TOOLS

Tools are defined as a template, software, or physical instrument that enables one to perform a specific operation or series of operations to enhance the outcome of a given activity or process. A tool is something (such as an instrument or apparatus) used in operating.

A wide range of tools to support different aspects of the seed sector have been developed. Tools range from tracking seed production, targeting markets using geospatial tools, seed certification and traceability, data capture for on-farm trials, seed systems assessments, and a range of open-source and commercial tools to manage an effective seed business. CESSA is well placed to create awareness of validated tools and redirect users to these resources and potentially negotiate preferred licensing terms where required.

There are several tools currently available to support the African seed sector *(see table below).* More tools are emerging each year as exponential investment in digital technology is expected over the next decade.

EXAMPLES OF TOOLS SUPPORTING THE AFRICAN SEED SECTOR

No.	Tool	Purpose	Suggested role of CESSA	Priority 1= High	Link
1	Seed production roadmap and access to breeding lines	Enables national governments, MSMEs and large seed producers, and other seed sector operatives in planning, producing, tracking, and delivering quality seeds to smallholder farmers	Direct users to CIMMYT and ICRISAT variety databases to access adapted lines.	1	https://maizecatalog.cimmyt.org/ About | Seed Systems (icrisat.org)
2	Seed Systems Assessment Tool (SeedSAT)	Conduct in-depth country seed system analysis with governments and other stakeholders to highlight areas for investment to further the delivery and use of improved varieties of crop seed	SeedSAT is one of the offerings provided by CESSA.	1	https://seedsat.org/
3	FAO Seed Toolkit (Modules 1-6)	Support practitioners along the entire seed value chain to acquire the knowledge and skills to deliver quality seeds	Direct stakeholders to FAO Seed Toolkit	1	https://www.fao.org/seeds/seeds-toolkit/en/

		and planting materials to farmers			
4	Seed Systems Toolbox for RTB	Understand existing seed systems of vegetatively propagated crops	Link stakeholders to RTB Seed Toolkit	2	https://tools4seedsystems.org/
5	The African Seed Company Toolbox - AGRA	The Toolbox deals with three issues: 1) the seed manufacturing process, 2) the seed marketing process, and 3) the requirements for sustaining and growing a seed company	Adapt to web course	1	https://agra.org/wp-content/uploads/2020/09/The-African-Seed-Company-Toolbox.pdf
6	Quality Assurance (QA)/Quality Control (QC) through genetic fingerprinting (CIMMYT)	The theory and practice of QA/QC of seed quality in maize breeding and seed production	Consolidate lessons learned and point to in-country service facilities	3	https://repository.cimmyt.org/bitstream/handle/10883/19046/58899.pdf?sequence=1&isAllowed=
7	SeedAssure	Work digitally via real-time software platform that helps high quality seed through the supply chain.	Direct users to SeedAssure website	3	https://seedassure.com/
9	AgroTracker to ensure agro-inputs quality using mobile and web technologies	KEPHIS and partners have a mobile-and web-based platform to track inputs, especially seeds, are certified in a rigorous, secure, transparent, and effective manner. The solution is based on smart tags to achieve full traceability of the inputs supply chains in Kenya	Direct users to AgroTracker site. Explore on extending this platform to other AGRA countries their respective	2	https://agrotrack.org
10	Field Trial App (web-based) - SFSA	Collecting and managing data from crop field trials	Link stakeholders to SFSA field trials app.	2	SFSA Field Trial App on Google Play

Description of tools to be used within the CESSA website:

1. Seed production roadmaps and access to lines of improved varieties

Research organizations around the world and within the country are developing new crop varieties and lines to respond to everchanging production ecologies, market requirements for better nutrition and taste, and production constraints such as emerging pests and disease as well as drought and extreme temperatures associated with climate change. CESSA has consolidated different resources one can access to improved lines and varieties for different crops to better serve African seed producers.

