AGRA
Growing Africa's Agriculture

KIT Royal Tropical Institute

PIATA 2019 Outcome Monitoring Report

AGRA Mozambique

Consolidated report

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Colophon

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Acronyms

ADEM	Agência de Desenvolvimento de Manica
ADRA	Adventist Development and Relief Agency
ADVZ	Agência de Desenvolvimento de Vale de Zambeze
AENA	National Rural Extension Association
AFAP	African Fertilizer and Agribusiness Partnership
AfDB	Africa Development Bank
AGRA	Alliance for a Green Revolution in Africa
AGRIMERC	Sustainable Development Organization for Agriculture and Rural Markets
APROSE	Association for the Promotion of the Seed Sector
AU	Africa Union
CAADP	Comprehensive Africa Agriculture Development Programme
CDM	Cervejas de Moçambique
CDR	Result demonstration field
CIM	Companhia Industrial de Matola
CLUSA	Cooperative League of the USA.
COPAZA	Zambezi's Farmers Cooperative
DINAS	National Agricultural Services Directorate
ETG	Export Trading Group/Export Marketing Ltda
EU	European Union
FAO	Food & Agriculture Organization
GAIN	Global Alliance for Improved Nutrition
GOM	Government of Mozambique
ICT4Ag	Information Communication Technology for Agriculture
IFAD	International Fund for Agricultural Development
IIAM	Instituto de Investigação Agrária de Moçambique
IIAM-CZC,	Zonal Research Centre Central Region
ISPM	Instituto Superior Politécnico de Manica
KII	Key Informant Interview
MADER	Ministério de Agricultura e Desenvolvimento Rural
MASA	Ministério de Agricultura e Segurança Alimentar (until 2019)
MIC	Ministry of Industry and Trade
MITADER	Ministry of Land, Environment and Rural Development
MT	Metric Ton
MZN	Mozambican Currency (Metical)
PAEI	Políticas Agrárias e Estratégias de Implementação
PEDSA	Strategy and Plan for Agricultural Development
PIATA	Partnership for Inclusive Agricultural Transformation in Africa
PICA	Integrated Plan for Agricultural Marketing
PITTA	Integrated Programme for Agricultural Technology Transfer
PNISA	National Agricultural Investment Plan
POCOCE	Operational Plan for Cereal Marketing
PODA	Operational Plan for the Development of the Agricultural Sector
SEMEAR	Semente Melhorada para Agricultura Renovada
SHF	Smallholder Farmer
TA	Technical Assistance

TASAI	The African Seed Access Index
UEM	Universidade Eduardo Mondlane
UGC	General Union of Cooperatives
USEBA	Basic Seed Production Unit
UPCT	União Provincial de Camponeses de Tete
UPL	United Phosphorus Limited
USAID	United States Agency for International Development
VBA	Village-Based Advisor

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1 Summary of results and key messages

1.1 Introduction

The Alliance for Green Revolution in Africa (AGRA) is catalysing and sustaining an inclusive agricultural transformation in Africa by increasing incomes and improving food security for 30 million farming households in 11 focus countries. Since 2006, AGRA and its partners have worked across Africa to deliver proven solutions to smallholder farmers and thousands of African agricultural enterprises. The alliance has built the systems and tools for Africa's agriculture: high quality seeds, better soil health, and access to markets and credit, coupled with stronger farmer organisations and agriculture policies. AGRA's theory of change is that sustainable agricultural transformation can be facilitated through a combination of:

- Policy and state capability – investments to work with and support governments to strengthen execution and coordination capacities, enhance transparency, accountability and enabling policy environment;
- Systems development – investments to build downstream delivery systems while providing support to local private sector to scale technologies and services for better productivity and incomes; and
- Partnerships – to facilitate alignment between government and private sector, improving integration and coordination for investments in agriculture.

In Mozambique, AGRA focuses on:

- Support to the government to strengthen the sector's delivery efficiency through improving intra- and inter-ministerial coordination, as well as putting in place conducive policies for increased production and private sector investments;
- Scale up strategic catalytic downstream interventions that seek to:
    - strengthen structured market access in Nacala Corridor;
    - increase input availability and distribution in Zambezi valley through strengthening agro-dealer networks;
    - develop an agricultural market platform to improve delivery coordination in the Beira Corridor.

By executing this strategy, AGRA expects to improve food security and increase incomes for at least 1.84 million smallholder households directly and a further ~1.2 million indirectly and targeting four key crops: cassava, maize, rice and soya. Deployment of this strategy in Mozambique began in Q4 of 2017 and, to date, AGRA has invested ~US$15.3m against the strategy. With these funds, AGRA has invested in the different bodies of work as below:

- In policy and state capability, AGRA has just begun implementation of a project to improve evidence-based planning and coordination of agricultural investments, while another investment that seeks to strengthen the enabling environment through sub-sectoral policy and regulatory reforms is ongoing since January 2019.
- In farmer and systems development, AGRA has set up three consortia in the three target regions (Beira Corridor, Nacala Corridor and Zambezi valley) focusing on productivity enhancement and market access.
- In system development and partnerships, AGRA has public-private partnerships (PPP) investments to enhance seed distribution, soil mapping and fertiliser blending.

The strategy is aligned with the government's priorities and contributes to the need for a strong sector with effective coordination and implementation capabilities

For the 2019 outcome monitoring, AGRA Mozambique elected to focus on two crops – maize and soybean. For the qualitative systems analysis, AGRA selected seed systems and market systems.

1.1 System change

The main purpose of the system change monitoring is to assess system performance, document AGRA's change ambitions for these systems, and to analyse initial results. The analysis focuses on the market system and the seed system. A summary of findings on each of the two systems is presented below.

