targets. The five-years analysis highlights significant gains across the five countries, highlighting positive gains to improve smallholder farmers' lives and sustainably strengthen and transform seed value chains. In particular, the analysis shows how the project has facilitated the commercialization of a large quantity of new crop varieties to farmers. Indicators 1, 2 and 3 in table 2 illustrate that performance improved 74%, 64% and 89% respectively and above targets (resulting in more than 9,200 tons of seeds sold with a value of \$14.7 Million). As smallholder farmers are the primary target of this project, we estimate that more than 346,000 have accessed improved seeds through local seed companies and seed cooperatives, against a target of 180,142 farmers. This represents nearly four hundred thousand people who are better able to cope with extreme poverty and climate change by making inroads against food shortages and gaining access to better information on seeds than was previously possible.

Over the years, the project has made significant gains in generating new and innovative partnerships, having galvanized public private partnerships (PPP) with immense value. Being an incremental indicator by nature, new and powerful PPPs have been realized despite achieving 16% below target. (See indicator 6 in table 2). We attribute this shortfall to the challenges brought about by the Covid 19 pandemic in 2020, when nearly all economies came to a standstill and significantly slowed down the gains realized at the beginning of the project. In Mali, political instability experienced during the better part of project implementation was also a key impediment to progress.

Nonetheless, experience and evidence drawn from the efforts to achieve accelerated impacts demonstrate Seeds2B's resilience and capabilities. One pertinent example is evidenced in our continued collaboration with NARS as technology uptake catalysts. In Kenya, a policy debut on royalty remittances has gained track, realizing about \$140,000 in royalties back to the NARS over the five-year project period which is 155% above our set target for this indicator. While the licensing system in Kenya still needs improvement (see the KALRO licensing system assessment in the policy section 8.3 of this report), such performance provides the opportunity for Senegal, Mali, Uganda, and Malawi to build on Kenya's successes while looking ahead to adopting similar approaches.

Capacity building and awareness creation activities among seed value chain stakeholders, and particularly smallholder farmers, were part of the key activities conducted during project implementation. Across the five countries, more than 45,000 people were directly reached during PASTTA-led field days, training courses and information meetings (indicator 10 in the table 2 below).

This number is 17% above the target and is remarkable given that we couldn't hold such events for 2 years due to Covid restrictions.

While these are remarkable achievements, we still believe millions of farmers are being left behind, especially the poorest and those disadvantaged because of their sex, age, disability, ethnicity, or geographic location and therefore, much has yet to be done. However, it is clear that PASTTA's impact has significantly contributed to bringing improved varieties to smallholder farmers at scale and has built a stronger and more sustainable seed ecosystem in the targeted countries. This success shows that the approach taken by PASTTA was appropriate and has set the stage to scale-up this initiative beyond the initial scope of the project.

Table 2: 5-years PASTTA project indicators performance chart

PASTTA Project Indicators	5 years (FY 2017 - FY2022)		
	Target	Actual	% - Deviation
1. Volume of seeds sold (MT)			
Globally (All countries – combined)	5,330.58	9,263.64	▲ +74%
Kenya	3,834.70	5,926.66	▲ +55%
Mali	326.64	803.24	▲ +146%
Senegal	325.45	815.40	▲ +151%
Malawi	728.52	1,213.76	▲ +67%
Uganda	115.27	254.59	▲ +121%
2. Value of seed sales (USD) (USAID: EG.3.1-26, page 105)			
Globally (All countries – combined)	9,034,958	14,752,750	▲ +64%
Kenya	4,432,402	4,548,954	▲ +3%
Mali	2,731,336	3,457,203	▲ +29%
Senegal	1,343,262	3,341,656	▲ +149%
Malawi	400,531	3,021,413	▲ +654%
Uganda	127,426	383,524	▲ +201%
3. Acreage of land under Seed production (Ha) (USAID: EG.3.2 -2.5, page 99)			
Globally (All countries – combined)	103,333	195,652	▲ +89%
Kenya	16,560	21,890	▲ +32%
Mali	46,082	64,994	▲ +41%
Senegal	36,429	95,276	▲ +162%
Malawi	2,902	13,884	▲ +378%
Uganda	1,359	5,180	▲ +281%
4. # of farmers impacted			
Globally (All countries – combined)	180,412	346,767	▲ +92%
Kenya	100,577	69,227	▼ -31%
Mali	47,671	161,612	▲ +239%
Senegal	25,130	75,970	▲ +202%
Malawi	6,324	21,079	▲ +233%
Uganda	710	2,405	▲ +239%

5. Value of Royalties remitted (USD) in Kenya			
Globally (All countries – combined)	55,055	140,307	▲ +155%
Kenya	55,055	140,307	▲ +155%
Mali	0	0	0%
Senegal	0	0	0%
Malawi	0	0	0%
Uganda	0	0	0%
6. # Of seed companies and public institutions impacted to access seeds of improved varieties – Sum of the 5 years (USAID: EG.3.2 -2.4, page 93 / EG.3.2, page 50)			
Globally (All countries – combined)	616	517	▼ -16%
Kenya	126	110	▼ -13%
Mali	242	166	▼ -31%
Senegal	140	130	▼ -7%
Malawi	63	67	▲ +5%
Uganda	44	44	0%
7. # Of active licensing deals			
Globally (All countries – combined)	108	83	▼ -23%
Kenya	51	61	▲ +20%
Mali	46	8	▼ -83%
Senegal	5	6	▲ +20%
Malawi	0	0	0%
Uganda	6	8	▲ +33%
8. # Varieties officially registered			
Globally (All countries – combined)	79	49	▼ -38%
Kenya	17	11	▼ -37%
Mali	42	29	▼ -31%
Senegal	9	4	▼ -56%
Malawi	9	10	▲ +11%
Uganda	1	7	▲ +367%
9. # of improved varieties trialed and commercialized (varieties in the pipeline) (USAID: EG.3.2-7 P85)			
Globally (All countries – combined)	1,427	1,496	▲ +5%
Kenya	290	484	▲ +67%
Mali	546	387	▼ -29%
Senegal	146	115	▼ -21%
Malawi	229	276	▲ +21%
Uganda	216	234	▲ +8%
10.a. # Seed value-chain actors reached on field days, training and B2B events to catalyze awareness			
Globally (All countries – combined)	38,715	45,257	▲ +17%
Kenya	10,855	15,181	▲ +40%
Mali	15,387	13,619	▼ -11%
Senegal	4,680	5,132	▲ +10%

Malawi	6,331	8,006	▲ +26%
Uganda	1,462	3,319	▲ +127%
10.b. # Women reached on field days, training, and B2B events to catalyze awareness			
Globally (All countries – combined)	11,475	14,974	▲ +31%
Kenya	3,230	5,911	▲ +83%
Mali	3,470	2,537	▼ -27%
Senegal	1,550	1,654	▲ +7%
Malawi	2,650	3,921	▲ +48%
Uganda	575	1,525	▲ +165%
10.c. # Youth reached on field days, training, and B2B events to catalyze awareness			
Globally (All countries – combined)	13,721	13,013	▼ -5%
Kenya	1,950	3,708	▲ +90%
Mali	6,846	3,542	▼ -48%
Senegal	1,525	1,441	▼ -6%
Malawi	2,950	4,085	▲ +38%
Uganda	450	938	▲ +108%

7. IMPLEMENTATION CHALLENGES

The COVID-19 outbreak significantly impacted the project’s activities in Years 3 to 5. The first table below shows specific COVID-related challenges faced and mitigation strategies employed.

Tables 3 and 4: List of challenges met during the project

Challenges	Impact	Mitigation
Adhering to in-country health agency protocols for all staff, partners, and farmers during planned activities	Inability to congregate stakeholders	Teleworking, social distancing, personal protective equipment, digitalizing our processes including holding virtual meetings
Cancellation of field days or limited number of participants	Reduced awareness about the varieties being promoted	Replacing large field days with smaller focus group meetings
Management of casual workers at trial and seed production sites	Lack of trial/seed production management which led to the loss of some trial sites	Provisioning of personal protective equipment and social distancing
International travel cancelled	Inability to hold key strategic planning and reporting meetings	Virtual meetings
Domestic travel limitations	Management of trial sites and partners	Remote coordination, virtual meetings
Delays in seed samples delivery (imports)	Trial implementation cancelled, delayed, or postponed to the following season	Coordination of new campaigns for the next season

Other challenges encountered during the project implementation are as follows:

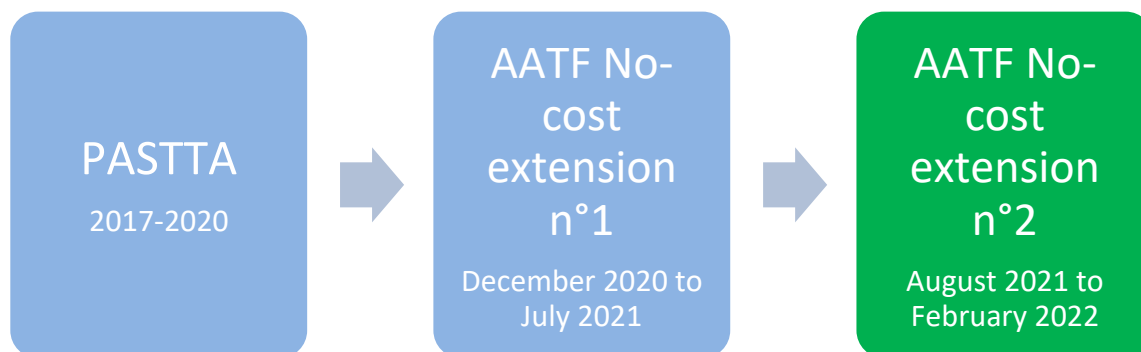
Challenges	Mitigation
Lack of clear and operational national plant variety protection regulations or NARS variety commercialization strategy	Support policy development, its validation and socialization amongst all stakeholders
Slow response to key SFSA interventions and lack of commitments by NARS partners in areas such as EGS production and variety registration	Better planning and coordination, capacity building, gap analysis.
Lack of commitment from variety owners and/or local seed companies in investing in promoting new technologies	Support actors through de-risking mechanisms and promotional activities; develop broader partnerships across the value-chain
Shortage of seeds for conducting trials as well as seed quality issues leading to trials failure	Trials repeated in the following season. Improvement of partners’ seed quality management
Climate change and unpredictability of seasons	There is no specific mitigation action. We work closely with partners and farmers in order to optimize sowing dates as a result of late/lack/excessive rains. Where possible/relevant, installation of on-site supplemental irrigation has been done
Availability and affordability of fertilizer amid the Ukraine-Russia conflict	Rework fertilization formulas with what is available, rely on local source of organic fertilizers (manure, compost, etc.)

8. COLLABORATION WITH SUB-GRANTEE IMPLEMENTING PARTNERS

8.1 AATF²: implementation of PASTTA beyond our focus countries

During the first phase of PASTTA, we collaborated with AATF to implement the activities in Malawi and Uganda. The project focused on soybean, groundnut, cowpea, pigeon pea and tomato in Malawi, and soybean, groundnut, common bean, and tomato in Uganda.

The PASTTA two-year extension covered only Senegal, Mali, and Kenya. Uganda and Malawi were not part of it. However, a no-cost extension (NCE) was negotiated and signed with AATF in December 2020 to finalize the work initiated during the first phase of the program through July 2021. Due to a number of reasons including COVID, not all activities had been finalized by July 2021. Therefore, a second no-cost extension was prepared with AATF using the remaining unspent money to cover activities from August 2021 to February 2022. The chart below represents a summary of our collaboration with AATF since 2017:



In light of the funds available during the no-cost extension period, we agreed with AATF to mainly focus on activities that would drive increased impact at the farmer level as outlined in the table below.

