An investors' guide to Africa's emerging seed markets

Report of the research on generating seed market intelligence

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Contents

List of abbreviations and acronyms

A2SI	Access to Seeds Index of the World Benchmarking Alliance
ACTESA	Alliance for Commodity Trade in Eastern and Southern Africa
AFSTA	African Seed Trade Association
BII	British International Investment
CAADP	Comprehensive Africa Agriculture Development Programme
COMESA	Common Market for Eastern and Southern Africa
COMSIS	COMESA Seed Information System
EBA	Enabling the Business of Agriculture Index
EWS-KT	East-West Seed Knowledge Transfer
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and agriculture data of the FAO
ISSD Africa	Integrated Seed Sector Development in Africa
MVP	Minimum viable product
NGO	Non-governmental organization
SDGs	Sustainable Development Goals
TASAI	The African Seed Access Index
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research
WUR	Wageningen University & Research

Executive Summary

Fragmented market intelligence is *the* major barrier to investment in Africa's emerging seed markets, according to participants in our June 23rd conference session on *An investor guide for Africa*. There is significant demand for a service of assessing the attractiveness of emerging seed markets in Africa for (impact) investment. The service should go beyond collating relevant information from diverse sources, by interpreting it and making informed recommendations to (impact) investors. We intend for our report to offer a substantiated value proposition for an entrepreneur or institution interested in prototyping and anchoring this service. We do this with the view to increase intelligence on Africa's emerging seed markets.

This report shares what Wageningen Centre for Development Innovation has uncovered through research about seed market intelligence in Africa. The research has been conducted mostly online involving literature review, key informant interviews with 20 leaders in government, industry, science, and civil society and panel discussion about the actual intelligence and minimum viable product for a service they require in making investment decisions. Among them were respondents from: the African Union Commission; the regional economic community COMESA; national, regional, and multinational seed companies; development finance institutes and commercial lenders; international agricultural research institutes, other knowledge institutes, and consultants; the African Seed Trade Association (AFSTA); and an International NGO.

The research revealed several useful platforms, indices, and reports offering data for indicators of relevance to investors. Sources of market intelligence for the entire African region are included in the report. However, each does not cover all countries and dimensions of interest. We assessed 12 of them and learned that The African Seed Access Index (TASAI), Access to Seeds Index of the World Benchmarking Alliance, and Enabling the Business of Agriculture index of the World Bank overlap in 17 countries where data from CAADP Biennial Reviews are also available. These countries across Western and Central, and Eastern and Southern Africa offer the most readily available information for making investment decisions.

Our research also resulted in the convergence of multiple indicators around four categories. This includes those that assess: (i.) *seed sector* performance; (ii.) the potential absorption of crop harvests in *outputs markets*; (iii.) current progress against targets for development *impact*; and (iv.) other variables of the *country context*. Cascading from that level of aggregation are three topics (sub-categories) in each. For the seed sector these include indicators of seed demand, seed supply and seed regulatory function. For output markets these include the size or value of these markets, the level of investments made in farm productivity, and organization of producers in leveraging economies of scale. For impact these include different indicators of poverty reduction, food security and nutrition, and climate change adaptation and mitigation and biodiversity conservation, management, and use. And lastly, for country context these include demographics, political and economic stability, and infrastructure. A mosaic of data is available from the indices and other sources of information mentioned above. Important to our efforts to collate these data are their availability in the public domain.

Our research offers a substantiated value proposition and minimum viable product for the service. What it falls short of doing is outlining a viable business model for anchoring this service in the seed sector. Should an entrepreneur or institution be interested to pilot the service in Africa, we advise that they thoroughly consider the business model, including partnerships and revenue streams. A critical resource (and cost in the model) includes expertise on seed, seed business, and/or seed systems. Without this knowledge, based on our determination of the minimum viable product, accurate interpretations of the data cannot be made reliably. Collation is not enough to inform investment decisions and (impact) investors are looking for qualitative recommendations as well. We offer some cues for the curation of these data.

1 Introduction

Increasing seed market intelligence

Fragmented market intelligence is the major barrier to investment in Africa's emerging seed markets according to participants in the conference session on *An investor guide for Africa*[1]. Whilst several useful platforms, indices and reports offer data for indicators of relevance to (impact) investors, they don't cover all countries and dimensions of interest. In response to (impact) investors' calls for a dashboard to assess the attractiveness of emerging African seed markets, research was conducted to reveal relevant information and its sources to turn to in generating much-needed market intelligence.

Research objectives

The research strived to contribute towards achieving one of ISSD Africa's action learning project outcomes, namely: Stakeholder intelligence of the seed market in Africa increased. ISSD Africa is introduced shortly. The main research questions asked were:

1. What knowledge do investors need to better assess the attractiveness of investing in Africa's emerging seed markets?
2. What data are already available and what is the source of these data?
3. What type of service or product are investors looking for?