Market system analysis

Weaknesses in the maize and soybean market systems partially overlap, but ambitions differ for both commodities.

Weaknesses with primary maize market actors (producers, local and wholesale traders, processors and consumers) need to be addressed by service systems (seed and input supply, finance, extension, policies, and coordination), which equally face many challenges. For the primary actors, these are on technical knowledge use (quality seed, soil fertility management, plant protection), resource security (land, price stability, financial services, and climate), chain interaction, storage and quality control, The support systems need more client orientation (e.g. seed and input demand, knowledge demand, and financial services demand), more attention for value chain development (chain integration and chain empowerment, chain finance, etc.).

The primary actor challenges of the soybean market system are on technical knowledge use (quality seed, plant protection, and post-harvest handling, including threshing), resource security (climate and crop financing), market organisation (bulking, quality control), and challenges on diversifying soybean uses (besides using it for animal fodder).

The main weaknesses in the support system are on availability of quality new varieties and Rhizobium at affordable prices, information sharing on technology and finance, value chain development and actor coordination.

AGRA's ambitions regarding development of market systems focus on bulking, processing, marketing and extension for enhanced market-oriented production with the support of village-based advisors (VBAs). Emphasis is also on crop breeding and farmer adoption of improved varieties, seed quality assurance, and necessary fertiliser policy change. The extension message pursued is to produce maize using nationally produced seed of hybrid varieties along with fertiliser application. At grassroot level, VBAs provide extension services combined with input supply and bulking, and are linked to SME agro-dealers and traders. Upstream produce value chain linkages exist through agro-dealer networks, from district to provincial and national level, and improved links with larger milling and other processing companies, as well as through commodity platforms. For the soybean market system, AGRA pursues adoption by smallholders of new national varieties through quality early generation seed (EGS) and certified or guaranteed seed produced by private enterprises and the use of nationally produced Rhizobium. Extension services are provided by VBAs, which also supply

inputs and organise bulking of produce. VBAs have strong links with agro-dealers for access to inputs and with SME traders for sale of produce to large processing companies; input and output quality control are important elements in these links. Credit for produce bulking by SMEs is addressed through AGRA leverage funding. This funding increases the availability of credit for SMEs. Soybean value chain and market system coordination will be further enhanced by a – yet to be established - commodity platform.

Important challenges for reaching these ambitions were identified as: the interaction (of VBAs and SMEs) with the public sector at all levels, notably with public extension at grassroots and district level, and the interaction in the input supply chain (seed and fertiliser) through agro-dealer networks at different levels (including at national level with the Mozambican Seed Trade Association). Similarly, interactions in the produce value chain with traders and processors are challenged by the limitations in the availability of produce aggregation (bulking) and input (seed and fertilisers) stock credit. In both produce and seed and fertiliser value chains, input and output quality control deserves major attention. Furthermore, there are challenges in the sustainability of the soybean breeding programme, which currently depends on external breeders and financing. Soybean production has a clear market purpose – currently animal feed – but, in order to reduce risks, other uses need pursuing and developing. Development of a national soybean seed value chain (varieties, EGS, certified and guaranteed seed) and national Rhizobium production remain a central challenge. Another challenge is that large processors currently have their own agents and (often foreign) traders, who are in competition with VBAs.

Key observations and recommendations:

- National maize production is mainly for rural food security. Urban consumption of maize is decreasing, while use of maize for animal feed is increasing. Maize productivity is low, investment in maize production (fertiliser, pesticides and quality seed of hybrid varieties) remains limited, but is also impacted by abiotic (cyclones, droughts and floods) and biotic (fall armyworm and other borers) challenges. Market security has been an incentive for maize planting and use of quality seed and other inputs.
- AGRA investments in the link between maize marketing (bulking), production and input supply are highly relevant, particularly as they involve community entrepreneurial producers for aggregation, extension and input supply, as well as district level small and medium-sized enterprises (SMEs) and agro-dealers. However, interactions with larger volume actors, such as milling companies and wholesale input supply companies need to be stimulated in order to build longer-term relationships for higher volumes and lower prices (for inputs).
- Interaction between market actors and the formed consortia requires strengthening, and maize marketing platforms to be established.
- Fertiliser and seed legislation require improvement but, in terms of marketing, the challenge is mainly the implementation of regulations. Reduction of high transactions costs and fair distribution of revenue within the maize value chain are needed in order to sustain the chain.
- Credit by wholesale traders and processors to SMEs and VBAs can be facilitated and leveraged with the revolving funds used by the maize-marketing consortia. More innovative financial products for marketing/bulking, production credit and capital investment credit are also needed.

- The production of soybeans by commercially-oriented farmers is rapidly increasing. Much is destined for chicken feed, but the dependency on one use constitutes a market risk.
- The VBAs in the soybean value chain in Upper Zambézia are very satisfied with their agribusiness activities. If the business grows to become an SME, the individual farmers become the new VBAs.
- Large chicken feed processing companies have developed a bulking system through their own local agents. This system competes with the VBA/SME system supported by AGRA.
- Storage of soybeans in the bulking chain requires attention to quality; concerns exist over the occurrence of aflatoxins.
- AGRA interventions can be linked to marketing investments by large processors. In addition, AGRA's investment in bulking, input supply (seed etc.), in addition to a business approach to soybean production, is adding value to previously mentioned investments.

Seed system

Producers use only a few new varieties and adoption rate is low, which is also a result of a low release of new varieties, and unavailability of affordable quality seed of these varieties. Privatisation of key seed chain functions, such as EGS production, seed production, seed inspection, is required. Many quality control challenges exist, both in the production of EGS, certified and guaranteed seed, as well as in seed marketing (existence of poor and fake seed). Issues in the seed sector need to be addressed by sector coordination and seed legislation.