	Malawi	Uganda
Focus crops for NCE	Soybean and Groundnut	Bean and Groundnut
Key activities	<ul style="list-style-type: none"> ● Finalize registration of varieties initiated (Malawi only) ● Secure EGS production with research institutions ● Support seed companies in accessing EGS, producing, and commercializing seeds to farmers ● Marketing trials, communication, and field days 	
Put on hold	<i>Cowpea, Pigeon pea, Tomato</i>	<i>Soybean, Tomato</i>

² <https://www.aatf-africa.org/>

8.2 myAgro³: supporting last-mile delivery channels to reach farmers with innovations at scale

myAgro is an African-based entity involved in the development of smallholder agriculture and access to good quality inputs through a savings scheme. They are a key partner to connect R&D, extension, and seed delivery to farmers along the PASTTA project period. We started supporting them in Mali at the beginning of the project. In Year 4, considering the synergies between PASTTA and myAgro's activities, as well as the valuable contribution made by myAgro in testing, providing feedback, and adopting new varieties, the collaboration was extended to include myAgro Senegal during the two-year extension (FY21 and FY22).

With the support of PASTTA, myAgro has developed activities around the following four key pillars:

- 1) Developing and testing impactful agriculture packages (seeds of new varieties with fertilizers, inoculants, and crop management practices.)
- 2) Building the seed markets in Mali and Senegal
- 3) Protecting farmers' harvests from pests (e.g., fall armyworm)
- 4) Training farmers on good agricultural practices

Below are highlights of key achievements in our partnership with myAgro during the program implementation period:

>400,000

Farmers enrolled in myAgro's program (total of the five years)

*Empowering women in agriculture is a common value shared by SFSA and MyAgro.
Among the 400,000 farmers enrolled in myAgro's program, more than 50% are women.*

850 tons

of seeds ordered and delivered to farmers

3.6 M US\$

of seeds ordered and delivered to farmers

>10,000

Agricultural training organized

>400,000

Farmers trained in good agricultural practices

³ <https://www.myagro.org/>

8.3 Improving seed policies to unlock seed system development (with New Markets Lab⁴)

Seed policy support has been a major component of our work in PASTTA. Based on our experience over the years (and prior to PASTTA), we've seen how unclear and/or dysfunctional policies can impede the development of seed sectors. In partnership with seed industry stakeholders, we have identified areas where seed policies should be diagnosed or improved. Through our long-term collaboration with the New Markets Lab, we implemented the several policy related activities including:

- The development and popularization of manuals to help seed sector stakeholders navigate complex national or regional seed regulations
- The implementation of training workshops to build capacity of local stakeholders (e.g., on licensing models)
- The assessment to understand gaps in current policy frameworks and identifying actions going forward to address them
- The development of case studies on specific policy related topics

The following table presents the main achievements and links to access the main reports prepared with the support of PASTTA. **Click on the links** to access the reports.



Manuals

- SADC (Southern African Development Community) regional seed regulation [manual](#)
- COMESA (Common Market for Eastern and Southern Africa) regional seed regulation [manual](#)

Training workshops

- Several training workshops were organized in Kenya (2019), Senegal (2019), Mali (2020) and Uganda (2021). The workshops planned in Malawi did not take place due to delays in publishing the plant variety protection regulation.
- Annual policy workshops were organized during the yearly AFSTA congress to present policy studies and findings to seed systems stakeholders and solicit their feedback about seed policy in Africa.
- Leaflets and a model licensing agreement in English and French are being developed to facilitate awareness creation and understanding of the key concepts. These will be finalized in early 2023.

Assessment / Need assessment

- [Findings](#) of check-back mechanism for regionally-registered varieties (ECOWAS, COMESA, EAC, SADC)

⁴ <https://www.newmarketslab.org/>

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- [Report](#) on capacity building and licensing needs assessment in Malawi, Mali, Senegal, and Uganda
 - [Licensing of public plant varieties: the case of KALRO](#)
 - [Check-back mechanism on regionally registered varieties related to regional registration of public varieties](#)

Case studies

- [Case study](#) on regulation of vegetable crops in Kenya
- [Case study](#) on regional harmonization of vegetable seed in Kenya, Senegal, Nigeria and Malawi
- [Case study](#) on KALRO model plant varieties licensing agreement ([French version also available here](#))
- [Case study](#) on potato seed policy in Kenya

8.4 Collaboration with CIP: Building our own capacity to mainstream gender in our process

A partnership agreement was signed with CIP during the first phase of PASTTA and implemented during the no-cost extension mostly due to internal changes at CIP. Highlights of the three main activities implemented by CIP are described hereinafter.

Activity 1: Gender awareness training

Objective: build PASTTA team capacities on gender mainstreaming in projects.

CIP conducted a gender awareness training which covered three topics: (i) general gender definition and concepts, (ii) conceptualize and internalize the concepts of mainstreaming gender into the seed value chain, and (iii) identify strategies for incorporating/mainstreaming gender within existing work plans and/or field activities. Gaps in the seed value chain that need to be monitored as part of PASTTA's activities were identified.

Activity 2: Review of SFSA's potato target product profile

Objective: understand how traits selected in a TPP impacts women

For the TPP review and analysis, CIP used their in-house [G+ tool](#) to analyze individual traits with respect to the preferences of men and women users of the product and scores each trait as "do no harm" or "positive benefits".

The analysis showed that some traits have both positive and negative impacts on women. For example, a negative impact of yield could be the increased drudgery that can be associated with higher production, whereas a positive benefit is increased income. From the findings of the TPP review, CIP listed some recommendations when designing a new TPP on the traits negatively affecting women.

Activity 3: Review of potato variety registration and release process in Kenya

Objective: identify issues/traits that may deter women and men stakeholders from fully utilizing released varieties

The review was made using a desk review of relevant documents and related literature, combined with data collected via structured individual interviews with key stakeholders in the Kenyan seed value chain.

This review found out there is a gap in gender representation of official variety release committees. A change in policy is suggested to expressly provide specific guidelines for women's representation in these committees. Additionally, several factors taken into consideration in approving or rejecting a variety for release serve the interests of men to the detriment of women (for example, yield, labor requirements, etc.). A recommendation from this study is that NPT protocols should be designed by a holistic team comprising breeders, agronomists, and social and gender scientists.

The full project report (Gender mainstreaming in PASTTA project - Final Project Report by CIP- with Annexes) is available upon [request from Syngenta Foundation](#).

During Year 5, we had several off-line discussions with CIP in order to clarify the use of the G+ tools and how to implement them into our projects. We used the knowledge acquired through CIP training and outputs from the case studies they have implemented.

From this work, we reviewed all TPPs in the three focus countries using the G+ tool methodology and re-assessed the TPPs with a gender lens. Below is an example of the TPP analysis we made on the Kenya TPP for potatoes. We assessed each TPP trait by defining positive and negative benefits/effects on women and noted it with a score. The trait conclusion gives a score by trait and the TPP general score allows us to understand if the TPP has positive or negative aspects for women. Where needed, TPPs are edited to make sure that the average of all targeted traits is not unfavourable to women. In the example below, the general score is 2 meaning “TPP accepted has positive benefits to women farmers”.

Table 3: Gender analysis of the Target Product Profile (TPP)

	Trait importance	Positive benefits		Negative effects (Do no harm)		Trait Conclusion
		Rationale	Score	Rationale	Score	
Dry matter content	1	Better for cooking time	2	N/A	0	2
Tuber yield	3	High yield = high income	3	more labor for women, men responsible of cash crops	-2	3
Shelf life	2	N/A	0	N/A	0	0
Pest score	2	Reduce dependency of inputs controlled by men	3	men purchasing inputs/decide on the strategy	-2	2
Disease score	2	Reduce dependency of inputs controlled by men	3	men purchasing inputs/decide on the strategy	-2	2
Earliness	3	early maturity = first on the market/high prices	3	Men give priority to income compared to home consumption	-2	3
TPP general score						2

9. COLLABORATION WITH THE USAID FEED THE FUTURE INNOVATION LABS

The FtF Innovation Labs provide an excellent platform by which new climate smart technologies adapted to smallholder farmer ecosystems are being developed. During the PASTTA program, we worked in collaboration with several Innovation Labs to scout for technologies while strengthening our technical approaches:

- We built a strong working relationship with the Soybean Innovation Lab in Mali, Kenya and Malawi and implemented their Pan-African Trial network in the three countries. In addition to these trials, we collaborated on other key topics such as soybean crop management (fertilizer, inoculants, post-harvest management, etc.) and variety advancement processes. We trained SIL on the Seeds2B variety advancement process and on the Field Trial application. There is a high potential to continue the collaboration on these topics with SIL and expand it to other Innovation Labs involved in breeding and variety advancement. Among the 146 varieties we worked on, a significant amount came from the Innovation Labs with the Soybean Innovation Lab accounting for the most varieties. The table below lists the varieties tested and supported through to the commercialization stage. The varieties in **blue** were commercialized as a result of the PASTTA initiative.

Table 5: list of varieties from the Innovation Labs tested and commercialized by PASTTA

Crop	Varieties	Tested in
Cowpea	5 varieties: Thieye, Sam, Yacine , Pakao, Melakh	Senegal
Peanut	2 varieties: CG 15, CG 16	Malawi
Soybean	139 varieties: Afayak; Bimha; Black Hawk; BRS 326; BRS 7980; BRS 8660; BRS CHAPADOES; BRS JIRIPOCA; BRS PEROLA; BRS SAMBAIBA; BRS TRACAJA; CLARK 68K; CLARK-63K; CONQUISTA; Dundee; EGRET; Favour; H296; IBIS 2000; Jenguma commercialized in Mali ; Kafue; Kaleya; KENSOY 005 (SCS-1) in the process of commercialization in Kenya ; KNSOY 001 (Hill) ; KNSOY 001 (Nyala) ; KNSOY 002 (EAI-3600) ; KNSOY 009 (Kensoy009) ; LD11-2170; LD12-459; Lukanga; M667; MAKSOY 1N; MAKSOY 2N; MAKSOY 3N; MAKSOY 4N; MAKSOY 5N; MAKSOY 6N; MAKSOY BN; Makwacha; Mhembwe; MRI DINA; N390; NASOKO; O253; Panorama 1; Panorama 2; Panorama 27 D; Panorama 29 I; Panorama 291; Panorama 3; Panorama 357; Panorama 358; Quarshie; S1075/6/93; S1079/6/7; S1139/5/120; S1140/5/4; S1141/5/38; S1146/5/25; S1150/5/22; S1150/6/22; S1179/5/58; S1180/5/54; S12-1955; S12-4718; S13-2743; S13-3851; SA11-20242; SA12-1955; SA12-4718; SA13-10592; SA13-2743; SA13-3851; SA16-11827; SA16-12880; SA16-13740; SALINTUYA-1; SC SAFARI; SC SAGA commercialized in Malawi ; SC Salama commercialized in Kenya ; SC SAXON; SC SENTINEL; SC SERENADE; SC SIGNAL commercialized in Malawi ; SC SPIKE; SC SQUIRE; SC STATUS; SC-SEMEKI; SNK500; SNKGM001; SNKGM002; SNKGM003; SNKGM004; Songda; Soungpungun; T267; TGx 1485-1D; TGX 1740-2F; TGx 1835-10E; TGx 1904-6F; TGx 1908-8F; TGX 1963-3F;	Kenya, Malawi, Mali, Uganda

	<p>TGx 1987-10F; TGx 1987-38F; TGx 1987-40FZ; TGx 1987-62F commercialized in Malawi; TGx 1988-18F; TGX 1988-5F; TGx 1989-60F; TGX 1990-67F; TGx 1991-22F commercialized in Malawi; TGx 2000-20FZ; TGx 2000-26FZ; TGx 2001-10DM; TGx 2001-11DM; TGx 2001-13DM; TGx 2001-1DM; TGx 2001-24DM; TGx 2001-3FM; TGx 2001-6FM; TGx 2001-8DM; TGx 2002-14DM; TGx 2002-16FZ; TGx 2002-23DM; TGx 2002-3DM; TGx 2014-04FZ; TGx 2014-16FM commercialized in Malawi; TGx 2014-19FM; TGx 2014-23FM; TGx 2014-28FZ; TGx 2014-49FZ; TGx 2014-5GM; TGx 2021-03FZ; TIKOLORE</p> <p>Note: these soybean varieties were tested in one or several country(ies) mentioned in the third column</p>	
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- We had regular interactions with the Peanut Innovation Lab in order to strengthen our knowledge and guide our choices on the ground. Peanut is a very challenging crop that requires in-depth knowledge to succeed. As such, it doesn't attract a lot of investment from the private sector. The Lab has developed a wide range of training material and studies that we have shared widely with both internal and external stakeholders working on peanuts.
- In Year 4 we engaged with the Post-Harvest Innovation Lab on seed post-harvest management and seed storage solutions, more specifically bags for crops like cowpea to ensure optimal storage conditions. These technologies have not yet been introduced at scale due to their costs and availability, but this is an area to investigate in the future.
- Through our collaboration with local partners in different countries, we had indirect collaboration with the Sorghum and Millet Innovation Lab, Legume System Research Innovation Lab and Peanut Innovation Lab who are working closely with NARS breeders in different countries.
- During the AFSTA annual congress in March 2022, technical sheets for varieties supported by several Innovation Labs were shared with relevant stakeholders such as African seed companies, National seed trade associations, and NGOs among others. The variety sheets were created by the Innovation Labs using the template developed by SFSA. We also advised USAID and Innovation Labs on how to better promote the key technologies they have developed.