We conducted this research with the aim to generate greater intelligence on Africa's seed markets, give recommendations for investment decisions and broker connections. Higher investments in seed markets can help improve matching supply and demand and increase the use of improved varieties through appropriate marketing strategies.

ISSD Africa

Integrated Seed Sector Development in Africa (ISSD Africa)[2] is an international community of practice, guiding seed sector innovation and development on the African continent to alleviate the problem of limited access to quality seed. Addressing complex seed sector challenges of continental importance will result in better performing seed sectors with increased access to quality seed, of varieties that farmers prefer. This will have a positive impact on food and nutritional security and on farmer income.

In support of its mission, ISSD Africa invests in action research, dialogue, and learning on eight topics. Among them is *Creating demand for quality seed*. Activities of this topic pursue two outcomes:
1. Stakeholder intelligence of the seed market in Africa is increased; and 2. Effective policies, strategies and/or practices in promoting quality seed use are identified and applied.

This report

The report shares what Wageningen Centre for Development Innovation has uncovered through research about the value proposition of a service of assessing the attractiveness of investing in emerging seed markets in Africa. The research has been conducted mostly online involving interviews and panel discussion with twenty leaders in government, industry, science, and civil society about the actual intelligence and minimum viable product (MVP) for a service they require to inform their investment decisions in Africa's seed markets. Sources of market intelligence for the entire African region are included in the report.

[1] Conference on *Guiding Seed Sector Transformation in Africa – Durable Solutions to Systemic Problems*, 21-23 June 2021. Learn more about the conference session on *An investor guide for Africa* here: https://issdafrica.org/2021/06/08/an-investor-guide-for-africa-generating-seed-market-intelligence/; and https://www.youtube.com/watch?v=LECz8moCaNw&list=PLAROYb3nEDkFfS5UIeGJeN1FNqH-2iD_B&index=17&t=8s

[2] More information on ISSD Africa is available on https://issdafrica.org/

2 Method

Our research started off with semi-structured interviews of 20 key informants from across different knowledge institutes and types of investors (Appendix 1). The respondents shared what they believed are the most important factors to consider when assessing the attractiveness of seed markets. We sought these data with initial lines of enquiry and assumptions that demand-side dynamics are important but so are other factors including the enabling environment and efforts to promote seed. We also assumed that patterns would be different for different types of crops differentiated by market archetypes (see 3.3 Different entry points for navigation) and that some may emerge more interesting than others for certain kinds of investors (e.g., public/social, commercial, debt or equity partners). These lines of enquiry are evident in our questionnaire (Appendix 2). However; being semi-structured, more insights were captured.

Second, we dived into different sources of information. Included among them were: the African Union Commission and African Union Development Agency Comprehensive Africa Agriculture Development Programme (CAADP) Biennial Review Reports on progress in the implementation of the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods; Common Market for Eastern and Southern Africa (COMESA) Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) Seed Information System (or COMSIS); The African Seed Access Index (TASAI); Access to Seeds Index (A2SI) of the World Benchmarking Alliance; Agrobiodiversity Index of the Alliance of Bioversity International and CIAT; the Food Systems Dashboard of the Global Alliance for Improved Nutrition and Johns Hopkins University; the Food and Agriculture Organization (FAO) of the United Nations food and agriculture data (FAOSTAT); World Bank Open Data; Enabling the Business of Agriculture Index (EBA) of the World Bank Group; and various initiatives tracking progress against the indicators of the Sustainable Development Goals (SDGs). Contrasting data sought by key informants with data supplied by these sources, indicators began to coalesce around different sub-/categories.

Next, we performed some matchmaking to give structure and order to these findings. The result was four categories and three topics (sub-categories) under each from which indicators cascade. In the next section of the report, we present these. Appendix 3 shows the frequency of these indicators' mention by different types of respondents. The final step in our methodology was to validate this output and discuss the value proposition and MVP of its delivery as a service. This was done during the ISSD Africa conference on *Guiding seed sector transformation in Africa* in the session entitled *An investor guide for Africa* on June 23rd, 2021, with a panel of three experts and online audience of more than 70. Panellists were Mr Elijah Mwashayenyi of East-West Seed Knowledge Transfer (EWS-KT), Mr Sami Khan of British International Investment (BII, formerly CDC Group) and Dr Ed Mabaya, founder and scientific advisor of TASAI and research professor in global development at Cornell University. We heard what information and partnerships are needed for being decisive in investment decisions and specific interests in predictions about the future and increasing confidence in the power of such predictions. Further, multiple polls were run during the session and answers to our research questions were distilled.

3 Value proposition

"There is a recurring challenge, from an investor perspective, that we have on market intelligence and the access to credible figures. No doubt there's a lot more that's required in terms of getting the right market intelligence, collating that information, but more importantly also coming up with some sort of analysis that can really help in connecting the investors with the supply chain in Africa."