AGRA aims to support sustainable variety breeding programmes for priority crops, such as cassava, maize, rice and soybeans. This will be achieved through qualified public breeders, PPPs and privatisation of EGS and certified and guaranteed seed production. Efficient seed value chains will result in affordable seed prices. Efficiency is also achieved through the partial privatisation of seed inspection and seed extension (via VBAs). A central role for the Association for the Promotion of the Seed Sector (APROSE) is needed for contribution to seed policies and regulation change.

Many challenges are faced such as the limited attention on institutionalisation of breeding programmes, as perceived by the *Instituto de Investigação Agrária de Moçambique* (IIAM), and the privatisation of breeder and foundation seed production. The gradual replacement of seed companies' own agencies with an agro-dealer network can also lead to less control by seed companies of the recommended prices as the agro-dealers are inclined to use higher margins. Involvement of private sector inspection and district agro-dealer networks (and MOSTA) are important steps for seed quality control. With APROSE involvement, legislation development to overcome the distortion of seed value chains by chronic seed subsidies (as opposed to emergency subsidies) is also facing resistance from those larger companies that rely on government contracts.

In the Partnership for Inclusive Agricultural Transformation in Africa (PIATA) initiative, AGRA focuses on three corridors in Central and Northern Mozambique. In terms of seed system change, the attention is shifting from variety improvement and EGS production to quality seed production, marketing and distribution and promotion of quality seed use for priority crops such as maize, soybeans, cassava and rice.

Key observations and recommendations:

- AGRA has provided major assistance in recent years to variety development in priority commodities, as well as the establishment of national seed companies for quality seed production of the newly released varieties. The focus of the current AGRA programme is much more on the marketing and distribution of quality seed of available improved varieties.
- This shift in emphasis towards marketing and distribution (from push to pull) is more than relevant, as access to quality seed and its use remains a limiting factor in the seed value chain.
- Concern exists about the sustainability of the soybean variety development programme and breeder seed production due to IIAM capacity constraints.
- The needs for a sustainable supply of breeder and foundation seed remains a challenge as the development of PPPs in EGS production is not well coordinated. IIAM breeders develop their own arrangements with seed companies.
- National seed companies are increasing their market share. National seed companies have been heavily supported by AGRA, but the current ones have sound business plans.
- The public seed subsidy programme and the FAO-supported voucher programme continue to distort the seed market. AGRA supported agro-dealers complain about constraints in seed sales due to these programmes (mindset of buyers and prices), while seed companies have limited access to public tenders for seed subsidy programmes.
- The capacity of the National Seed Authority (ANS) remains limited with regard to human and financial resources and the dependence of the ANS on financial support of seed companies leads to unsustainable relationships. AGRA is supporting the development of private seed inspection within supported seed companies.
- AGRA participates in platforms on the issues of seed system legislation and the role of subsidies. AGRA's support for APROSE's role is important but, at the same time, leads to stronger dependency by APROSE on external support. Support for a seed agro-dealer network, such as MOSTA, could be considered in this challenging context.
- Current seed legislation is based on a Ministerial Decree (12/2013) and is not a seed law endorsed by the Cabinet of Ministers, which provides less long-term security for external private investors in the seed sector.

The AGRA programme is well coordinated with the *Ministério de Agricultura e Segurança Alimentar* (MASA, recently changed to *Ministério de Agricultura e Desenvolvimento Rural*, MADER) and other ministries. AGRA makes a difference by supporting national seed production, seed distribution and marketing, and seed use. New approaches and system changes are being introduced, which are more than complementary, and these can help stimulate change in the national seed system.

1.2 Household survey

A household-level survey was conducted among maize and soybean farmers in Tete, Manica, and Nampula provinces. The main objective of the survey was to establish a baseline measurement of selected farm-level outcome indicators. A summary of findings is presented below.

A household survey was carried out amongst a group of maize farmers (N=1,006) and a separate group of soybean farmers (N=1,398). Both groups of farmers were sampled from the population of farmers benefitting directly from AGRA interventions. The household survey collected data for the 2018 cropping season. Table 1 summarises AGRA outcome indicators for maize and soybean farmers based on the 2018 crop season. These indicators are used to measure progress at farmer level towards the AGRA goal of catalysing agricultural transformation for increased income and food security.

Table 1: AGRA outcome indicators (2018 cropping season)

Outcome indicator	Maize farmers	Soybean farmers
Goal indicator 2: Average number of months of adequate household food provision	10.9	11.0
Goal indicator 6: Wealth assets index score	-0.684	-0.597
1. Average yield (kg/ha) (Indicator 1)	399	283
3. Rate of application of target improved technologies or management practices (Indicator 14)	29%	16%
4.4 Average distance (minutes) from farmers to agro-dealers (Indicator 15)	97.2	96.2
4. Percent of farmers accessing agricultural advisory extension support services (Indicator 16)	50%	65%
Percent of hectares under improved technologies or management practices (Indicator 20)	19%	12%
Average fertiliser use (Total N + P + K, kg/ha) (Indicator 21)	3.0	0.7
6. Percent of post-harvest losses (at farm level) (Indicator 22)	1%	2%
33. Percent of total household produce sold through structured market facilities/arrangements (Indicator 30)	4%	2%
10. Value of smallholder sales (US$) (Indicator 36)	$29.6	$41.5
13. Percent farmers using financial services of formal institutions (Indicator 43)	9%	12%

Numbering according to the terms of reference. In parenthesis numbering of AGRA's Theory of Change

AGRA-supported farmers have, on average, enough food to meet their family's needs for about 11 months of the year. Nevertheless, 38% of maize farmers and 35% of soybean farmers report having experienced a shortage of food in at least one month in the past year. The wealth assets index score in itself is difficult to interpret. The underlying data suggest that most soybean households are in the 3rd and 4th wealth quintiles, which means they are in the middle-upper range in terms of wealth relative to the rest of the country. In comparison, maize-cultivating households are, on average, slightly less wealthy: most are in the 2nd and 3rd quintiles – the lower-middle range in terms of wealth, whilst 15% belong to the 1st (poorest) quintile of the country. Male-headed households tend to be wealthier and more food secure than female-headed households.