We are keen to scale up our collaboration with the Innovation Labs building on what has already been achieved on the ground. Future plans include more in-country engagements between our Seeds2B local staff and the Labs' local teams to find other potential areas of collaboration. We recently started an engagement with the Innovation Lab on Livestock Systems to co-develop a concept to improve forage seed systems in select African countries.

10. M&E PROCESS AND SFSA DATA TOOLS

We developed a robust M&E unit to support collection, analysis and reporting of key impact data throughout the PASTTA program.

10.1 Data collection tools: how digital tools help us to advance varieties and measure impact

Data plays a central role in PASTTA both for variety assessment and advancement, successful commercialization and for impact measurement. The data is captured and stored securely in the cloud. The table below highlights some of the digital tools we developed throughout the program.

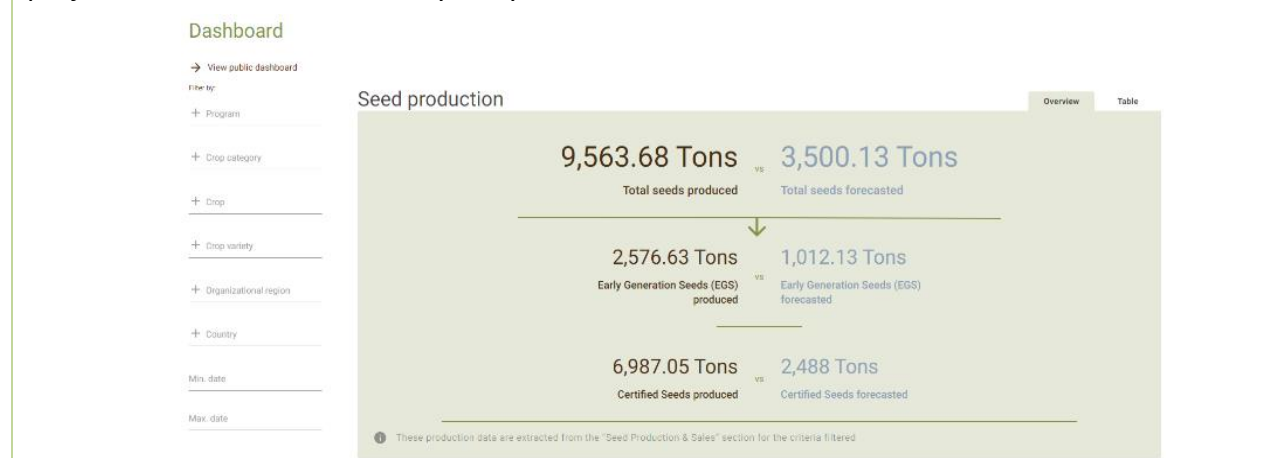
Field Trial Application

This cloud-based system includes features such as trial design, data collection and management, and variety portfolio management, among others. The data is entered by SFSA staff directly or by trialing partners trained in using the tool (or using specific forms extracted from the app).

The Field trial app is continuously under development to provide more features to users in line with the trial management or variety pipeline management. The latest features developed were focused on data validation, trial power and statistical analysis. These are very helpful when conducting a PAM to support decision making and application of results.

Impact Model

This cloud-based system centralizes all the data related to activities, achievements, and development of crop varieties. This includes the status of licensing agreements, registration of varieties, sales of imported seeds, seed production, and sales. The data is entered directly by SFSA staff who collect the information from activities which have been implemented or facilitated, or by partners (such as myAgro). From the survey conducted during Year 4, we analyzed feedback from our colleagues and developed a plan to improve the Impact Model app. These improvements have been shared with the developers for integration into the tool. A new dashboard is under development that will help us to easily access data directly linked to project's KPIs. It should be ready early 2023.

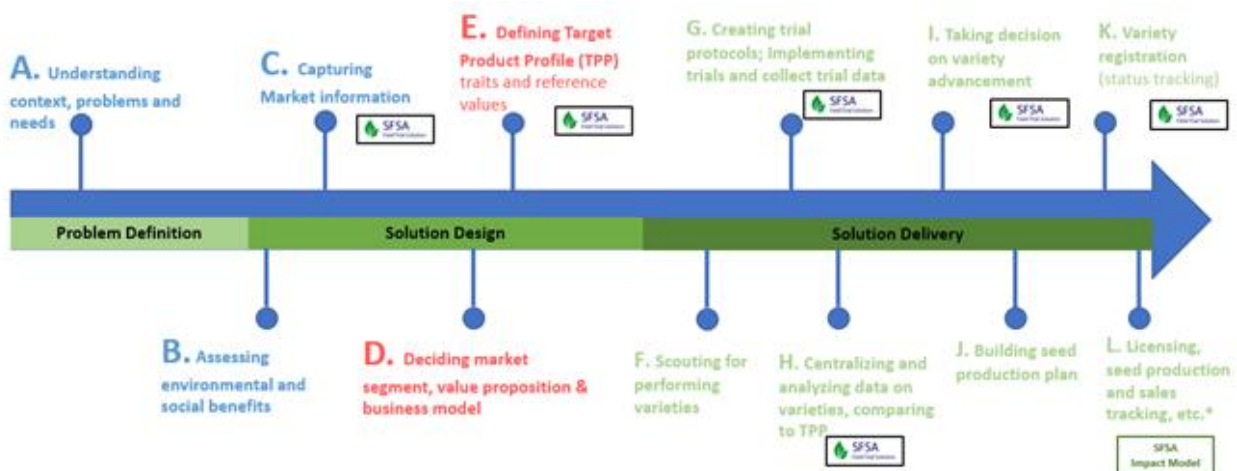


Smartsheet Events Database/Forms

When events are organized (training sessions, field days, information meetings, etc.), aggregate data on attendance is collected on the number of people that participated and on the participants' profiles (farmers, scientists, private sector, men, women, etc.).

During the PASTTA program, we moved from a cloud-based Excel sheet to the Smartsheet cloud platform to facilitate event data reporting from the field via automated forms, as well as post-event data analysis (for reporting, impact measurements, etc.). The Smartsheet platform significantly improved the data entry process from the field using mobile devices and also made it easier to translate forms into French for the West African countries. The platform allows the users to attach supporting documents such as event photos and attendee sheets for ease of reporting. This minimizes data entry errors and simplifies the analysis and reporting process.

The following chart presents the variety advancement process highlighting the different phases of *problem definition, solution design and solution delivery*. It also shows the various steps taken to *i) Understand the context, problems and needs and, ii) Assess the environmental and social benefits, etc. we follow in order iii) to ensure successful delivery of varieties to the market*. In the chart, the logos of our tools (Field Trial App and SFSA Impact model) indicate where they are used along the process.



10.2 Variety description sheets: efficient communication about new varieties is essential

As part of the commercialization guidelines and variety promotion, we developed variety technical sheets for the varieties in pre-commercial and commercial stages (from Stage 6 to Stage 8). These sheets are designed to support variety promotion and commercialization for the seed stakeholders during Seeds2B events including field days, and other training events. They summarize relevant information on key variety attributes such as potential yield, days to maturity, and pest, and disease tolerance. They also include a crop management protocol on best crop management practices. Also included in the sheets are pictures showing the product and the field during the crop cycle.

Variety technical sheets are still under development for Kenya, Senegal, and Mali, based on the portfolio of varieties promoted (see examples in figures below). Our variety technical sheet template was shared with the Innovation Labs for use in developing their own variety sheets. We presented the first versions of PASTTA and Innovation Labs' variety technical sheets to African seed companies and national seed trade associations during the 2022 AFSTA Congress. The general feedback was positive, but more work is needed to socialize the benefits of these varieties to a wider set of seed systems stakeholders. Below are examples of variety technical sheets developed by Seeds2B team and ILs.

Common beans
Nyota
High yielding, iron and zinc biofortified and drought tolerant bean variety.

i Country of origin/owner: Kenya
Product/market segment: Home consumption (boiled)
Variety type: OPV

***** Special features: (value + description)
- Yield potential: 1.4- 2 tons /ha
- Number of days to maturity: 60 - 70 days
- Drought tolerant
- Zinc content: 33 PPM
- Iron content: 90 PPM

- Field Nyota picture coming from KALRO brochure.

Technical features

Cultural practices

Before sowing

- 1 Prepare soil to fine tilth

Sowing

- 2 Sow your field at the onset of rains, using 20-25 kg/acre of seeds. Follow the spacing according to the picture and 50 cm row to row
- 3 Apply 50 kg/acre of planting fertilizer at planting time and mix the fertilizer and the soil thoroughly before covering the seed.

Crop management

- 4 Weed at least 12 times per season. The 1st weeding should be done two weeks after emergence and the 2nd one must be done before flowering.

Harvest

- 5 Harvest when it's dry and spread beans out in the sun to dry on a plastic sheet or gunny bag further before threshing (if not, you'll damage the seeds). After threshing, winnow the grains before storage.

Storage

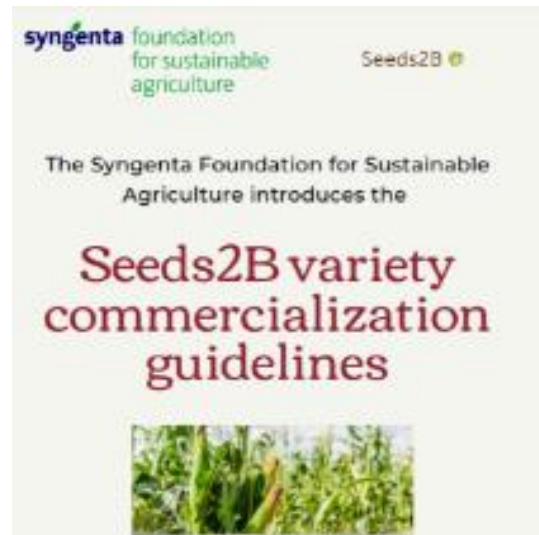
- 6 Treat the seeds before storage:
 - Use of non-chemical, hermetic storage technologies
 - Dusting with storage pesticides such as Actellic dust
 - Grains can be further treated with sunflower or com/maize oil at 200ml per bag
- 7 Store the beans in sacks or other containers, and stored them in a clean, dry and ventilated place.