S. Khan – BII

All respondents agree that there is much more that can be done to make relevant information on Africa's emerging seed markets available to investors. This is a pain point felt by commercial as well as impact investors. The public and private sectors see potential gains in having information on seed for a wide array of crops and countries across Africa available. This calls for an ambitious undertaking of categorizing, ordering, and interpreting relevant data. Flexibility in how information is navigated strengthens the value proposition.

3.1 Pain relievers and gain creators

Figure 1 captures the pains and gains of customers (investors) of such a service and the pain relievers and gain creators of the service itself. The value proposition of the service is that it will help investors in their jobs of expanding their business, earning a return on investment, and/or increasing their investment impact. Investors are currently pained by risks they face due to uncertainty or invest too much time and other resources in gathering information. This constrains their revenue streams and/or impact. What they stand to gain from the service is more sound investment decision making power, lower costs of accessing information, and information that is precise, accurate and readily available. The service would achieve this by collating information from various resources in a more complete overview that facilitates the comparison and interpretation of these data and improves the assessment of business/impact opportunities. It would offer the product of a central location with links to these resources that is updated regularly. This could take shape in an online dashboard linked to sources of data that offers flexibility in how different customers enter and navigate it.

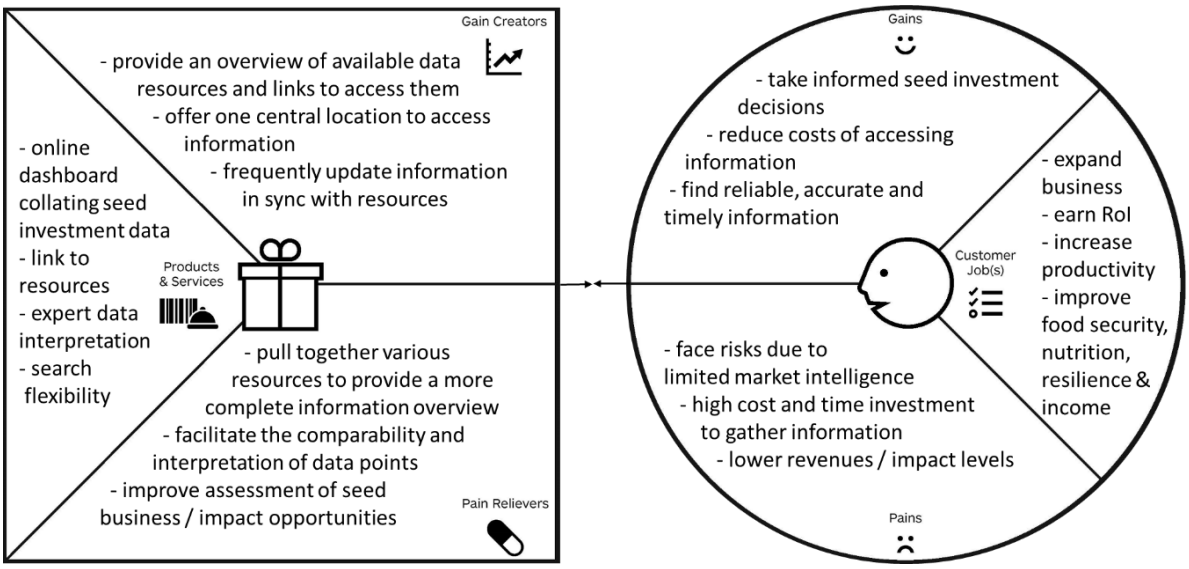

Figure 1 *Value proposition of a service in collating and curating seed market intelligence (source: the authors using the value proposition canvas[3])*

[3] Osterwalder, A., Pigneur, Y., Bernarda, G. and Smith, A., 2015. *Value proposition design: How to create products and services customers want*. John Wiley & Sons.

3.2 Indicators of investor interest

"The things that we consider include, related to the seed sector, of course things like seed demand and seed supply, what kind of regulation is there. In terms of the markets, we also look at market size, what farmer organizations are there. We also look at what our impact will be. And in terms of the country context, we also look at the demographics, stability and so forth. There are maybe one or two other additional considerations. We look at potential partnerships. We also look at what extension services are there."

E. Mwashayenyi – EWS-KT

Interviews resulted in a long list of indicators (Appendix 3). We identified four categories which encapsulate their diversity. There are indicators that assess the performance of the *seed sector* itself and express potential absorption of crop harvests in *output markets*. Then there are those that measure *impact* and lastly a whole host of others that capture the *country context*, which differ from one place to another (Figure 2).