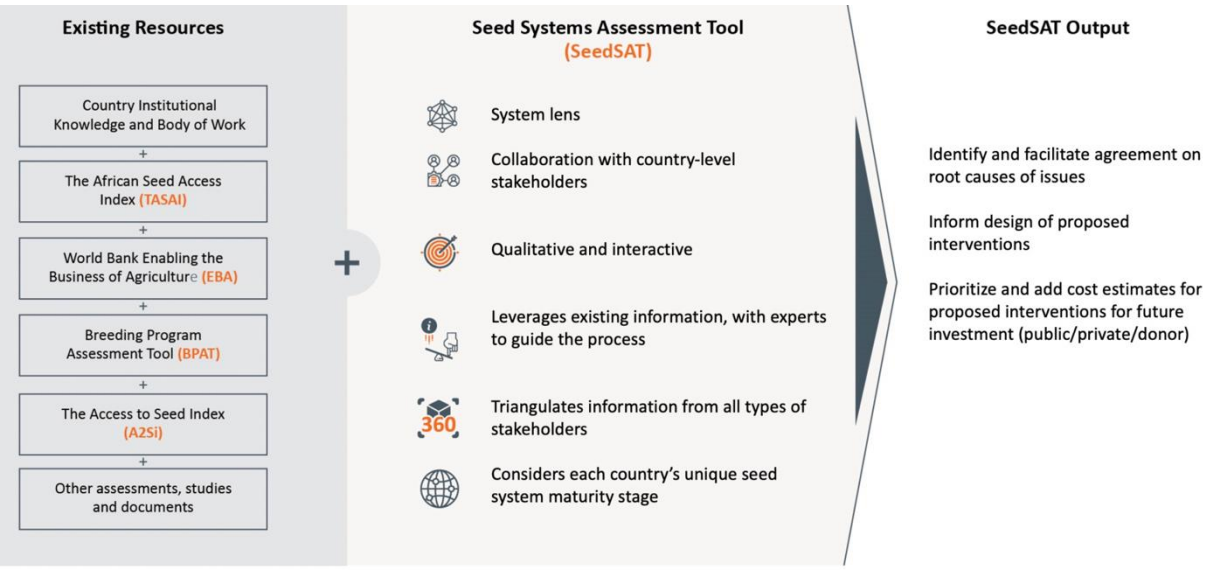
The links below connect to these organizations for different crops.

Links to CGIAR released varieties to support African farmers include:

- Maize – CIMMYT - https://maizecatalog.cimmyt.org/
- Rice – IRRI - http://inger.irri.org/ [not fully operational]
- Sorghum – ICRISAT - http://seedsystems.icrisat.org/
- Pearl Millet – ICRISAT - http://seedsystems.icrisat.org/
- Finger Millet – ICRISAT - http://seedsystems.icrisat.org/
- Groundnut – ICRISAT- http://seedsystems.icrisat.org/
- Chickpea – ICRISAT- http://seedsystems.icrisat.org/
- Pigeonpea – ICRISAT - http://seedsystems.icrisat.org/
- Cowpea – IITA – [no online catalogue but requested one]
- Soybean – IITA - [no online catalogue but requested one]
- Vegetables – WorldVeg - https://avrdc.org/seed/improved-lines/
- Cassava IITA – [no online catalogue but requested one]
- Yam IITA – [no online catalogue but requested one]
- Potato – CIP - http://www.cipotato.org/resources/publications/cd-rom/catalogue-of-potato-varieties-and-advanced-clones [Not working]
- Sweet potato – CIP - http://www.cipotato.org/resources/publications/cd-rom/catalogue-of-potato-varieties-and-advanced-clones [Not working]

2. Seed Systems Assessment Tool (SeedSAT)

SeedSAT is a new assessment tool to analyze national seed systems for diverse staple crops with governments and other stakeholders to increase the delivery and use of seed for improved crop varieties. The tool complements existing resources (e.g., TASAI, World Bank's EBA, BPAT, and A2Si) and helps identify and prioritize seed system modifications and investments. The outcomes from using SeedSAT are illustrated below:



For more information on SeedSAT go to https://cessa.agra.org/analysis/

3. FAO Seed Toolkit

The Seeds Toolkit has been developed to support practitioners along the entire seed value chain to acquire the knowledge and skills they need to deliver quality seeds and planting materials of well-adapted crop varieties to farmers. The Toolkit is designed primarily for capacity-building activities, especially for small-scale farmers and small and medium-scale entrepreneurs, and comprises the following six interrelated modules:

Module 1: Development of small-scale seed enterprises[1]
Module 2: Seed processing: principles, equipment, and practice [2]
Module 3: Seed quality assurance [3]
Module 4: Seed sector regulatory framework [4]
Module 5: Seed Marketing[5]
Module 6: Seed storage[6]

To learn more about the FAO Seed Toolkit go to https://www.fao.org/seeds/seeds-toolkit/en/

Let us know if there are topics not covered that one would like AGRA to develop to support your seed enterprise by contacting us at https://cessa.agra.org/contacts/

4. Seed Systems Toolbox for Roots, Tubers, and Bananas (RTB)

The tools in this toolbox include methods, models, approaches, and information and communication technologies (ICTs) to support researchers, policymakers, and practitioners. Detailed information to use

[1] https://www.fao.org/publications/card/en/c/CA1490EN
[2] https://www.fao.org/documents/card/en/c/ca1491en
[3] https://www.fao.org/documents/card/en/c/CA1492EN
[4] https://www.fao.org/documents/card/en/c/CA1493EN
[5] https://www.fao.org/documents/card/en/c/CA1494EN
[6] https://www.fao.org/documents/card/en/c/CA1495EN

diverse tools to understand the root, tuber, and banana seed systems, so one can design, conduct, monitor and evaluate seed system projects.