For maize, the estimated average yield for 2018 is relatively low at 399 kg/ha. The relatively low yield for maize could be explained by the low fertiliser application rates in the 2018 season, and weather shocks (a tropical depression in Nampula in January 2018, which reportedly destroyed a large share of the crops, as well as droughts in Manica and – to a lesser extent – Tete). The average yield for soybean is 283 kg/ha. In 2018, only 16% of farmers applied the target improved technologies or management practices that are promoted by AGRA. Average post-harvest losses are relatively low: the majority of soybean and maize farmers reported no post-harvest losses at all. However, it is unclear whether this can be explained by misreporting or whether post-harvest losses are not a big issue for AGRA-supported farmers.

1.3 SME performance

An important pathway of change of the PIATA programme is supporting the development of SMEs operating in and providing support services to agricultural value chains. Key findings from a rapid SME survey indicate that:

- AGRA-supported commercial seed multipliers (22 staff on average, 54% women) have moderate financial stability (with very good access to formal credit) and moderate human capital (notably a good proportion of female staff). Business resilience and investment in technology is very weak.
- Seed companies (73 staff on average, 43% women) have moderate business resilience with a high numbers of buyers. Their financial stability and level of human capital is very good and they invest in a moderate degree in technology, infrastructure and equipment.
- Input supply companies/agro-dealers (2 staff on average, 25% women) have a low business resilience because they are young and do not offer diversified services or have many buyers. Technology investment is also very low. Levels of human capital and financial stability are moderate.
- Agri-value chain actors (31 staff on average, 33% women) include aggregators, traders and processors. This group paints the same picture as input supply companies, displaying weak resilience to market shocks and making very limited investments in research and development (R&D), storage or equipment. They have good access to formal credit, which strengthens their financial stability score. On average, the level of human capital is average.

Overall, the SMEs sampled are young and have yet to demonstrate their resilience to changing market and business contexts. Notably, their access to formal credit is generally very good.

2 Objectives and scope of the report

KIT Royal Tropical Institute was contracted by AGRA to implement annual outcome monitoring of its activities under the 2017-2021 PIATA initiative.

The annual outcome monitoring has three different, interrelated objectives:

1. Understand AGRA's progress towards desired outcomes, both for internal and external reporting to:
    a. elicit data and insight into the effect of AGRA interventions on its beneficiaries; and
    b. provide insight into sustainable improvement of the performance of agricultural sector support systems.
2. Learn about the performance of AGRA interventions, to allow for intelligent evidence-based adaptation of implementation.
3. Document lessons learned for improved design of future AGRA – and external – interventions.

These objectives are realised through a combination of quantitative and qualitative methods, implemented by a team of qualitative and quantitative experts.

The Mozambique team consisted of:

- two international experts in quantitative data collection in agriculture;
- an international expert in qualitative data collection in agriculture;
- a number of desk-based international quantitative data analysts;
- a national coordinator of quantitative and qualitative field-data collection in agriculture;
- a team of 10 local enumerators trained on the specific components of the survey and data management.

AGRA Mozambique selected maize and soybean as priority crops for reporting for 2018. AGRA also selected the seed system and market systems as the priority domains for system analysis. Primary data was collected by the qualitative team in Mozambique over a period of two weeks in June 2019. For each system, information was collected via key informant interviews. Key informants were identified by AGRA, and a small number were 'snowball' referrals (i.e. informants identified through the key informants). Qualitative information was also collected during stakeholder workshops.

Household survey data was collected based on AGRA intervention locations. The sample was determined using multi-stage random sampling, by first randomly selecting geographically spread VBAs and then randomly sampling 25 beneficiaries per VBA. A total of 1,006 households were interviewed for maize and 1,396 for soybean in Nampula, Tete and Manica provinces. The reason the soybean sample was larger, was that the team found that many of the sampled farmers had not yet started soybean cultivation. Consequently, the sample size was increased in order to still get sufficient observations on soybean practices.

SME surveys were administered to 31 randomly selected companies and businesses linked to AGRA interventions. AGRA Mozambique made available country programme roadmaps

and information related to issued and planned grants. Secondary data and online reports completed the data sources.

This report should be read keeping in mind the limitations of the study. To manage costs, sample sizes of the household data collection effort had to be capped. Also, the SME performance survey was designed for rapid and cost-effective data collection. The system analysis was limited to two systems, and field data collection was limited to one week per system.

The report results should be interpreted with caution. The household data refers to the 2018 main cropping season, and should be considered a baseline for monitoring future change, as AGRA-PIATA interventions had not been implemented at a scale at which significant results could be expected in the 2018 season. Similarly, the SME performance measurement will serve as a baseline for measuring change over time. The system change studies have made an effort to place the entirety of AGRA investments in a country, impacting on the system, in context. The field work, however, could, because of the limited field time, only cover a portion of AGRA's intervention portfolio.