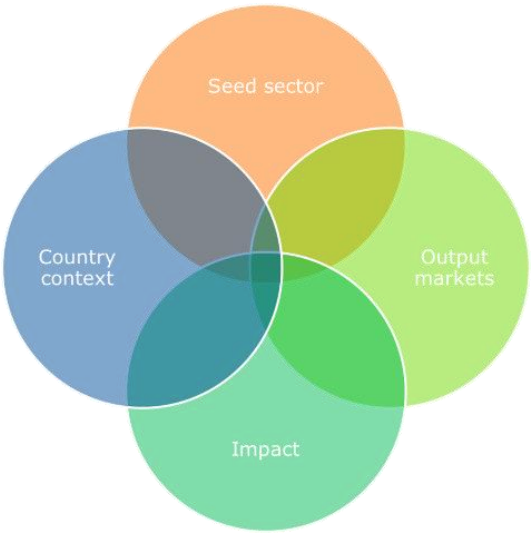

Figure 2 *Categories of indicators of interest*

Under each of these categories, we have done some further aggregating according to topics (Figure 3). *Seed sector*: these include indicators of seed demand, seed supply, and regulation. *Output markets*: their size or value, level of investment made in farm productivity, and organization of producers in leveraging economies of scale.

Impact: we consider different indicators of poverty reduction, food security and nutrition, and climate change adaptation and mitigation and the conservation, management, and use of biodiversity. *Country context*: demography, political and economic stability, and infrastructure are important. For all of these, a mosaic of data is available from the indices and other sources of information (Appendix 3).

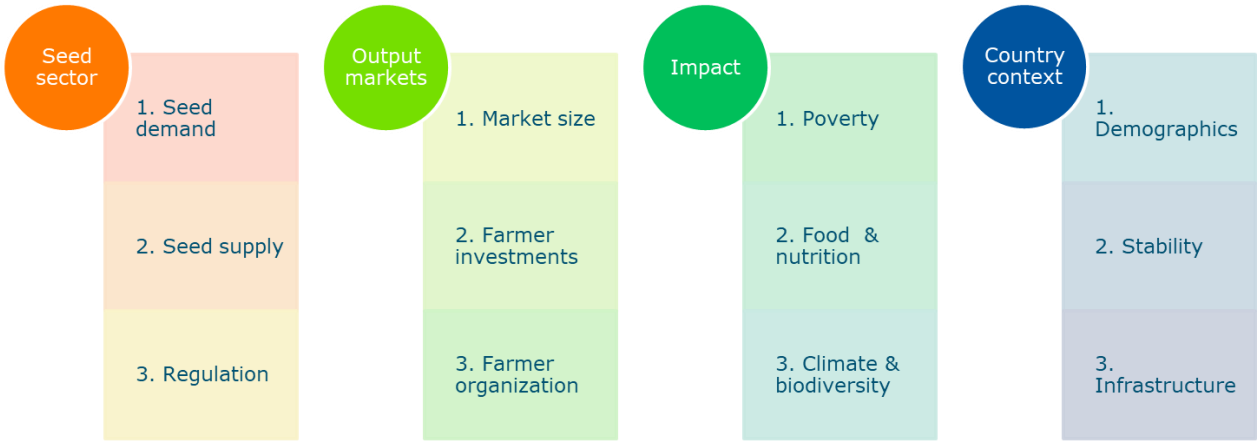

Figure 3 *Topics from which indicators cascade (source: the authors)*

3.3 Different entry points for navigation

An archetype refers to the origin of a pattern and is used in this context to predict different seed market behaviours. Figure 4 presents on the y-axis, from bottom to top, increasing demand for crops grown from quality seed of improved varieties. On the x-axis, from right to left, is increasing marginal economic value for quality seed of improved varieties. Clockwise, from top left; you have crops that seed is widely demanded of and high in marginal economic value, to bottom right; where crops' seed has lower levels of demand and lower marginal economic value. Each quadrant offers seed entrepreneurs different potential for profitmaking; therefore, the interests of the public and private sectors are unevenly distributed. These archetypes are fairly accurate in predicting the seed business models of vegetables, sweet potato, sorghum, and cotton, for example. Whilst vegetable and cotton seed may be firmly in the hands of the private sector, ensuring that quality seed and improved varieties are available for sweet potato and sorghum, requires public investment.