Tools include:

- Multi-stakeholder-framework/[7]
- Impact-network-analysis/[8]
- Seed-tracker/ Seed-tracker/[9]
- Integrated-seed-health-approaches-and-models/ Integrated-seed-health-approaches-and-models/[10]
- Seed-tracing/ Seed-tracing/[11]
- Small-n-exploratory-case-study/[12]
- Four-square-method/[13]
- Means-end-chain-analysis/[14]
- Experimental auctions/[15]
- Seed-regulatory-framework-analysis/ [16]
- Sustainable-early-generation-seed-business-analysis-tool-segsbat/ [17]
- Glossary-of-root-tuber-and-banana-seed-systems/[18]

To learn more about the RTB Toolkit go to https://tools4seedsystems.org/

Let us know if there are topics not covered that one would like AGRA to develop to support your seed enterprise by contacting.

5. The African Seed Company Toolbox

The toolbox is geared towards start-ups and young companies, but general seed enterprise management principles apply to all seed companies (Funk, 2009). Emphasis is on the production of seed for staple grain crops, not vegetable or vegetatively propagated crops.
Features:

- The African Seed Company Toolbox offers 52 separate tools that can be read in an order most appropriate to your needs at the time.
- Many tools contain exhibits that can be modified to suit your business needs.
- The tools are designed to be used for training middle managers as well as other company staff.
- Many of the tools link to other tools; to develop a full understanding of an issue, it is recommended that one reads all tools related to a given subject.

[7] https://tools4seedsystems.org/tools/multi-stakeholder-framework/
[8] https://tools4seedsystems.org/tools/impact-network-analysis/
[9] https://tools4seedsystems.org/tools/seed-tracker/
[10] https://tools4seedsystems.org/tools/integrated-seed-health-approaches-and-models/
[11] https://tools4seedsystems.org/tools/seed-tracing/
[12] https://tools4seedsystems.org/tools/small-n-exploratory-case-study/
[13] https://tools4seedsystems.org/tools/four-square-method/
[14] https://tools4seedsystems.org/tools/means-end-chain-analysis/
[15] https://tools4seedsystems.org/tools/experimental-auctions/
[16] https://tools4seedsystems.org/tools/seed-regulatory-framework-analysis/
[17] https://tools4seedsystems.org/tools/sustainable-early-generation-seed-business-analysis-tool-segsbat/
[18] https://tools4seedsystems.org/tools/glossary-of-root-tuber-and-banana-seed-systems/

For managers who wish to learn more, a list of useful Internet links is provided at the end of the toolbox. You can download a pdf of the Toolbox HERE.[19]

6. Quality Assurance and Quality Control (QA/QC) of lines through genetic fingerprinting (CIMMYT)

Quality Assurance/Quality Control (QA/QC) is defined as the combination of quality assurance, the process or set of processes used to measure and assure the quality of a product, and quality control, the process of ensuring products and services meet consumer expectations.

The purpose of QA in the seed value chain is to provide proper service and support for seed production at various stages and ensure that the sales and marketing team have high-quality products. Quality assurance is, thus, process-oriented and focuses on the prevention of low-quality or genetically impure seed being mixed with high-quality seed. A good QA program always starts with established protocols on functions, objectives, and action plans, including a set of quality standards. QA is important for proactively preventing mistakes in the process of creating or maintaining new finished inbred lines, or hybrids. The purpose of QC in the seed production chain is to identify and correct the errors or mixtures that might have slipped through QA protocols. QC involves routine testing of the seed materials throughout the process of seed production or breeding using all available seed testing methods, including germination, seed viability, seed vigor, phenotypic and morphological traits, grow-out tests, and implementation of biochemical and/or molecular marker based.

This resource developed by CIMMYT for maize can be adapted for other pure-line crops to ensure the genetic purity of the seed.

You can download a pdf version of the manual from CIMMYT's website HERE.[20]

7. SeedAssure offers a complete, real-time software platform that tracks quality seeds through the supply chain.

SeedAssure is a digital data platform that is easy to use, customizable, and readily integrated into multiple systems. The software employs standardized, up-to-date quality measures and disease monitoring modules. It is not a 'reinvention of the wheel' but supports existing 'tried and tested' methodologies used for years in seed inspection. SeedAssure makes processes faster, more efficient, more effective, and more sustainable for all partners in the supply chain.