Recommendations coming from KALRO's brochure.

Figure 2: Example of variety technical sheet developed in Kenya

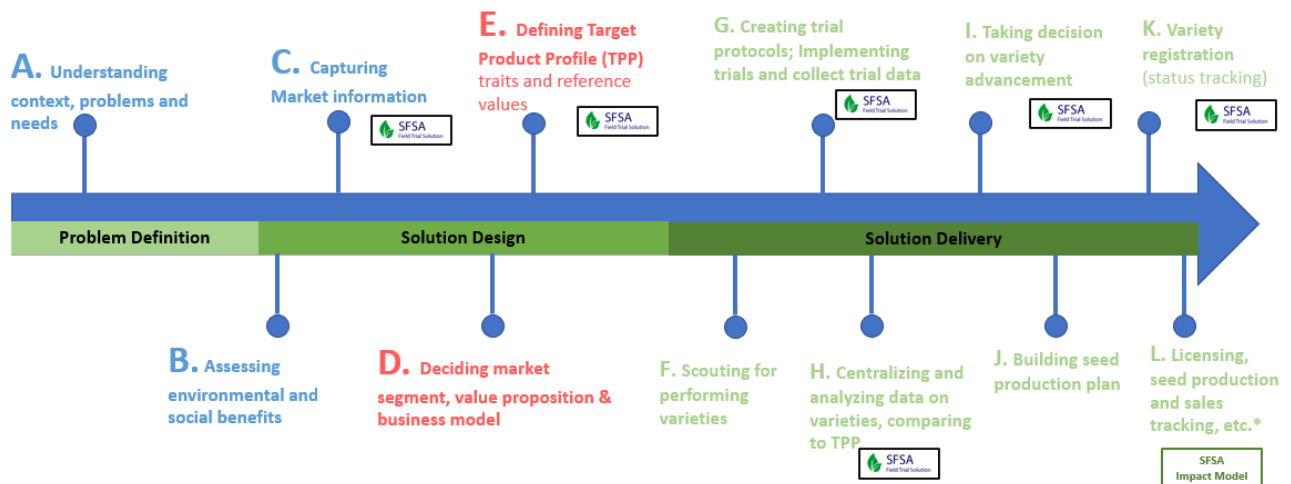
10.3 Seeds2B’s guidelines for variety commercialization: building a toolkit and processes to successfully bring varieties to market

Successful commercialization of varieties requires following a systematic approach based on the product life cycle (PLC). The PASTTA program has given us a wealth of experience in best practices in variety commercialization. As a result, and in order to scale up this approach, we are authoring a commercialization toolkit or handbook that can be used by project leads to manage the seed delivery process. This guide could be appropriate for public breeders, local private sector or practitioners coaching others. It covers the end-to-end steps, from problem definition to delivery of the relevant seed to farmers, and ultimately consumers. We expect to make the toolkit available from July 2023 and will be accessible through a website.



An article has been published on Syngenta Foundation’s website (<https://www.syngentafoundation.org/news/recent-news/helping-seeds-meet-all-their-needs>) and the brochure can be downloaded by clicking on the image above.

During Year 5, we started developing a website in collaboration with a local media agency in Nairobi, Kenya. This website will host all the commercialization tools and templates developed by the team which can be accessed online. The website will be designed to optimize users’ experience and guide them through the PLC process and required steps to successfully commercialize varieties. Users will have the opportunity to request training on some of the tools in the handbook. As part of the continuous improvement process, users will be able to provide their feedback on the usability of the system.



II. SEEDS2B AFRICA ORGANIZATION SETUP

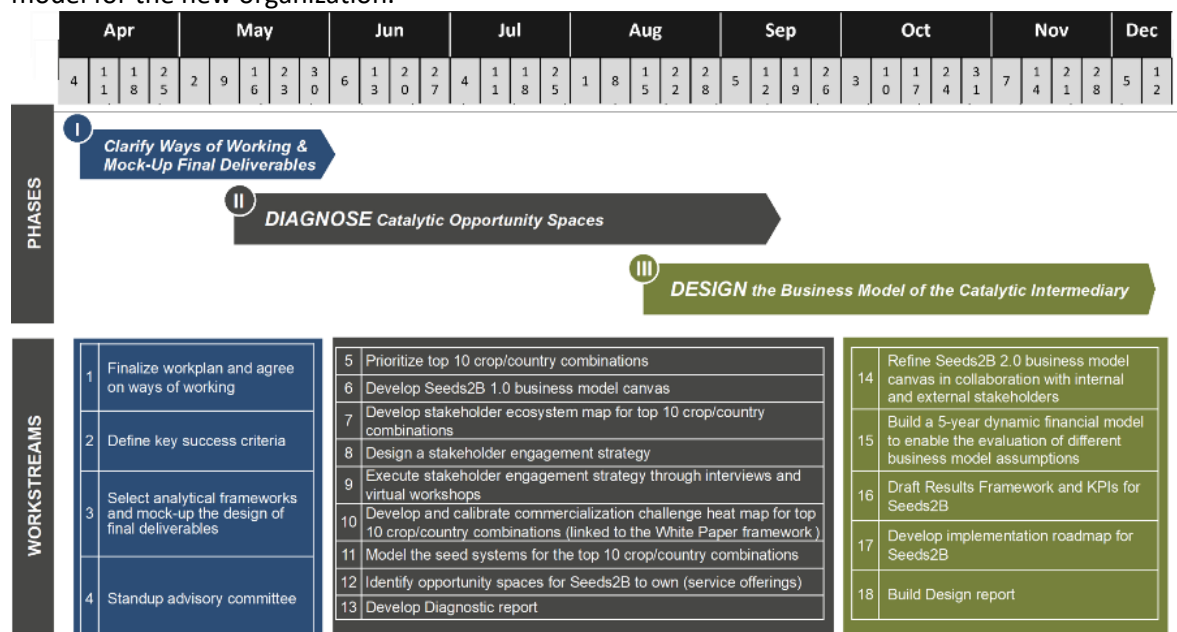
During the latter part of the PASTTA GDA, the project included a plan to design and, if proven feasible, launch an Africa-based catalytic intermediary as a mid-term delivery mechanism for variety commercialization and delivery of new varieties into the marketplace. This intermediary, dubbed Seeds2B Africa, would have a role to play in building capability in public and private sectors and scaling product advancement and variety commercialization.

The project kicked off in April 2022 with assistance from Context Global Development Consultants (CGD) with a goal to design a best-bet business model for Seeds2B Africa to sustainably serve smallholders through catalyzing scalable market development and innovation delivery systems, while building capacity across the public and private sectors.



Figure 3: SFSA and CGD teams meeting in Nairobi (November 2022)

The figure below shows a high level illustrative workplan through December 2022. The planned activities will culminate in the building of a business model for the new organization.



In January 2023, we plan on rolling out the new PASTTA program under the Public International Organization agreement with the International Potato Center (CIP) for 4 countries namely, Kenya, Rwanda, Mali, and Senegal. We expect to be able to have Seeds2B Africa fully operational in the first quarter of 2024 after which we will transition the PASTTA program to the new entity and assess the opportunity to support more crops and country combinations.

12. PASTTA PROJECT HIGHLIGHTS OF ACHIEVEMENTS

Over the five years of the project, PASTTA has made great progress in supporting different crop value chains including support in policy improvements and the digital ecosystems. The following is a selection of the best and most impactful stories from our work during the PASTTA implementation period. Some were highlighted in previous reports, but new ones have also been added to the list as indicated.

Kenya videos

- 2021: Mechanizing Potato Farming in Samburu County – [watch the video here](#).
- 2020: Linking Pastoralists to the Potato Value Chain – [watch the video here](#).
- 2020: Enhancing the Soybean value chain in Kenya – [watch the video here](#).
- 2019: Scaling potato seed production in East Africa – [watch the video here](#).

Senegal videos

- 2021: How PASTTA introduced the maize hybrid “Kabamanoj” to Senegalese farmers Kabamanoj – [watch the video here](#).
- 2022: Farmers’ feedback: how the adoption of Kabamanoj positively impacted farmers in Senegal – [watch the video here](#).



Uganda video

- 2021: Highlights of the bean program in Uganda (PASTTA) – [watch the video here](#).

Other videos

- 2021: The Seeds2B variety advancement process: example of AAA maize in India – [watch the video here](#).
- 2020: Variety commercialization for scaling seed delivery to low-income farmers – [watch the video here](#).

Articles [\(Click on articles title to go directly to the article in this report\)](#)



NEW!

Choice can be empowering! The gender differences in adoption of new improved cowpea varieties in Mali

NEW!

Public Private Partnerships (PPP) model reaping benefits in the maize value chain in Mali

NEW!

PASTTA pushes the envelope to have pastoral farmers adopt potato farming in Samburu County of Kenya

NEW!

The Kabamanoj maize variety meets farmers' needs in Senegal.

PASTTA kickstarts the commercialization of soybean and groundnut varieties in Malawi

NARO approves a commercialization policy to define how its varieties can reach farmers

Mali publishes its 2020 national catalog of varieties

PASTTA enhancing local soybean production by bringing together a consortium of value chain actors in Kenya

Private sector engagement to multiply publicly bred soybean varieties begins in Malawi

In Uganda, PASTTA is contributing to making the licensing of publicly bred varieties a reality

In her words – a potato farmer in Kenya shares her experience working with Syngenta Foundation and PASTTA

PASTTA catalyzes Public-Private Partnerships (PPPs) on the ground to accelerate adoption of new varieties in Senegal

In Mali, promoting good agricultural practices (GAP) among farmers is crucial for getting the best out of good seed

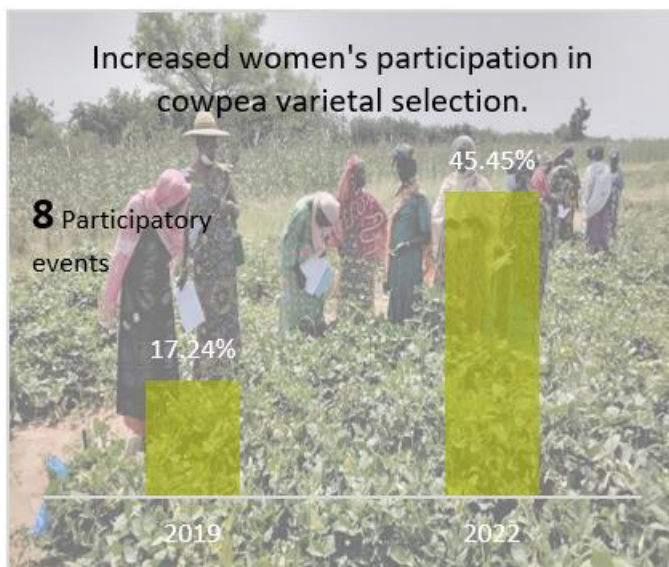
Involving local seed cooperatives in public-private partnerships to scale dissemination of short cycle biofortified pearl millet in Senegal

PASTTA support to NARS to accelerate access of improved seed in Kenya

Choice can be empowering! The gender differences in adoption of new improved cowpea varieties in Mali

Women in rural Africa are often disadvantaged in accessing information and knowledge about quality seeds of improved varieties due to limitations on mobility and access to social networks which shuts them out of formal information channels such as extension services and training opportunities including field days.

In the last five years, the PASTTA project in Mali anchored its premise on closing the gender gap, especially on choice of technology and adoption of improved crop varieties. The increased participation of women in the variety selection process demonstrates their increased empowerment. Eight participatory selection



events were organized during the PASTTA project, involving a total of 212 cowpea value-chain actors (including 70 women). Over the years, specific efforts were made to involve more women in seed technology transfer activities.