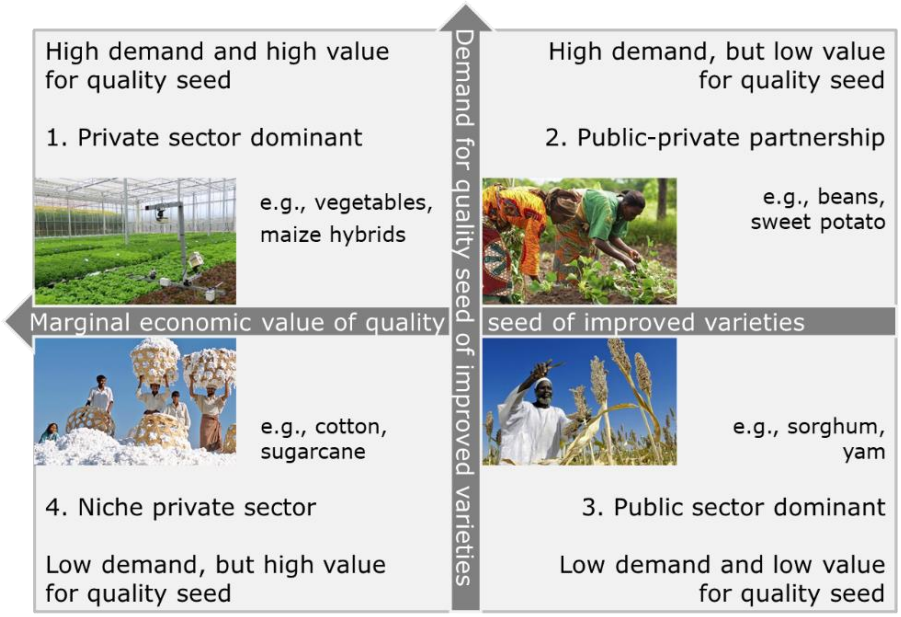

Figure 4 *Seed market archetypes (source: adapted from de Boef et al., 2015)*[4]

[4] de Boef, W., Huisenga, M., Atwood, D., Mennel, J., Dassel, K., Prabhala, P., Weddle, J., Anderson, K. and Taintor, M., 2015. Early generation seed study-summary. Gates Open Res, 3.

We consider market archetypes as important in determining the relative weight given to each sub-/category of indicators by different types of investors. Equity partners and commercial lenders may be most interested in achieving the greatest returns on investment and looking at the left-hand side of Figure 4 accordingly. Meanwhile, development finance institutes that are willing to accept lower returns and longer horizons may well be looking with greatest interest at the impact of their investments on rural households and communities' food security and nutrition; or the right-hand side of the figure accordingly. It also helps to be able to focus on a specific crop and value chain, which archetypes bring to the fore. Investors see the usefulness of seed market archetypes as an entry point and perspective to investment decision making.

Sub-/categories of indicators, the seed market archetypes, and specific geographic scope each offer a different entry point for navigating seed market intelligence. The flexibility in choosing these as a starting point is part of the value proposition of the service. Investors may not know beforehand what information is most relevant to them, so being able to navigate through different dimensions and levels of information will reveal what they had not previously considered.

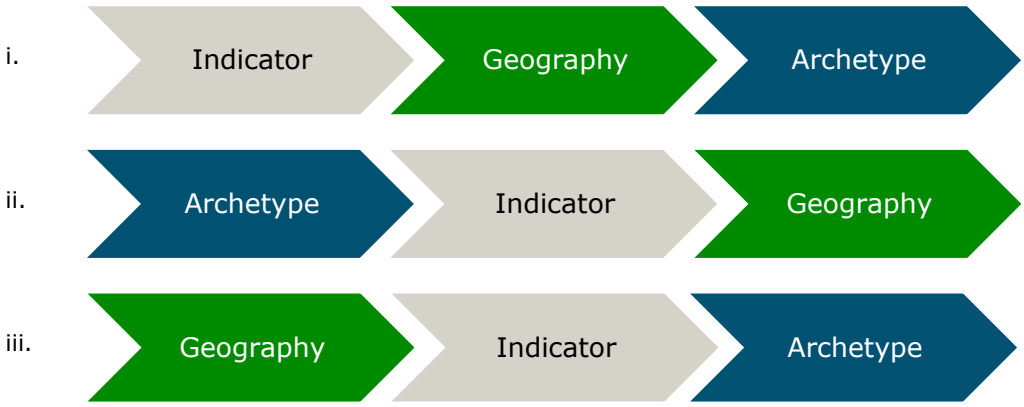

Figure 5 *Hypothetical pathways (not exhaustive) taken by i. a donor, ii. an equity partner, and iii. a government to navigate seed market intelligence*

Figure 5 shares some hypothetical pathways by which different types of investors navigate the investor resource. This is not an exhaustive list:

i. A donor may start by selecting indicators related to their topic of concern (e.g., climate change adaptation) to identify a country in need of support. Then the donor may use the seed market archetypes to select crops and value chains to focus their investment upon.
ii. An equity partner may first look at seed market archetypes to identify which crops offer better returns on investment in seed business. Where scores for indicators are most attractive for these crops, the investor can narrow down their search to specific countries.
iii. A government looking to support its seed industry intuitively will start by selecting its country from the list and assessing its performance against different topics of indicators. Then, likewise to the donor (see i. above), may use the seed market archetypes to prioritise a crop.

4 Minimum viable product

"As the seed sector is rapidly evolving, accurate and timely information is necessary and the service offered should follow these dynamics as well as appreciate the differences between countries."