Learn more about SeedAssure HERE.[21]

8. AgroTrack for traceability of agro-inputs

The AgroTrack portal was developed by KEPHIS in partnership with GoldKeys to ensure that agro-inputs within its regulatory purview, especially seeds, are certified in a rigorous, secure, transparent, and effective manner. AgroTrack uses smart tags, mobile phone and web technologies to achieve full traceability of the inputs supply chains in Kenya.

Learn more about AgroTrack HERE. [22]

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[19] https://agra.org/wp-content/uploads/2020/09/The-African-Seed-Company-Toolbox.pdf
[20] https://repository.cimmyt.org/bitstream/handle/10883/19046/58899.pdf?sequence=1&isAllowed=
[21] https://seedassure.com/
[22] https://agrotrack.org/

9. SFSA Field Trial App on Google Play

The field trial app was developed in 2019 by Seeds2B under the Syngenta Foundation for Sustainable Agriculture (SFSA). The Trial app handles field trial data and can be used to monitor the commercial development processes of a product life cycle from breeding through to commercialization. It walks one through developing a target product profile and the varieties one wants to replace. To do this one defines the criteria to be considered a suitable replacement variety. Trials can be created and then linked to a specific target profile, the trial locations, and observations to be collected. Data can then be entered using the mobile phone app.

Screenshots of the app are shown below for reference:

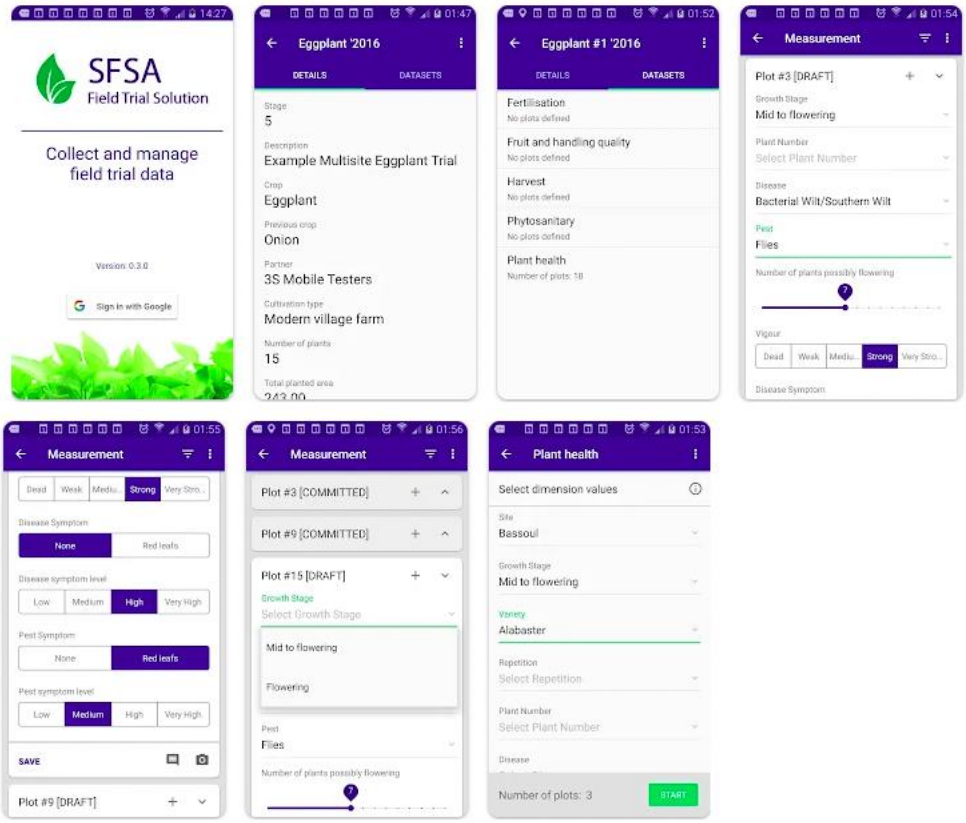

Figure 2: Screenshots of SFSA Field Trial Solutions android app[23]

Key takeaways from tools

There is a proliferation of digital tools. This will only increase with time so CESSA can promote vetted tools to support the African seed system. There is a need to develop a better understanding of existing tools, training to apply these tools and maintenance of tools. CESSA will adopt human-centered design (HCD) principles in developing licensing new tools for African seed systems to increase the likelihood of sustained use.

[23] https://play.google.com/store/apps/details?id=com.threesmobile.fieldtrials&hl=en_US&gl=US