Part I: Qualitative system analysis

3 Introduction of system analysis

AGRA is an African-led alliance focused on putting smallholder farmers at the centre of the continent's growing economy by transforming smallholder agriculture from a subsistence focus into a highly productive, efficient, sustainable and competitive farming system, while also protecting the natural resource base on which agriculture depends. As the sector that employs the majority of Africa's people, nearly all of them small-scale farmers, AGRA recognises that developing smallholder agriculture into farming as a business is essential for ensuring food security, lifting millions out of poverty, and driving equitable growth across the continent.

In Mozambique, AGRA specifically focusses on the following aspects:

- Support to government to strengthen the agriculture sector's performance through improving intra- and inter-ministerial coordination, as well as putting in place conducive policies for increased production and private sector investments;
- Scale-up strategic catalytic downstream interventions that seek to:
    - strengthen structured market access in the Nacala Corridor;
    - increase input availability and distribution in the Zambezi valley through strengthening agro-dealer networks;
    - develop an agricultural market platform to improve delivery coordination in the Beira Corridor.

By executing this strategy, AGRA expects to improve the food security and increase incomes for at least 1.84 million smallholder households directly and a further ~1.2 million indirectly. AGRA targets four crops in Mozambique: cassava, maize, rice and soybean. Deployment of this strategy in Mozambique began in Q4 of 2017. AGRA's strategy for Mozambique is centred on three main topics. These are: (i) policy and state capability; (ii) systems development; and (iii) partnerships.

3.1 Agricultural policy context

Mozambique signed the Comprehensive Africa Agriculture Development Programme (CAADP) Compact in 2011 (IESE, 2013) in order to modernise its agriculture and to increase food security and income generation. In 2017, Mozambique's progress score (4.1) towards implementing the Malabo Declaration on agricultural transformation was just above the benchmark (3.94), meaning it was generally on track in meeting the CAADP/Malabo commitments (AU 2017) (see Table 2).

Table 2: Mozambique's progress towards implementing the Malabo Declaration on agricultural transformation in Africa (2018)

Five key areas of strong performance		Five key areas of weak performance	
CAADP process completion	71%	Public agriculture expenditure as a share of total public expenditure	6.9%
Quality of multi-sectorial and multi-stakeholder coordination	41%	Annual growth of value-added agriculture (agricultural GDP)	2.6%

Prevalence of wasting among children under 5 years old	4%	Increase in value of intra-Africa agricultural trade	-11.5%
Youth engaged in new job opportunities in agricultural value chains	77%	Men and women in agriculture with access to financial services	0.4%
Rural women have access to productive assets in agriculture	80%	Smallholder households resilient to climate and weather-related shocks	0.3%
Country progress score (out of 10): 4.1			

Source: AU, 2017

Agricultural policies

Mozambique has internalised the CAADP into its agricultural policy through the Strategic Plan for the Development of the Agriculture Sector (PEDSA). PEDSA and the Agrarian Policy and Implementation Strategy (PAEI) outline Mozambique's agricultural development strategy. The National Agricultural Investment Plan (NAIP) (*Plano de Investimento no Sector Agrário* (PNISA, 2013-2017)) aims to operationalise PEDSA, and it has been extended to end in 2020 to conform to the PEDSA timeline.

PEDSA's strategic objectives include increased agricultural production and productivity, improved infrastructure and services for markets and marketing, strengthening of agricultural institutions, and proper management of natural resources. Although some policies are aimed at smallholder farmers (SHFs), most of the proposed actions are focused on a more agro-industrial approach.

The Government of Mozambique (GOM) share of expenditure for agriculture is 8%, which is 2 points below the African Union (AU) CAADP's target of 10%. However, the majority of this allocation goes toward supporting recurrent/operational costs and the agricultural sector's share of total credit extended in the economy is incommensurate to its contribution to gross domestic product (GDP). In 2015, credit extended to agriculture stood at US$182 million, which is 3.4% of total lending (MASA, 2015).

The government is also facing institutional capacity challenges including the key one being the lack of flagship programmes to drive change, in addition to weak programme coordination at provincial level and with development partners.

The PEDSA is produced by MASA. The Ministry of Industry and Trade (MIC) and the Ministry of Land, Environment and Rural Development (MITADER) are also closely involved.

MADER is currently developing the new PAEI, PEDSA and PNISA since the installation of the new Government in January 2020.

Marketing policies

MIC's operations are guided by its Marketing Strategy and the Operational Plan for Agricultural Marketing (PICA). The marketing strategy focuses strongly on monitoring infrastructure, such as road access and storage capacity. The data presented in Table 3 are projections rather than actual marketing data. Exact data are difficult to obtain as maize is largely marketed by small, medium and large private traders. The informal market dominates, particularly in border areas with Malawi and Zimbabwe. The figures on marketed quantities by year are presented in Table 2 and 3 should therefore be viewed with caution.

Table 3: Development of agricultural marketing in Mozambique in metric tonnes (MT)

Year	Maize	Rice	Sorghum	Cassava	Groundnut	Sunflower	Coconut	Pigeon Pea
2003	279,736	16,574	6,879	105,613	34,430	5,835	26,461	63,818
2004	279,736	17,905	7,451	98,902	39,966	4,536	23,418	42,988
2005	252,988	12,273	3,345	101,371	26,656	99	21,289	104,337
2006	305,728	16,671	7,330	116,204	30,416	6,470	28,892	65,990
2007	345,525	22,266	24,940	135,863	51,307	3,080	34,891	76,897
2008	442,200	25,698	40,690	233,756	55,464	5,917	35,489	95,477
2009	475,530	40,390	39,030	231,855	54,725	4,820	37,635	63,710
2010	623,404	80,659	49,856	311,298	80,768	17,465	37,198	108,264
2011	728,309	101,707	50,803	342,234	86,947	4,552	34,560	110,210
2012	793,189	98,699	52,097	387,073	127,274	13,145	33,435	70,039