E. Mabaya – TASAI

There is clear demand for a (digital) service collating and curating seed market intelligence for Africa. Seed markets on the continent are emerging and changing rapidly, which calls for dynamism in the way data is managed. We live in a digital age and digital offers both the accessibility and dynamism required. We strongly recommend that an entrepreneur or institution interested in anchoring this service in Africa explore the possibilities and user experience of doing so online. This requires reiterative testing. Our research offers structure to the logic that could be applied. An inspiring example is TASAI. TASAI recently developed its dashboard to present and contrast data for indicators and countries within the scope of its assessment[5]. It is important to monitor such initiatives to avoid duplication and combine efforts if possible.

The first important activity of the service is collating relevant data. Beyond understanding what data are relevant, which our research reveals and details in Appendix 3, these data need to be accessible. We turned to public sources of data, which we argue suffices. There is already a lot that is publicly available and of interest to investors. Some minimum criteria for the resources used are their relevance, timeliness, and extensiveness. The later concerns the concentration versus fragmentation of indicators, and efforts to collate these accordingly (geographically but also temporally). Accuracy is another obvious criterion of concern, but we observe good rigour to how these indices and reports are generated. Self-reporting is a common feature, which may warrant triangulation.

Appendix 3 reveals how un/available data are for certain (topics of) indicators. For example, indicators assessing seed demand are few.

"It is fairly difficult to predict seed demand, and in add on to that there is fairly unpredictable subsidy program of governments and NGOs, and they are still a big part of the seed demand"

E. Mabaya – TASAI Inc.

We encountered just five proxies for seed demand. Without a reliable measure, seed demand may be deduced from indicators of output markets. However, the demand for produce like grain and commercial seed demand can be non-linearly related as farmers choose to save, exchange, and even sell seed informally. Furthermore, we only encountered six indicators of output markets.

We discovered that the TASAI, A2SI, and EBA overlap in 17 countries where data from CAADP Biennial Reviews are also available (Figure 6). These countries across Western and Central, and Eastern and Southern Africa offer the most readily available information for making investment decisions.

[5] https://www.tasai.org/en/dashboard-home/

Figure 6 *Overlapping distribution of TASAI, A2SI, EBA, and CAADP Biennial Review data*

The next step is curating these data, which includes giving weight to indicators, deriving indices, or summating these data for reduction, simplification, and ease of interpretation. Not all indicators are equal, especially not to different types of investors. This poses a challenge to the meaningful integration of data in a dashboard on market intelligence. It may require some serious logic, more consultation with different types of investors (see distribution of investors' interests in Appendix 3), and customization to their divergent needs. Another challenge is the possibility of extrapolation. Some investors expressed demand to obtain predictions based on analyses of trends. This proves very difficult and technical, which would add to the cost of operating such a service and potentially also the cost of accessing such a service. We doubt the trustworthiness of predictions given the complexity of seed markets and advise against it.

Even if the two steps of activities, collation, and curation, overcome their respective challenges, are performed effectively, and achieve MVP, there are strong interests in additional functions that could lead to increased (commercial) use of the service. The service could support the collection of additional seed investment information to fill gaps and improve data relevance, timeliness, extensiveness, and level of detail. It would also be helpful to share contact details of willing parties, like stakeholders in seed value chains, to create a portal for facilitating business linkages and potential partnerships. And while an online dashboard can be the first stop for investors to start their seed market investment analyses, consultation is requested in helping them reach a decision. Another request voiced during the interviews was the need for investors to access latest research on seed markets.

5 Conclusion

Our research offers a substantiated value proposition and minimum viable product for the service. What it falls short of doing is outlining a viable business model for anchoring this service in the seed sector. Should an entrepreneur or institution be interested to pilot the service in Africa, we advise that they thoroughly consider the business model, including partnerships and revenue streams. A catalytic resource (and cost in the model) is expertise on seed, seed business, and/or seed systems. Without this knowledge, accurate interpretations of the data cannot be made reliably. Collation is not enough to inform investment decisions and (impact) investors are looking for qualitative recommendations as well. We offer some cues for the curation of these data, but strongly believe that that seed expertise will be pivotal in anchoring and commercializing the service.

As a potential precursor to an upscaled, professional, and commercial resource for obtaining seed market intelligence, many respondents mentioned that an investor resource might be of greatest immediate interest to a so-called 'missing middle'. This includes those investors that do not have the means or network to assess seed market intelligence themselves. Diversifying the products available for generating seed market intelligence might open multiple revenue streams, including donor funding. Such institutional funding could help greatly in sustaining the service. We hope that this report helps any interested parties to join forces in prototyping such a service soon.