This work was carried out in collaboration with the cowpea program of the national research institute IER (Institut d'Économie Rurale). Under the leadership of the Cinzana agronomic station, the PASTTA project brought together actors in the cowpea sector in the areas of Ségou, Cinzana and N'Tarla to select men and women, farmers, producers, traders, and processors.

Looking into the future, the project will continue to organize participatory field events on preliminary and advanced cowpea adaptation and marketing trials while targeting parity in women's involvement. Besides fostering gender-responsive approaches in the project value-chains, the power of choice of seeds is key to benefiting women by recognizing their preferences, interests, and aspirations and by overcoming barriers to seed access.

“

Recognized as a female crop, considering women's selection criteria is essential in the development of new cowpea varieties. Women's participation allowed us to see beyond the productivity that men seek and to select for different product profiles.

Dr. Sory DIALLO, Cowpea Breeder - IER

Public Private Partnerships (PPP) model reaping benefits in the maize value chain in Mali

Sina Coulibaly, PASTTA field officer in Koutiala (Mali), has been saying since 2016 that, “the Seeds2B's dissemination models will lead to a better maize seed system in the long term”. This is evident from a producer cooperative called *Kaba Nafan* (Profitable Maize) which was created in 2022 by 39 small agricultural producers targeted by the PASTTA project in the localities of Cinsina, Garré, Kolonto, Kaniko, N'Gountjina and Walosso in Mali. Following our interventions, farmers have come to understand the benefits of adopting improved varieties and the value of cooperative societies in supporting their livelihoods.

During the 2022 rainy season which was the first season of operation, this cooperative produced maize on 102.5 hectares. Through a process facilitated by the PASTTA project, the cooperative procured 2.05 tons of certified seeds. PASTTA's support aimed at addressing challenges related to the lack of equity and guarantee funds, which was a barrier to accessing other inputs. The expected income generated from this venture will serve as a starting fund for the acquisition of inputs during the next farming season for seed production which will subsequently be distributed to farmers eager to grow these promising varieties.

The PASTTA project in collaboration with the IER (national research institution) supported cooperative members' training in maize crop management and hybrid maize seed production techniques. This is an opportunity for IER to develop a new pathway to disseminate their new varieties. For the farmers' cooperative members, it ensures they can access high quality and affordable seeds at the right time and also builds their technical capacities on maize production.



Figure 4: Visit of members of the national maize association office to the maize plot of a member of the Kaba Nafan cooperative in the

These public to private collaborations connections typically don't happen naturally and is where PASTTA played a key role in facilitation by building credibility and capacity on the farmers' side and securing the supply of maize parental lines from IER on the other side. During the 2022 season, three school training sites were established, benefiting nearly 60 smallholder farmers trained on different subjects including soil health, climate-smart agriculture, and agronomic practices among others. Beyond the cooperative's members, these school training sites attracted a number of stakeholders involved in the coordination of the national maize value-chain (see figure above). Kaba Nafan is a very good example showing how PASTTA supports farmers and seed value-chain stakeholders at different levels to be more professional, develop sustainable Public Private Partnerships (PPP) with high catalytic capacity to connecting farmer groups to financial institutions and inputs suppliers while organizing more training and awareness on performing maize varieties and seed production protocols besides good agronomic practices.

PASTTA pushes the envelope to have pastoral farmers adopt potato farming in Samburu County of Kenya



Seeds2B-PASTTA Kenya team alongside seed company partners during a briefing meeting at the Samburu County Governors' office before attending a field day meeting.

Improving food security and income requires – amongst other things good cooperation between key stakeholders. A well-attended field day in Kenya makes this point.

The PASTTA program recently organized a field day in collaboration with the Samburu County government in Kenya. The aim was to promote the production of certified potato and other seeds. Over 500 farmers attended with about 60% women's participation. Participants included more than 190 young growers. Also present were representatives of the Kenya Seed Company Ltd, the Kenya Plant Health Service Inspectorate (KEPHIS), Agventure, and the Samburu Department of Agriculture.

Link: <https://www.youtube.com/watch?v=bKDLhfX7P4M>).

The event focused strongly on understanding the benefits of potato apical cutting technology in potato seed production. In general, regulated light ensures that potato seed breaks out of dormancy in a timely manner. Each potato's apex then goes on to produce sprouts with high vigor. PASTTA funded the development of a diffused light storage technology using locally adapted materials to support adoption of this technology.

Several field day attendees also shared their experiences and ideas for improving the current apical cutting situation. Tony Gathungu, our Head of Seeds2B, was excited to bring on more partners in this area, with a focus on development and scaling up the technology. Lucy Kioko, SFSA's Regional Director for East Africa, described how Samburu farmers could band together to promote a more centralized apical cutting system. Lucy sees potential for the Farmers' Hub model to improve last-mile delivery of quality inputs to Samburu farmers—a great compliment to the Syngenta Foundation's portfolios to reach smallholder farmers with sustainable technologies.

Cooperation was also very much the theme of the principal guest, Samburu County Deputy Governor H.E. Gabriel Lenengwesi. He emphasized the importance of **“nurturing effective relationships between key stakeholders in the agricultural sector”**. This, he underlined, would “promote greater food security and income and successful agribusinesses”.

The Kabamanoj maize variety meets farmers' needs in Senegal.

The primary source of nutrition for the Senegalese population in rural areas like Matam, Kédougou, and Kolda is maize. However, one major obstacle to the production of maize is the lack of affordable, high-quality seeds. In order to mitigate this, the program supported the introduction of a high performing maize hybrid dubbed *Kabamanoj* through large scale demonstrations in the maize growing areas. Reports now indicate a noteworthy impact on smallholders' yields and resilience to pests and diseases. The Senegal PASTTA team recently held focus group discussions with implementing partners as well as farmer groups and off-takers to get feedback on the performance of the variety. The full capitalization report is available upon [request from Syngenta Foundation](#).

Data show a remarkable increase in yield of up to 150% over the past three years. ***“The Kabamanoj variety promises additional income and can help meet specific family needs as well as diversify entrepreneurial activities”***, Head of the Division of Support to Production and Rural Entrepreneurship (DAPER) at SAED said. Farmers are dedicating more land to growing the new crop variety and the area under Kabamanoj has increased by over 10% demonstrating how strongly smallholder farmers are embracing new crop technologies. We've also received positive feedback from a local seed company called SPIA on the performance of the variety. They indicated that some of the varietal traits such as short maturity, drought resistance, grain size and taste beat other competing varieties in the market.



“*The maturity is shorter, the cob is bigger, and we have more fodder for livestock consumption. It is a variety that adapts to our environment. As president of the corn producers in Kédougou, I want to say that we are satisfied with the quality of the product, but it is expensive for some of the farmers.*

AGNA DIALLO.

The Kabamanoj maize variety has enabled farmers to diversify into cash crops. They can now grow the variety and sell a portion of their harvest while keeping the rest for consumption. It is also possible for them to grow the variety off-season, which increases their food security.

“This case study shows how the introduction and adoption of a widely adaptable, high-yielding variety can be a game-changer, not only in Senegal but in the entire West Africa region” comments Camille Renou, Seeds2B Africa Technical Lead. *“Now, in partnership with the Sunrise Agritec seed company (Kabamanoj variety owner), we are trying to produce the Kabamanoj seeds locally, develop local expertise on hybrid seed production, and increasing access to the seed and subsequently better prices for farmers”*, adds Camille.

PASTTA kickstarts the commercialization of soybean and groundnut varieties in Malawi

In many sub-Saharan African countries, significant investments are made in breeding new varieties. Unfortunately, making these new varieties available to farmers at scale continues to be a challenge. The reasons for this vary across countries and crops. PASTTA primarily focuses on transferring seed-related technologies to smallholders in order to increase their harvests and income. **By adopting a holistic approach, PASTTA attempts to address the main challenges identified throughout the seed value chain – from variety creation to making the seed available to farmers.** In Malawi, PASTTA has worked on these four key pillars:



This approach has been implemented in Malawi since the beginning of PASTTA. Significant achievements were made in Year 3, particularly on soybean and groundnut:

- **1 soybean and 2 groundnut** varieties (publicly bred) released in July 2020,
- **18 tons of early generation seeds** of these newly released varieties produced (September 2020),
- **4 seed companies contractually engaged** to start seed production from November 2020 onwards.

Farmers began accessing the supported varieties in 2021

PASTTA has significantly contributed to the development of these public-private partnerships and has been instrumental in kickstarting their development. In addition, this will, without doubt contribute to the self-sustainability of the seed system in Malawi to the benefit of more farmers.



Figure 5: A group from the DARS soybean team monitoring soybean multiplication trials at the Bwanje irrigation scheme, September 2020

A wider partnership

Beyond partnerships facilitated between the Department of Agricultural Research Services (DARS) and local seed companies, PASTTA has also involved other partners like IITA, SIL, ICRISAT and SeedCo because of their expertise and their technical contributions. This is essential if we want to reach the highest standards in breeding and seed production specific to each crop.

A complementary work around policy

Policy is also part of this success: PASTTA supported and advised the government in developing and getting approval for a plant variety protection regulation in August 2020. PASTTA is also facilitating collaboration between DARS and local seed companies on policy related matters such as variety licensing approaches.

NARO approves a commercialization policy to define how its varieties can reach farmers

A major reason why new varieties are not adopted at scale is related to the in-country regulatory framework. In particular, the absence of a) a clear strategy and policy for publicly bred varieties commercialization, and b) plant variety protection (PVP) frameworks can be a bottleneck. In Uganda, NARO (National Agricultural Research Organization) has expressed the need to be supported in defining its commercialization policy.

During PASTTA Year 3, PASTTA provided crucial technical expertise in the development of the policy document, in order to:

- Facilitate all policy drafting meetings
- Get the draft documents approved by the NARO council in August 2020

This essential document covers both intellectual property and licensing aspects for NARO varieties.



Figure 6: NARO meeting to develop the commercialization policy, July 2020

A NARO commercialization policy along with a national PVP regulation

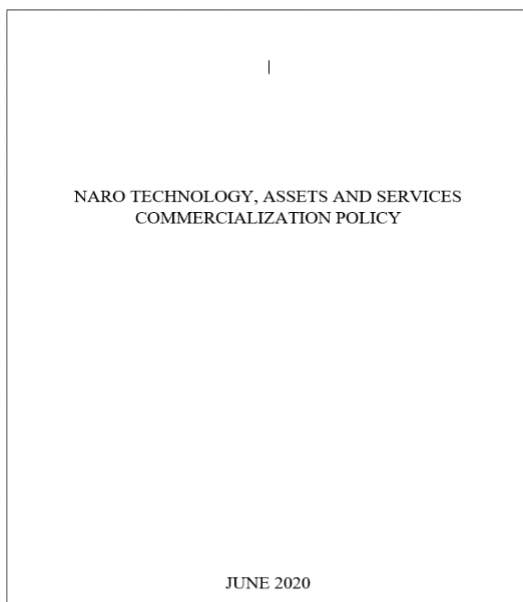


Figure 7: First page of the NARO commercialization policy

Uganda enacted the PVP Act in 2014. In pursuit of full implementation of the Act and establishing the PVP system, the Ministry of Agriculture, together with partners facilitated a process for the development of the regulations required to operationalize the 2014 PVP Act. PASTTA joined other partners like ISSD and USAID/Feed the Future in this initiative and convened the final taskforce meeting. This resulted in the creation of a final document that was to be validated by national stakeholders by the end of 2020.

PASTTA facilitated the awareness creation to key stakeholders on the value of these regulations. PASTTA has played a significant role in transforming the national seed system regulation framework in Uganda to increase investments in breeding, strengthen public-private partnerships, and benefit farmers. Other countries have faced the same issues as Uganda, and the experience of this country can act as an example of how they too can move away from inefficient seed systems.