Source: MIC, 2012

Table 4: Growth in agricultural marketing in 2016 and 2017 (in MT)

Product	Actual 2016	Production	Stocks 2017	Projected 2017	Actual 2017	Actual percentage (%)	Growth (%)
Maize	3,312,065	2,346,000	1,077,794	3,423,794	3,147,559	91.9	0.5
Rice	123,298	402,000	0	261,370	184,023	70.4	49.3
Sorghum	124,966	249,800	0	160,521	188,850	117.5	51
Wheat	0	17,100	0	0	0	0	0
Total	**3,380,329**	**3,014,900**	**1,077,794**	**3,845,685**	**3,520,432**	**279.8**	**100.8**

Source: MIC, 2017

3.2 AGRA objectives and activities

AGRA programmes have been operational in Africa and in Mozambique since its inception in 2007.

In its 2017-2021 strategy, AGRA seeks to catalyse and sustain an inclusive agriculture transformation in 11 priority countries including Mozambique. By executing this strategy, AGRA expects to improve the food security and increase incomes for at least 1.84 million smallholder households directly and a further ~1.2 million indirectly and targeting four key crops: cassava, maize, rice and soya. Deployment of this strategy in Mozambique began in Q4 of 2017 and, to date, AGRA has invested ~US$15.3 million against the strategy. With these funds, AGRA has invested in the different bodies of work:

- In policy and state capability, AGRA has just begun implementation of a project to improve evidence-based planning and coordination of agricultural investments while another investment that seeks to strengthen the enabling environment through sub-sectoral policy and regulatory reforms is on-going since January 2019.
- In farmer and systems development, AGRA has set up 3 Consortia in the three target regions (Beira Corridor, Nacala Corridor and Zambezi valley) focusing on productivity enhancement and market access;
- In system development and partnerships, AGRA has public-private partnerships (PPP) investments to enhance seed distribution, soil mapping and fertiliser blending.

The strategy is well aligned with the government's priorities and contributes to the need for a strong sector with effective coordination and implementation capabilities, and strengthening delivery systems for improved productivity and marketing of produce.

AGRA programme 2007-2016

In the first 10 years (2007-2016), AGRA's work in Mozambique was in the following programmes: seed systems, soil health, policy, market access and inclusive finance. AGRA invested an estimated US$47.6 million in 50 grants (see Annex 1); a summary by system is presented in Table 5. The presented aggregation provides an indication, but systems do overlap. The reported budget is US$48.1 million, possibly higher as some grant amounts for state capability development were not reported.

Table 5: Clusters of grants provided by AGRA during the 2007-2016 period

System development	Total value of in US$
Extension systems	998,759
Input supply systems	29,293,294
Market systems	10,499,654
Seed system	5,539,981
State capability	1,283,993
Total 2007-2016	**47,615,681**

AGRA programme 2017-21

For the period 2017-2021, AGRA is aiming to support 1.53 million smallholder farmers in the Nacala, Zambezi valley and Beira corridors at a cost of US$27 million (AGRA 2017). These investments are expected to have an indirect impact on 3.75 million smallholder households.

Since 2017, AGRA has already approved 28 grants at a total value of US$15,102,672 (Table 5), while others are in the pipeline (e.g. Credit leverage programme with GAPI, strengthening policy development with APROSE, etc.).

Table 6: Main consortia programmes and partners and targets with multiple grants 2017-2021

Description	Partners	Crops/Value chain target
Strengthening agribusinesses and inclusive market systems on the Beira Corridor (Kugulissa)	ADEM, UPCT, MICAIA Foundation	144,750 households (HHs)s; maize and soybean; Manica and Tete Provinces
Productivity, incomes enhancement through agribusiness development – Zambezi valley	AGRIMERC, AFAP, ADRA	180,000 HHs; maize and soybeans
Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi valley	IIAM-CZC, ISPM, ZEMBE, Sementes Nzara Yapera, Emilia Commercial, Oruwera & ADEM	40,000 HHs direct and 221,000 HHs indirect;
Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	MIRUKU, AENA & AGMARK	205,184 HHs;
Agro–dealer development – Zambezi valley	AGRIMERC ODS	72,000 HHs, maize, soybeans
Agro–dealer development – Nacala Corridor	AGMARK	maize, soybeans
Improving soil health, food security, and livelihood of smallholder farmers in Mozambique through development and use of appropriate fertiliser blends	IIAM, UEM, DINAS (YARA & MFC)	14,400 HHs directly and 130,350 HHs indirectly – fertilisers
Capacity building in cassava micro-propagation – Limpopo Corridor	IIAM	5,000 HHs, cassava

For each priority system and intervention area consortia have been formed with key preferred partners. These are the following:

- Otumiha—market system in the Nacala Corridor:
  - Miruku (consortium lead and SMEs);
  - Agmark (agro-dealers); and
  - AENA (VBA extension).
- Kugulissa—market system in the Beira Corridor;
  - ADEM (consortium lead and SMEs);
  - MICAIA (VBA extension); and
  - AGRIMERC and UPCT (extension).
- Seeds—seed system:
  - IIAM-CZC (consortium lead, research);
  - Zembe (seed company);
  - Emilia Comercial (seed company);
  - Nzara Yapera (seed company);
  - ISPM (higher education);
  - ADEM (business development agency); and
  - Oruwera ltda (seed company).
- PRODAZAV—market system in the Zambezi valley:

        - AGRIMERC (development agency);
        - AFAP (fertiliser business partnership); and
        - ADRA (agricultural development NGO).
    - MozArroz—rice market system in Zambezi:
        - GAPI (credit organisation);
        - AFAP; and
        - ACOF (seed company).