Appendix 1 Key informants

Investor Type	Organization	Name
Commercial investors	East West Seed	S. Morris
	SeedCo	D. Muungani
	Mukushi Seeds	J. MacRobert
	Rijk Zwaan	M. Burnett
		H. Bos
Impact investors	CDC group	A. Portillo
	Rabobank: AGRI3 FUND	A. Johan
Knowledge institutes	BENEFIT	D. Alemu
	KIT	C. Hoogendoorn
	IFPRI/CGIAR	B. van Campenhout
	IFPRI/CGIAR	D. Spielman
Regional and sector Organizations	TASAI	M. Mugoya
	AFSTA	G. Gitu
		J. Rakotoarisaona
	SeedNL	A. Michiels
		M. Karssenberg
		L. van Benthum
	COMESA	J. Mukuka
	African Union Commission	B. Egulu
INGO	CRS	B. Dey

Appendix 2 Semi-structured interview

Questionnaire semi-structured interviews

- Which *demand* factors to assess the attractiveness of seed markets in Africa are important to consider?
- Which *other* factors (market dynamics, enabling environment, security) are important to assess the attractiveness of seed markets?
- Which distinctions need to be considered to ensure the information is relevant for different type of seeds and markets (crop types / informal vs formal / known vs unknown varieties / current vs future demand / seed stages: EGS, other / geographical differences)
- What is important for effective marketing / promotion of seeds to reach the demand?
- What are the key steps / check list / tips / not to forget in the process to assess the attractiveness of seed markets?
- Which resources are available to collect information / data or tools / methods to assess the attractiveness of seed markets in Africa (specific resources to be linked)?
- What aspect of assessing the attractiveness of seed markets did we not discuss and should be added?
- Who should be consulted in the key informant interviews: expert suggestion from network?

Appendix 3 Mapping indicators

Resource	Description	Geographic scope	Link
TASAI (The African Seed Access Index)	Indicators essential to monitor seed sector development at national level	21 countries in Eastern, Southern, and Western and Central Africa	https://www.tasai.org/en
EBA (Enabling the business of Agriculture) – World Bank	Assesses whether governments make it easier or harder for farmers to operate their business. Supplying seed is a specific set of indicators and module of the index	Global	https://eba.worldbank.org/en/eba
World Bank Open Data	Database for indicators of economic and development importance	Global	https://data.worldbank.org/
A2SI (Access to Seeds Index) – World Benchmarking Alliance	Compares seed companies' efforts to improve access to quality seeds of improved varieties for smallholder farmers	Global, Eastern and Southern Africa, Western and Central Africa, and South and South-East Asia	https://www.worldbenchmarkingalliance.org/access-to-seeds-index/
CAADP (Comprehensive African Agriculture Development Programme – AUDA-NEPAD (African Union Development Agency)	Main mutual accountability tool to track the progress of the African Union Member States in implementing the Malabo Declaration	51 African countries reported in 2021	https://au.int/en/documents/20220310/3rd-caadp-biennial-review-report
FAOSTAT (food and agriculture data of the FAO) – Food and Agriculture Organization of the United Nations	Food and agriculture indicator database per country and 10-year trends per region	Global	https://www.fao.org/faostat/en/
Agrobiodiversity Index – Alliance of Bioversity International and CIAT	Measures biodiversity across nutrition, agriculture, and genetic resources	20 pilot countries (9 in Africa)	https://www.bioversityinternational.org/abd-index/
Food Systems Dashboard – GAIN (Global Alliance for Improved Nutrition) and Johns Hopkins University	Combines multiple data sources for a complete view of food systems (mainly FAO, World Bank, and Euromonitor International)	Global	https://www.foodsystemsdashboard.org/
COMSIS (COMESA Seed Information System) - Common Market for Eastern and Southern Africa, Alliance for Commodity Trade in Eastern and Southern Africa	Used to measure performance of the COMESA Seed Trade Harmonization Implementation Plan (COMSHIP)	COMESA members	https://www.comesa.int/wp-content/uploads/2020/10/ACTESA-Strategic-Plan-2020-2030-draft-June-2020.docx