Mali publishes its 2020 national catalog of varieties

A national catalog of varieties is an official document issued by the Ministry of Agriculture that gathers all the varieties registered in the country and their technical attributes. This reference document is used in seed production, certification, and commercialization process.

The national catalog must be updated and published regularly for the benefit of seed companies, farmers' organizations, and farmers in general. In Mali, the publication of the catalog is not a regular event with the last version having been published in 2013. The main issues encountered relate to the availability and accumulation of the technical data and funds available to publish the catalog.

In close collaboration with the technical services of the Malian Ministry of Agriculture (Labosem), PASTTA provided technical and financial support in order to address the above-mentioned challenges. This resulted in the publication of a new catalog in June 2020 and its distribution to all key public and private seed stakeholders in Mali.

During the first three years of PASTTA, we supported the registration of 3 maize, 7 sorghum, and 10 groundnut varieties. These twenty new varieties are currently listed in the new catalog. The sorghum and groundnut varieties have been locally bred by IER and ICRISAT. The maize varieties are produced by the private sector and have been chosen for their high performance and preference by farmers compared to the local varieties. The maize variety "Kabamanoj", introduced successfully during PASTTA is the first-ever privately bred maize variety to enter the Malian national catalog, and has increased the prospect of its local seed multiplication and trade in West Africa. It also widens options for seed companies and farmers in Mali to access the varieties they need from various origins.

The publication of this catalog is a great achievement for the project and a considerable support to variety diffusion throughout the seeds value-chain and adoption by stakeholders.

The West African seed regulation signed in 2008 sets harmonized principles about variety registration procedures, seed production and trade for the whole region (17 countries, >300 million people). It is still under implementation and has led to the creation of a broad West African catalog of varieties which is a compilation of all national catalogs. In order to be functional, this requires each country to regularly provide an up-to-date catalog and data. The support provided to Mali to publish its 2020 catalog is an essential step towards getting all varieties registered in Mali listed in the regional catalog.

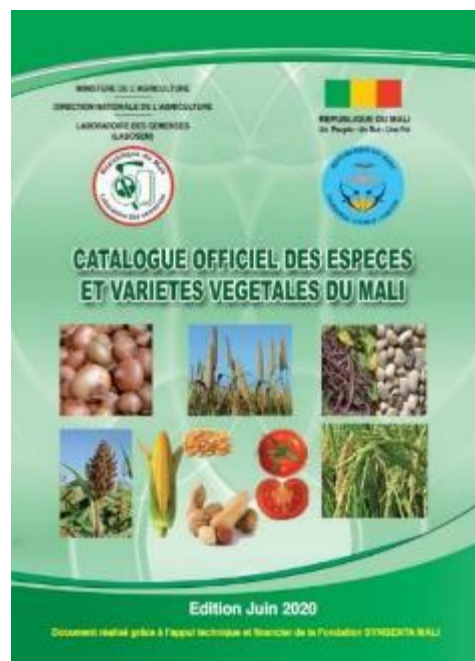


Figure 8: First page of the Malian catalogue of varieties, June 2020

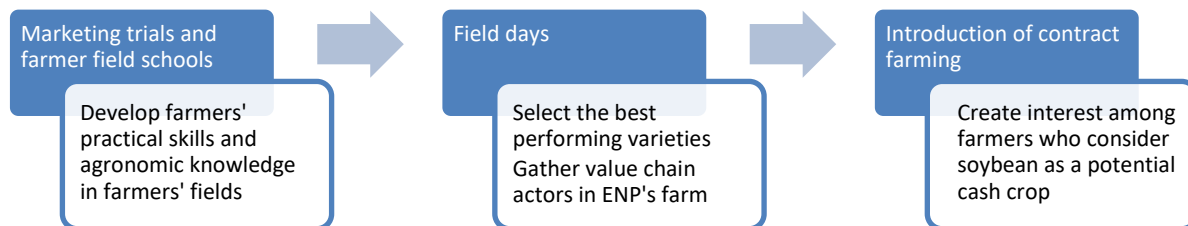
PASTTA enhancing local soybean production by bringing together a consortium of value chain actors in Kenya

Soybean consumption is soaring in most countries of sub-Saharan Africa, driven by a strong demand for both animal feed and industrial processors. However, despite favorable growing conditions in many parts of Africa and agronomic benefits (crop rotation, soil fertilization, breaking disease cycles, etc.), soybean demand is largely met by imports, with only marginal local production in most countries. Although demand in the country for soybeans has reached 150,000 MT, Kenya produces no more than approximately 5,000 MT annually. Apart from the largely missing agronomic know-how, one of the main reasons for such low productivity is the lack of adapted soybean varieties that perform well under tropical conditions.

In order to enhance soybean production and the soybean value chain among farmers in Kenya, the PASTTA program has partnered and signed an MOU with Equatorial Nuts Processing (ENP), a food processing company. This partnership aims to (i) promote soybean production through contracts, (ii) improve access to certified seeds and (iii) ensure training of farmers in good practices. ENP requires about 600 tons to start contracting 1000 farmers during the 2021 long rains. It had not been possible to start up the aggregation process because there were no available certified seeds in Kenya until March 2020. PASTTA has contributed to the implementation of activities as listed below:



Figure 9: Soybean field day



ENP has benefitted from this project not only by reducing their operation costs on export demand by substituting it with local supply, but also through the opportunity to conduct processing testing on oil content and achieving their social cooperate target of impacting on the local community.

PASTTA aims to strengthen the partnerships along the value chain in order to secure the supply of EGS to seed companies and develop markets for the grain produced. We will support the development of a soybean national consortium to develop interactions and collaboration between soybean value chain actors. This consortium will also help to identify bottlenecks in the development of soybean in Kenya and find bespoke solutions with the relevant stakeholders.

Private sector engagement to multiply publicly bred soybean varieties begins in Malawi

In the PASTTA Year 3 annual report, we presented how the program had played a significant role in kickstarting the development of publicly bred varieties. Work consisted of supporting DARS to identify the best varieties matching farmers' and markets' needs, getting them released and securing production and supply of EGS. In Year 4, the private sector was engaged. In the same year, activities in Malawi were mostly focused on soybean and groundnut due to the remaining program duration and available funds.

Using the EGS harvested in Year 3, four seed companies (Capital seed, Limbe Leaf Ltd., Pyxus Ltd. and Museco) have started soybean seed production on a total of 15 hectares. Sixteen tons of seeds were harvested early in 2021. During the 2021 winter season, some of these companies have carried out seed multiplication on 11 additional hectares.

The private sector has a very positive view of partnerships with the public sector. Carl Jensen, CEO & Co-founder of Good Nature Agro, says that they *"believe that the future of agriculture will comprise of deep partnerships and collaborations between specialists working closely together to support farmers. These partnerships permit each company to maintain focus on their respective critical paths and the highest quality inputs – seeds in our case – in the hands of farmers as a viable package."* Emmanuel Simwinda, Product Stewardship Manager for BASF, shares this point of view that *"Experience has taught us that innovation alone is not sufficient and that agriculture will benefit from a broad range of partnerships including private sector engagement."* This opens up promising opportunities for PPPs.



While seeds of varieties supported by PASTTA should reach farmers in 2022, it is important to note that we are still at a very early stage of private sector engagement for seed multiplication and commercialization of these crops. Therefore, it is essential to provide longer-term support to ensure that sustainability mechanisms are in place.



Figure 10: Soybean field day in Malawi

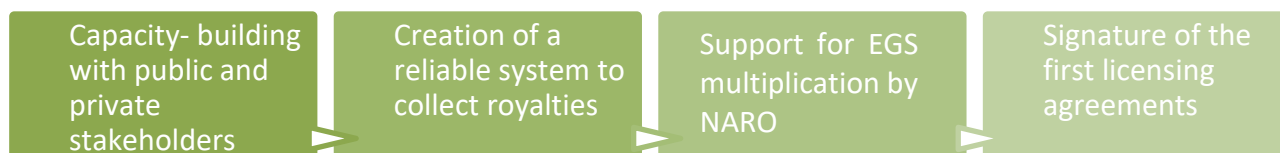
Finally, while soybean is successful with private seed companies, it is different for groundnut. Because of the low multiplication rate, a low return on investment and the difficulties with producing groundnut seeds, the private sector is still reluctant to invest in this crop. We are exploring other approaches for contributing to the groundnut seed sector in Malawi.

In Uganda, PASTTA is contributing to making the licensing of publicly bred varieties a reality

In the PASTTA Year 3 annual report, we presented how the program had played a significant role in transforming the national seed intellectual property management regulatory framework in Uganda. More specifically, the work consisted of supporting NARO (National Agricultural Research Organization) in developing its variety commercialization policy, published in June 2020. In this section, we will explain how this has successfully started to become a reality on the ground during Year 4.

Finalized in June 2020, the spirit behind the NARO commercialisation policy was to strengthen public-private partnerships (PPP) and streamline access and utilization of NARO technologies. The seed commercialization policy published last year has enabled NARO to clearly define how the varieties created by the institute will be licensed to the private sector, aiming to address the issues met before where a) new varieties are not taken up by seed companies, b) there is no revenue generated by the sales of these varieties back to the breeder, and c) a lack of traceability of seed leads to challenges regarding quality. Dr Kassim Saddik (Deputy Director General, Agricultural Technology Protection at NARO) stated that “NARO has a responsibility to sustain its mandate, therefore it has put in place the NARO commercialisation policy and guidelines as mechanisms to help it do so.”

Building on what was achieved in Year 3, PASTTA has continued its efforts into Year 4 to successfully connect the public and private sector and get varieties licensed by NARO to private companies. This work has consisted of training all public and private stakeholders about this new commercialization policy to make sure it can be implemented properly. Support for the creation of a reliable system to collect royalties has also been provided, therefore expediting a system that can be trusted.



Several companies engaged with NARO for seed production

In Year 4, PASTTA’s efforts in Uganda were focused on bean and groundnut. In total, 13 seed companies expressed interest in commercializing NARO varieties. However, signing of the licensing agreements has been delayed by the official signature of the PVP regulations by the minister of agriculture. “The Policy will ultimately give confidence to private sector actors to invest in commercializing NARO technologies since it grants commercial powers to specific players. They are then guaranteed the benefits of their efforts

which was not the case before, when commercialization was open to all companies,” says Nelson Masereka, secretary of the Uganda Seed Trade Association. Seed production started during the 2020-2021 season B and continued into the 2021 season A for most of the companies. The first payments of royalties by seed companies to NARO was expected in 2022.



Figure 11: bean field day in Uganda

In her words – a potato farmer in Kenya shares her experience working with Syngenta Foundation and PASTTA

Seeds2B Africa has been increasing its efforts to empower women farmers through seed access. In the last four years, the project has made significant progress towards promoting and adopting an inclusive strategy in empowering vulnerable households who have taken up improved crop varieties.



Agnes Letowon pictured is among many farmer beneficiaries who can attest to the project's impact. She is based in Samburu, a largely pastoralist community in the north-eastern part of Kenya. This was her story in February 2021:

"I am the treasurer of the Poro Potato Group, organized by the Syngenta Foundation in Samburu. Initially, we relied on traditional farming technologies including recycling seeds, if any, for smallholder crops. We were uninformed about potato as a crop and even which varieties were available. We used to buy traded potatoes and tried planting them, but they did not do well since we did not understand how to farm potatoes. We suffered severe losses on our farms due to pests and diseases. We didn't know about the best crop protection practices, or mechanized farming with planters and harvesters – as we heavily relied on human labor. We are glad to have been introduced to better seeds and mechanization farming by Syngenta Foundation Kenya. Through numerous field day events, we have learned about various potato agronomic practices, value-chains, and markets. Together with my fellow women, I now have the confidence to continue with potato farming to enable my farm to have food, sell the surplus, and even educate and purchase clothes for my family."

Numbers in 2020/21 through PASTTA.