Partnership development plans for Mozambique include (AGRA, 2017):

- Implementation of the Action Plan toward a new PNISA and PEDSA in collaboration with the World Bank, FAO, IFAD, AfDB and Austria Development Agency;
- Policy reforms in seed and fertiliser regulations in collaboration with EU and USAID;
- Agro-dealer development in partnership with EU, GIZ and IFAD;
- Agriculture financing and technology transfer in collaboration with IFAD and BNI, and GIZ;
- Market systems development in partnership with private sector actors such as GAIN, Technoserve, Heineken, OLAM, ETG, UPL, BAYER, CDM, and others.

4 Market system

Below is discussed the performance of the market system (Section 4.1), AGRA's change ambitions for this system (Section 4.2), the results to date (Section 4.3), and an analysis of those results (Section 4.4). The focus crops, maize and soybean, are discussed separately.

AGRA is providing grants for market system development, these are not maize, soybean, rice or cassava specific. The total invested amount since 2010 in 21 grants is reported in Annex 2 and is US$19,486,077.

4.1 System performance

Maize market system performance

Figure 1 shows the maize production over time. From the 1990's, there has been a steady growth in maize production until 2010. In 2011, maize production suddenly dropped back to 1990s levels (mostly resulting from serious drought around that time), but has since then recovered to reach an all-time high in 2018.

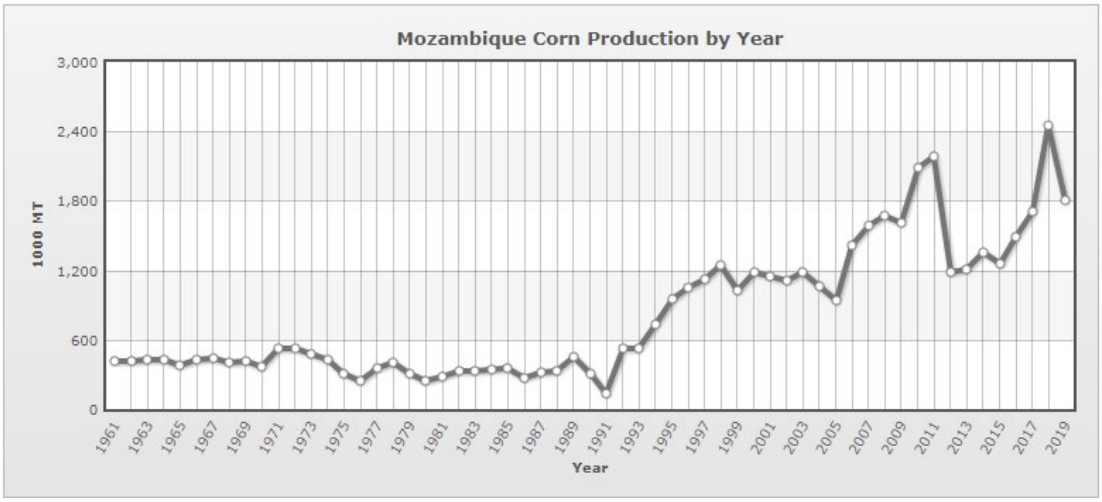


Figure 1: Annual maize production in 1,000 MT in Mozambique.
Source: indexmundi.com

Figure 2 shows how this maize is then marketed. In addition to regional trade flows, the main trade flow goes from the districts with surplus in the North to districts with deficits in the South. Some of the production in the border areas is sold in Malawi, Tanzania, Zambia, and Zimbabwe but this is a small percentage of total production. In 2017, for example, about 2.5% of maize production was exported (own calculations based on FAOstat data)

Figure 2: Trade flows of maize produced in Mozambique

Source: FEWSNET, 2009

The state of affairs of the maize market has been analysed. A description of the current state of the market system is presented below in Table 7. More detailed information on the maize system is presented in Annex 9.

Table 7 shows that maize production in Mozambique in 2018 was estimated at 2,449,000 MT. The table also shows five new varieties that were released. However, use of improved varieties remains low: countrywide only 8-9% of farmers in Mozambique makes use of improved maize varieties. In our sample, this number was slightly higher: 20% of households

in the sample indicated having cultivated improved maize varieties. A total number of 3,000 extension workers are active. Unlike previous decades, the public sector is no longer unique in the provision of extension services. Currently, about half the extension workers are working in the public sector, the other 50% is working in the private sector or for NGOs. Only a small share of households currently sells their maize. Despite import tariffs, there is a lot of maize being imported, mainly from South Africa. Maize also is being exported this happens mainly through informal channels. The main country of export is Malawi. There are few wholesalers, and there is little marketing consistency.

Table 7 also shows an overview of bulking and marketing in Mozambique. In terms of bulking and marketing, a number of challenges remain. Although there are capacitated SMEs and there is a network of VBAs with community confidence, challenges include limited bulking funds and finance, bulking happening very informally, and limited availability of storage infrastructure. Furthermore, volumes for bulking are often low.

An overview of processing facilities is also presented in Table 7. Furthermore, the table presents information on the current state of the retail sector, the policy aspect of markets, and the degree of stakeholder collaboration.