Indicator	Frequency of response			Resources
	Commercial investors (n = 4)	Impact investors (n = 2)	Knowledge institutes (n = 4)	
Seed sector				
Seed demand				
Seed quantity (in/formal)	3	1	3	
Seed quality		1	1	
Seed price	2	1		TASAI
Seed to grain price ratios				TASAI
Seed company pricing strategies and activities to ensure affordability for smallholder farmers				A2SI
Demonstration and promotion strategies				A2SI
Promotion and free rider problem (no one willing to invest in creating demand)			1	
Impact of counterfeit products			1	
Farm data (crop types, crop productivity, profitability, income/purchasing power)	3			
Farmer seed use and needs (production practices, landholding, cropping pattern, varietal traits, habits)	3		2	
Farmer seed knowledge, experiences, preferences, and expectations (adoption/innovation levels)	1	1	1	
Average size of agricultural holding				FS Dashboard
Market segments (farmers, companies, seed growers, government)		1	1	
Market growth potential	1	1	1	
Seed supply				
Number of active seed companies/producers	1	1	1	TASAI
Quality of seed grower base	1			
Quantity of seed produced and sold	1	1		TASAI
Production growth potential		1		
Cost of seed production	1	1		
Number of varieties sold and dropped				TASAI
Average age of varieties sold				TASAI
Efficiency of seed import/export processes	2		1	TASAI
Total sales of certified seed				TASAI
Market concentration	1	1	1	TASAI
Market share of state-owned seed company	1	1	1	TASAI
Presence of institutional markets (seed aid and seed subsidy)			1	
Competition (level playing field)	1	1	1	
Concentration of agro-dealer network	2	1	1	TASAI
Availability of seed in small packages and labeling				TASAI, A2SI
Number and adequacy of breeders	1			TASAI
Availability of foundation seed			1	TASAI
Number of varieties with special attributes	2			TASAI
Access to seeds for smallholder farmers				A2SI
Diverse portfolio of seeds available to smallholder farmers				A2SI
Distribution channels	1	1	2	A2SI
Access to farmers			1	
Retail landscape and link to consumer of missing middle	1			
Regulation				
Number of varieties released				TASAI
Length & cost of variety release process				TASAI, EBA
Legal points for transparent and efficient variety release processes				EBA
Status & implementation of national seed policy framework	2	1	2	TASAI

Indicator	Frequency of response			Resources
	Commercial investors (n = 4)	Impact investors (n = 2)	Knowledge institutes (n = 4)	
Digital innovations in regulation	2			
Harmonization with regional regulations				TASAI
Adequacy of efforts to eradicate counterfeit seed				TASAI
Use of government subsidies	2	1	1	TASAI
Performance of national seed association				TASAI
Adequacy of seed inspection services				TASAI
Availability of extension services for smallholder farmers				TASAI, A2SI, CAADP
Seed company contribution to enabling environment				A2SI
Activities of seed associations			1	
Collaborative research between public and private partners				A2SI
Government support to private sector			1	
Public expenditures to agriculture				CAADP
Domestic and foreign private sector investment in agriculture				CAADP
Forex availability and allocation	1			
Output markets				
Market size				
Access to output markets				A2SI
Value of farmers' output market (presence off-takers)	1	1		
Agricultural productivity				CAADP, FS Dashboard
Farmer investments				
Agronomic challenges (pests, diseases, drought)	1			
Capacity building of smallholder farmers				A2SI
Quality of extension services	1	1		
Seed affordability				A2SI
Accessing finance	1	2		CAADP, EBA, FS Dashboard, WB
Access to agriculture inputs and technology				CAADP, FS Dashboard
Farmer organization				
Presence and performance of farmer organizations	1			
Impact				
Poverty				
Seed company efforts to develop improved varieties for smallholder farmers				A2SI
Seed company commitment for local seed production				A2SI
Seed company involves smallholders in seed production				A2SI
Growth rate of the agricultural value added				CAADP
Reduction rate of poverty headcount ratio				CAADP, FS Dashboard, WB
Gap between the wholesale and farmgate price				CAADP
Youth employment in agriculture				CAADP
Women empowerment in agriculture				CAADP, WB
Income and livelihoods		3		
National budget for social protection				CAADP
Food & nutrition				
Prevalence of stunting & wasting				CAADP, FS Dashboard, WB
Prevalence of underweight & undernourished				CAADP, FS Dashboard, WB

Indicator	Frequency of response			Resources
	Commercial investors (n = 4)	Impact investors (n = 2)	Knowledge institutes (n = 4)	
Prevalence of moderate or severe food insecurity				FS Dashboard
Dietary intake				FS Dashboard
Minimum dietary diversity				CAADP
Food availability and affordability				FS Dashboard
Impact on input use		1		
Impact on productivity		1		
Climate & biodiversity				
Resilience to climate and weather-related shocks		1		CAADP, WB
Availability of climate change resilient varieties				
Agriculture land under sustainable land management practices				CAADP, FAO
Environmental performance index	2			FS Dashboard
Average Soil Biodiversity Potential Index				FS Dashboard
Production practices supporting the use and conservation of agrobiodiversity				Agrobiodiversity index
Climate Risk Index (CRI) score				FS Dashboard
Water use efficiency		1		
Country context				
Demographics				
Population growth (annual %)	1			FS Dashboard, WB
Percent urban population of total population	1			FS Dashboard, WB
GDP	1			
Livelihoods		2		
Beneficiary segmentation		1		
Stability				
Voice and accountability				FS Dashboard
Political stability and absence of violence/terrorism	1	1	1	FS Dashboard
Impact of disasters on agriculture				FAO
SDGs				A2SI
Company policies to integrate SDGs in business practices				WB, FAO
Risk and challenges to achieve impact		1		
Activities of other development partners		1		
Infrastructure				
Agricultural infrastructure index				FS Dashboard
Road density				FS Dashboard
ICT				A2SI
Infrastructure	1			

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