Over 400 (32% women) new pastoralists trained on potato farming, accessing quality potato seed on 25-30 acres seasonally.

\$220,000 income generated for Samburu farmers from the 440 tons of potato produced during the 2021 long rain season.

223 youths participated in field training events in Samburu.

A few months later, in September 2021, we caught up with Agnes again and she had this to say: *"As a woman, I took up farming potatoes because I know the pain of seeing my children go without food. I have learned to prepare my land adequately and use the correct fertilizer as guided. When my plants were attacked with pests, I utilized the correct crop protection mechanisms. Many women have admired this new activity here in Samburu and are willing to join my women's group. They are devastated by our reliance on pastoralism and some traditional crops which don't do well due to inadequate rainfall and diseases, which may then cause food shortages. Women with little children want to introduce potato-based meals into their household diet. We will continue with this journey and – hopefully – get sustainable access to high-quality potato seeds even if Syngenta Foundation departs. I thank the Syngenta Foundation for such a noble gesture in coming to us in this far land, away from the productive agricultural areas preferred by many organizations."*

In its ambitious, forward-looking strategy, the Seeds2B Africa program will continue to support these special communities to empower them, thereby contributing to the larger goal of poverty reduction and gender empowerment. The participation of women from a marginalized community in this project is truly noteworthy.

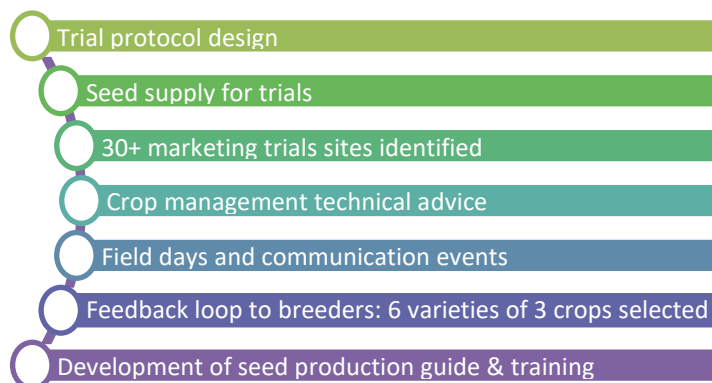
PASTTA catalyzes Public-Private Partnerships (PPPs) on the ground to accelerate adoption of new varieties in Senegal

The seed sector in Senegal is composed of two groups of actors: (i) the public sector handling the Research and Development work to create new varieties and produce EGS, and (ii) the private sector involved in larger-scale seed multiplication and commercialization to farmers. The private sector is represented by UNIS, a national union bringing together several seed companies and cooperatives in Senegal. For a strong seed sector to exist, there must be good collaboration between these actors. However, gaps related to seed production planning and communication about new varieties' performances and characteristics are negatively impacting seed diffusion and, more generally, the development of the seed sector.

PASTTA as a catalyzer of functional public-private partnerships

Within its role of facilitator and catalyzer, PASTTA is working with both the public and private sectors. While initiating the work on two new crops in Senegal for this extension (started Year 4), PASTTA adapted its approach to strengthen collaboration on sesame, cowpea (new PASTTA crops) and pearl millet based on collaboration agreements we have signed with ISRA and UNIS. This took shape in the 2021 rainy season where

concrete collaboration on the ground was the springboard for organization of and/or contribution to joint activities as listed in the above chart. *“These activities facilitated by PASTTA are bringing together actors from both the public and private seed sector around topics of common interest. Everyone can contribute with their own expertise, and communication is improved between actors which suggests encouraging prospects in the planning of commercial development of recently released varieties,”* says Abdoulaye Diop, PASTTA coordinator in Senegal, who has played a key role with his team in developing these partnerships.



Both partners see value in this partnership

Modou Thiam, President of UNIS, is *“delighted with this UNIS-SFSA-ISRA partnership aimed at scaling up new varieties.”* He confirms the relevance of this partnership and the key role played by SFSA: *“This collaboration should contribute to strengthening the seed sector, enhancing EGS production and improving the transfer of improved varieties to smallholder farmers. This work could not happen without SFSA support. We are looking forward to continuing this partnership in the coming seasons.”*

Ghislain Kanfany, pearl millet breeder at ISRA, also sees a lot of benefits: *“The collaboration between FSAD and ISRA is very beneficial for our institute, specifically in helping us in the large-scale dissemination of our new varieties, and thus contributing to a greater use of seeds of improved varieties. In addition, it is through this collaboration that we have been able to develop good materials on seed production and initiate capacity-building in seed production and good agricultural practices for seed-value-chain actors.”*



Figure 12: field day in Senegal, bringing public and private partners together

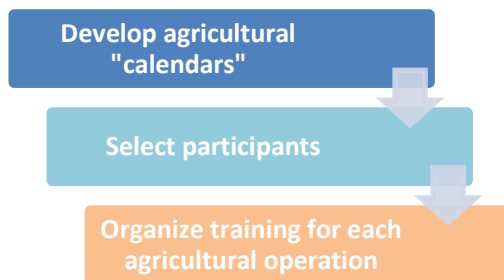
In Mali, promoting good agricultural practices (GAP) among farmers is crucial for getting the best out of good seed

How can good seed of an improved variety perform well in the field without good crop management? It's obvious that you can't have one without the other. However, we often note that smallholder farmers face challenges in adapting GAP which in turn negatively impacts performance of new varieties. This is what the PASTTA team has been focusing on to address in Year 4.

Optimal crop management is a complex science, considering multiple parameters related not only to the crop and variety, but also the environment (soil, climate, etc.). For smallholder farmers in Mali, accessing information and knowledge can be a challenge and agricultural practices are often not optimized. However, there are some standard practices adapted to Malian crops and conditions that have been developed and recommended by the NARS and promoted by the agriculture extension services. These are the recommendations that PASTTA is supporting in order to popularize crop management adaptation along with the diffusion of new varieties.

The performance gap between the researcher's field and the farmer's field

One issue commonly shared is that there are gaps between what the scientists achieve in their trials and what farmers achieve in their fields. If the quality of the seed planted by the farmer is good, the gap is



explained by differences in crop management. To address this, the PASTTA team in Mali has developed specific training modules and has coordinated training sessions to popularize good agricultural practices. *“From the trial protocols, we developed agricultural calendars for each focus crop. We then planned training sessions to support these crops. Each event gathered 5 to 10 smallholder farmers who in their localities,”* says Aboubacar Diarra, PASTTA coordinator in Mali.

67 trials and 418 farmers trained

From June to September 2021, we coordinated 67 trials focusing on four crops whereby 418 smallholder farmers were brought together and trained in good agricultural practices. *“The impact of our training sessions goes far beyond the farmers who were trained directly. It also involves their neighbors and the larger village communities. This is what contributes to achieving an exponential impact in adoption of good agronomic practices,”* Aboubacar Diarra adds.

Drissa Coulibaly, who is a Seeds2B pilot farmer in Koutiala, confirms that *“the training sessions during each agricultural training event are very informative. We realized that many of our practices are not relevant and not profitable. For example, thanks to nitrogen fixation we don't need to apply urea on legumes at the start of flowering, and fertilization of sorghum should be split into three applications instead of one.”*



Figure 13: trained farmers implementing adequate crop management techniques

Sina Coulibaly, who is a PASTTA field agent in Koutiala and spends most of his time in the fields with farmers, certifies that *“training heads of households who take the decisions on the farm is very impactful in changing farmers' practices. While the heads of households are mostly men, we also pay attention to female and youth inclusion. Indeed, about 25 percent of participants were female, and 23% were youths. Through this initiative, the adoption of PASTTA-supported technologies will exceed expectations,”* concludes Sina.

Involving local seed cooperatives in public-private partnerships to scale dissemination of short cycle biofortified pearl millet in Senegal

Pearl millet is a very important crop in Senegal covering more than 800,000 hectares (FAOStats). Mostly grown by smallholder farmers, and considered as a staple food in Senegalese diet, it plays a significant role in food security. Over the last few years, demand increased from farmers and processors for biofortified varieties to complement traditional existing varieties. These biofortified varieties combine better nutritional aspects (higher iron and zinc content), along with a shorter cycle and drought tolerance, which make them both suitable for many agro-ecologies and resilient to climate change.

Four varieties initially bred by ICRISAT and accessed through ISRA. Initial production trial runs and sales to farmers carried out in 2018 proved both very successful and showed potential for scaling. However, issues faced during the 2019 season related to the availability of EGS and a lack of investment by the main local seed companies in these new open-pollinated varieties revealed clear weaknesses and an incapacity to make seeds of these varieties available to farmers at scale.



Figure 14: Field Day held by a seed cooperative in Senegal

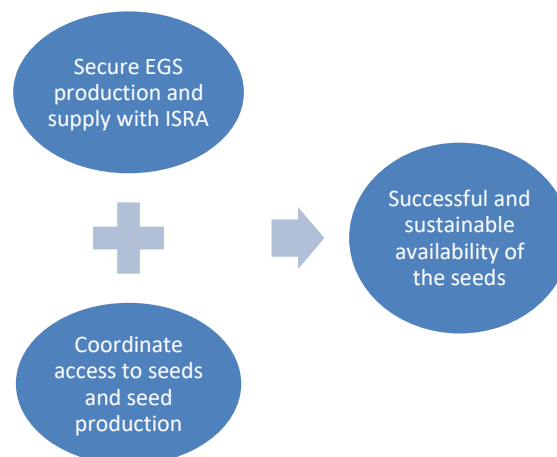
Local seed cooperatives to play a central role in making available seeds to farmers

Local seed cooperatives are groups made up of 100 to 200 members organized in a geographical zone and share common values and vision. They cooperatives have a seed production license and members are trained on seed production. They have existing contracts with grain processors and are also avail seeds they produce to their members.

PASTTA as a facilitator of key PPPs

PASTTA has played a key role with ISRA in a) raising seed cooperatives awareness of the biofortified varieties, and b) planning, producing, and delivering the EGS (produced off season) to the seed cooperatives. PASTTA has also identified, selected, and coordinated 15 different seed cooperatives in Central and South Senegal to plant about 19 hectares of seed production during 2020. Most of the seed cooperatives have previously collaborated with other USAID-funded projects like *Naatal Mbay* and currently collaborate with the nutrition project called *Kawolor*.

This is an innovative approach where a higher number of smaller partners are involved in availing seeds to farmers. This requires more coordination and training work but increases the likelihood of greater impact and sustainability in the existing markets in which these cooperatives have to sell their seeds and grains.



Engaging in policy advocacy for the benefit of farmers

“Policy” is a set of ideas or a plan of what to do in particular situations that has been agreed to officially by a group of people, a business organization, a government, or a political party⁵. More specifically, policies include a set of rules of practices to define “what” is possible and “how” certain activities are regulated or organized. All the activities implemented in PASTTA are interconnected with the policies on seeds at national and regional levels, including but not restricted to variety registration, variety protection, licensing, seed trade and movement and even value-chains organizations. PASTTA also plays multiple roles in relation to seed policies and acts as an observer, a system-tester, an advisor, and a facilitator. This article aims to illustrate different aspects of the policy work we do in PASTTA in different countries with concrete examples, and how we proceed to understand issues and remove barriers.

Unlocking the potential of public-private partnerships by enabling functional licensing agreement schemes and regional seed in Senegal and Mali.

One key objective of the policy work we are conducting in both Senegal and Mali is to improve the environment and enable implementation of functional public-private partnerships within the seed systems to improve availability to farmers of recently released and high performing varieties. In addition to working with both public and private actors and building bridges between them in our activities, another component includes capacity-building activities on plant variety protection and licensing agreement schemes. Over the last few years, we have held several workshops in both countries with public and private stakeholders to create awareness and build stakeholders’ capacities in these topics. The feedback was very good: “It is the first time that we have been made aware of licensing concepts and their technicality, and I am grateful to SFSA and PASTTA for that,” said Mr. Thiam, president of UNIS (Senegalese national seed association). But Mr. Thiam also added that “this training can be efficient only if the content can be actually implemented immediately by seed companies and public institutions.” In both Senegal and Mali, despite capacity-building activities and a legal environment which allows for protection of the varieties and licensing⁶ from public to private companies, this is not happening concretely on the ground. In order to understand the reasons, we collaborated with The New Markets Lab to conduct a licensing needs assessment in both countries. The study was conducted during Year 4 and the report with its conclusion was received early in Year 5. Key findings of the study show that (a) there are still gaps in the understanding of key concepts at both public and private stakeholder levels, (b) there is no intellectual property policy or strategy for public research institutions, and (c) there is not enough dialogue between public and private partners.

Going forward, we aim to collaborate closely with local stakeholders and define together a plan to build functional systems that match their needs. Our recent discussion (in early Year 5) with the new director of IER (Mali NARS) in Mali confirmed their interest in enabling licensing agreements for the varieties they create. We also connected at the same time with the national intellectual property office (CEMAPI) in order to put our efforts together and see how we can collaborate to organize further training, ensure regular coaching of local stakeholders, and support the implementation of licensing schemes. A similar approach is being undertaken in Senegal to build a multi-year plan going forward and make the licensing system functional.



⁵ <https://dictionary.cambridge.org/fr/dictionnaire/anglais/policy>

⁶ While variety owners can be advised about protection of the varieties, it is not a prerequisite for signing licensing agreements.

Supporting NARS to develop their own variety commercialization policy in Uganda

Earlier in the project, NARO requested PASTTA's support in creating a variety commercialization policy in order to define a clear framework for how the varieties created by the research institution can reach farmers. We supported its creation and publication, as well as training, to make local stakeholders aware of the new policy⁷.

About a year and a half after official enactment, the feedback continues to be positive, and this policy has kickstarted the creation of a stronger public-private relationship through the signing of licensing agreements between NARO and local seed companies. This was confirmed by Nelson Masareka, Executive Secretary of the Uganda Seed Trade Association (USTA), who was present at the AFSTA congress in Djerba (March 2022) and reported that *"17 USTA members (out of the 37 members) have already signed licensing agreements with NARO to access and commercialize seeds of varieties released by NARO,"* – a significant progress in developing strong public/private partnerships (PPPs). It is still a little early to assess the direct impact on farmers but we look forward to monitoring this in the coming years. However, so far, the example of Uganda has demonstrated the efficiency of such a policy in clarifying issues at both the NARS and seed-value-chains stakeholder level and is a great source of inspiration to other countries that currently lack a similar policy.

Contributing to licensing agreements implementation in Kenya with KALRO

In Kenya, the licensing system is more developed than those established in other PASTTA countries. KALRO is already entering into licensing agreements with companies for a range of different crops like bean, potato, and soybean. PASTTA has played an important role in contributing to these achievements to build KALRO's and local stakeholders' capacity in licensing and supporting KALRO to implement and manage licensing agreements. We have demonstrated the impact of supporting KALRO's human resource capacity through provision of funds to increase the pool of legal interns at the legal department. This has been ongoing since 2017. From 2018 through 2021, the funding support has been at the \$5,200 level to facilitate additional interns. The support has brought in a total of 3 legal interns with one of them being hired by KALRO on a full-time basis.

As a result, KALRO's legal office has improved its efficiency in drafting, reviewing, and negotiating over 166 collaborative research agreements, 40 MoUs, and 17 license agreements. The interns have also assisted in managing seed licensing agreements, leading to a more efficient collection of royalty payments amounting to \$41,893 and growing. Additionally, this initiative has assisted in developing organizational policies such as the intellectual property rights policy that has now been ratified and approved for implementation.

National crop policies need to evolve and be in line with today's needs: The examples of soybean and potato in Kenya

Our work on soybean with multiple value-chains stakeholders in previous years has highlighted the dysfunction of the value-chain and a lack of a national policy framework for this crop. Since Year 4, PASTTA has been continuously supporting Kenya Plant Health Inspectorate Services (KEPHIS) in developing a national soybean policy through regular meetings and facilitation sessions for stakeholders. This was slowed down by the COVID-19 pandemic which inhibited in-person gatherings, but we started making progress again in early Year 5 as normalcy returned. A draft of the soybean production and marketing

⁷ This work was reported in the Year 4 PASTTA annual report, section 12, highlights on countries' successes, topic: "In Uganda, PASTTA is contributing to making the licensing of publicly bred varieties a reality."

strategy including situational analysis, strategic objectives for the development and promotion of the soybean industry in Kenya, and an implementation plan, was prepared in March 2022 awaiting review by a committee established by KEPHIS. The next steps will be to make this national soybean policy officially published and in use by the end of Year 5.

Through our work on potato in Kenya, we have also identified gaps in the national potato policy. As an example, complaints from producers regarding the importation of potatoes by foreign companies as opposed to the use of locally produced ones are issues at both seed and potato ware production levels. At the beginning of Year 5, we requested NML to initiate a case study on the potato sector development in Kenya that will assess where policy and regulation prevents opportunities along the potato value chain. The study included an assessment of existing rules and policies compared to other countries' laws and regulations and recommendations for improvement.

This approach through value-chain development aims to strengthen markets and therefore organize upstream partners to engage and invest in these value-chains. These partners include seed companies who can produce seeds of varieties relevant to the market and organize farmers that can produce ware under contract for local processors.

Looking at regional seed harmonization schemes to make regional seed trade a reality for the benefit of farmers

Through its presence in five countries in Africa, PASTTA has worked in several regional economic blocks, i.e., ECOWAS (Mali, Senegal), COMESA (Kenya, and Uganda), and Malawi (SADC). Each group has its own seed regulation with specific rules, but all support the idea of developing regional seed trade between member states through harmonized procedures and regional variety catalogs. Over the last few years, we have aided the implementation of the regional variety registration protocols in both Senegal and Mali by supporting the registration of several varieties. One key example is the maize variety *Kabamanoj* that was tested, introduced, and registered in Mali through PASTTA before entering the ECOWAS regional variety catalog. Now the variety is commercialized in several countries in West Africa (Senegal, Mali, Ivory Coast) and plans for local seed production are underway in collaboration with the variety owner.

In partnership with New Markets lab (NML), we also conducted an objective assessment on how the regional seed regulation systems work. NML designed a check-back mechanism to assess how regional seed catalogs are working in practice, including identification of gaps and stakeholder experiences in registration of varieties in the harmonized regional variety catalogs and trading of seed that appears in regional catalogs. Highlights of this report were presented at the AFSTA congress in March 2022, and included current registration procedures, specificities of each variety catalog, stakeholders' experience-sharing, and recommendations going forward. A particular emphasis was placed on key issues such as accessibility requirements for the catalog (language, format), registration fees, and the content of the catalog. For example, COMESA does not have publicly bred varieties on its listing. These findings and recommendations constitute relevant takeaways for PASTTA going forward on how to address these challenges with the different regional economic communities. Following the AFSTA congress, we have initiated discussions with COMESA to assess how we can support and strengthen their regional action in the future.

In all, the PASTTA approach has attempted to address bottlenecks at both national and regional levels, has identified key bottlenecks that prevent farmers from benefiting from innovations in order to unlock seed systems, enabled research institutions to increase the spread their varieties, and encouraged private sector investment.

PASTTA support to NARS to accelerate access of improved seed in Kenya

The PASTTA project's goal remains to increase access to improved varieties of seeds for smallholder farming communities in Africa. We leverage the gains made by national research institutions by supporting key innovations in seed development, seed variety registrations, and seed policy development. The Kenya Agricultural and Livestock Research Organization (KALRO) has been instrumental in providing improved seeds to farmers in Kenya. Our support and partnership with KALRO has been a driving force behind improving access to quality and affordable seeds of improved varieties for the crops that smallholders need. We believe that developing and implementing sustainable business models for seed technology transfer from public research institutions to the private sector is part of the solution to making publicly bred seed technologies available to seed companies and farmers.

On a national scale, the project's partnership with KALRO is a worthy pathway for SFSA to contribute significantly to the growth of the agricultural sector in Kenya and across Africa. Given that NARS/IARs are key channels for national research and technology, and innovation development, our partnerships have catalyzed the transfer and utilization of such innovative research outputs to benefit smallholder farmers. Over the last five years, SFSA in Kenya has supported partnership initiatives between KALRO and private seed companies and necessitated licensing of various KALRO varieties supported by the PASTTA Program. These public-private partnership (PPP) outcomes have significantly boosted KALRO's capacity to produce potato and soybean early generation seeds (EGS), bolstering access to quality and affordable seeds of improved varieties for the crops that smallholders need.

Infrastructure expansion and potato seed revitalization program

Our efforts to strengthen potato seed production have culminated in a partnership project between SFSA and KALRO titled "Revitalizing certified seed potato supply through increased production of breeder's seed and empowerment of private seed enterprises." The compelling factor behind this initiative is the reluctance of private seed companies to invest in certified potato seed production, unlike other crops, due to heavy infrastructural, policy, and cash investments in potato seed production. SFSA support in potato and soybean EGS is a win-win economic model, creating an attractive pathway for private investors to venture into potato seed production. Our effort de-risks potato and soybean EGS by facilitating initial investments in seed production and bulking, hence making business entry into seed production by private seed companies relatively affordable. Our aim is for a reduction in the persistent shortage of certified seeds in Kenya and across Africa. In the financial year 2021, one of the first phases of this support involved the renovation of existing infrastructure at KALRO for the production of potato in-vitro plantlets and mini tubers. A greenhouse was successfully constructed and 4,600 rooted apical cuttings of the popular *Shangi* potato variety planted and achieved a yield of 31,378 mini-tubers during the first season and 29,038 mini-tubers in the



second season. The mini tubers will be maintained in the store to await sprouting and field multiplication during the Kenyan long rains season in January–April.

In addition to the infrastructural improvement at the Tigoni Research Centre, SFSA has also supported the KALRO potato hydroponic facility to increase its capacity of EGS production. Consequently, the facility mentored 23 college and university students as interns in 2021 as part of the capacity-building plan. As a result, the Centre has played host to NARS from other countries including Cameroon and Gambia visiting on learning tours in seed potato production, including the state-of-the art hydroponic technology at KALRO. Due to its immense contribution to the Kenyan Government Big 4 Agenda on the food security pillar, the project was featured in a State House Government news series entitled “Kenya – Project 254, Episode 77”. These interventions aim to produce 200 metric tons of seeds in the next three years while building the capacity of 20 commercial seed entrepreneurs in certified seed production. Subsequent phases will include continuing mini-tubers production, field seed bulking, recruitment, and capacity-building for potato seed entrepreneurs.

Investment support

An estimated investment of nearly US\$279,000 including KALRO’s US\$179,025 in-kind contribution towards potato seed revitalization is currently ongoing with estimated revenue of over US\$5 million over the next three years. The revenue from the sale of basic potato seed class realized in the second phase will be plowed back to finance breeders’ seed production operations to ensure the intervention’s sustainability. We also expect to see more investment in the potato value chain by the private sector.

Kenya is experiencing a rising demand for soybean for animal feed production and human consumption. The market for the crop is crowded with several players including small, medium and large enterprises. In order to meet the growing demand, we have supported KALRO’s soybean unit to increase its capacity of EGS. However, more resources are needed to fund infrastructural development in order to facilitate seed production, quality analysis, and seed processing. The KALRO soybean research center has now realized nearly 5.7 tons of various classes of soybean EGS varieties, having a value of approximately US\$30,000 if sold at the current market price. This is coming off a very low baseline of less than 1 ton of seed.

We view our support for KALRO and other NARs across Africa as a sound investment bringing high social and economic return.