Table 7: State of affairs in the maize market system. Source: document review and interviews

Maize market system components	**Current state of affairs**
Production	1,430,784 ha (CAP, 2009); 1,962,700 ha (TIA, 2008)(maize acreage in ha); 2,638,061 (Number of maize farming HHs); 1,214,255 MT produced in 2008 (TIA, 2008); 1,703,920 MT in 2017 (World Data Atlas); 2449000 MT in 2018 (FAO).
Bulking and marketing	209,374 MT maize marketed (TIA, 2008); 20.7% of HHs sell maize; 69% of maize marketed from Manica, Tete and Zambézia (TIA, 2008); MIC reports 442,200 MT maize marketed in 2008 (difference with TIA not explained).
Wholesale	Average of 100,000-125,000 MT maize imported (FAO); 2.5% grain and 20% flour import duty and 17% VAT; Imports are largely from South-Africa. (Informal) export up to 50,000 MT exported to Southern Malawi.
Processing	Large mills: Maputo – Marec Industries, Companhia Industrial da Matola, Pembe; Beira – Merec Industries; Nacala – Moageiras do Norte Chimoio – Deca; Medium mills: Nampula – Afron Moagem, Rajan Export, Moagem Ali; Quelimane-Ind Moageira Ximogolo; Angonia – Fapromul, Escola do povo; Tete – Compagri; Manica – ECA. Smallscale mills: Quelimane – Industria Moageira Celeste, Moagem Muthozane; Tete – Fate; Zambézia – Winnua (Mocuba) More than 1,000 other smaller mills
Retail	Maize/soybean feed is sold in Novos Horizontes outlets; Maize flour is sold everywhere; Heineken and CdM beer is sold everywhere.
Consumption	Average share of the total food expenditure accounted for maize is 16% in urban areas and 29% in rural areas (FAO, 2014); 24% of maize is used as animal feed (2017); maize consumption is decreasing in urban areas in favour of rice and wheat.

Seed system	Mostly used hybrids: PAN 53 (PANNAR), SP-1 (Zembe, NY, EC), Pristine 601 (K2), Molokwe. Mostly used OPVs: Matuba; TZM 523, TZM 309 New hybrid varieties: Namuli, 1001, 1002, 1003 (IIAM) New stress tolerant: WE 2101, WE 3128
Input supply system	Only 8-9% of farmers use improved varieties; only few farmers use hybrid seed. High GoM imposed transaction costs on fertiliser; Agricultural Input Subsidy Programme 2009-2010 targeted 25,000 producers receiving maize input pack (12.5 kilogrammekg of seed and 2 bags of fertiliser). 30% of the cost of inputs as farmer contribution.
Financial service system	Marketing (maize purchased from producers) largely financed by traders. Limited financing of SMEs and VBAs.
Extension system	A total of 3,000 plus extension workers, half of which are from the public sector; Traditional CDRs (field demonstrations) (public sector) endlessly repeated; more and more private (agro-dealers, VBAs) extension demonstrations.
Policies and state capacity	Decreto 9/2016 obliges large, medium and small commercial scale mills to fortify maize flour; No accurate data recording of MIC; No GoM restrictions on maize production and marketing;
Coordination and partnerships	No specific maize marketing platform; limited links between processors/traders and AGRA-supported maize marketing consortia.

The farm household survey conducted as part of this outcome report focuses on the marketing practices in 2018 of maize farmers supported by AGRA in Manica, Tete, and Nampula provinces (see Part 2 of this report). It yields the following observations.

First, the average farmer produces mostly for own consumption, In fact, 65% of the maize harvested during the main season is, on average, consumed by the farm household itself, while only 21% is sold or bartered – the remaining 15% is used for seed, given away for free, used as payment for inputs, or is lost. The revenue generated from these maize sales is, on average, US$29.8 per farmer. Per kilogramme, the farmers receive US$0.35, on average.

Secondly, most farmers (70%) sell their maize produce to traders or middlemen. Another common marketing outlet is direct sales to consumers, including to neighbours and friends. About 4% of farmers sell their harvest under a formal contract. In 40% of the cases, farmers receive inputs on credit as part of the contract. Typically, these farmers sell higher quantities than farmers without a contract, but they do not report receiving a higher price.

Thirdly, almost none of the farm households have access to formal market information channels, such as through SMS, radio, television, internet, or the farmer organisation. The main source of market information are the produce buyers - this is the case for 61% of households. Other important information sources are other farmers and the market.

Some of the most significant changes in the last 10 years in the maize market system – identified through a stakeholder workshop – include:

- changes in production as a consequence of pests (fall armyworm), extreme weather (drought, cyclones), and the introduction of new varieties;
- changes in marketing and processing as a consequence of market distortions (emergency programmes, foreign middlemen), the emergence of quality issues, and

changes in market support (market information is provided by the Kugulissa programme); and

- changes in state capacity and coordination, mainly in the form of political instability leading to fluctuating prices.

The development constraints and challenges existing in the system were identified in the maize market system stakeholder workshop and through interviews (see Table 8). Constraints and challenges with primary maize market actors (producers, local and wholesale traders, processors and consumers) need to be addressed by service systems (seed and input supply, finance, extension, policies, and coordination), which equally face many challenges. The primary actor challenges are on technical knowledge use (quality seed, soil fertility management, and plant protection), resource security (land, price stability, financial services, and climate), chain interaction, storage and quality control. The support systems need more client orientation (e.g. seed and input demand, knowledge demand, and financial services demand), and more attention for value chain development (chain integration and chain empowerment, and chain finance, etc.).

Table 8: Maize market system development constraints and challenges

System components	Constraints and challenges
Production	Use of low-quality maize seed; Limited knowledge; Limited external input use; Low technology adoption after CDRs (demonstrations); No land titles (DUAT); Seasonality of rainfall, and need for emergency operations after cyclones; Shortening of cropping cycle; Fall armyworm and need for early planting.
Bulking and marketing	Fluctuating market prices; Limited bulking funds, finance and marketing credit; Bulking very informal with inadequate volumes; Limited business knowledge; Limited availability of (storage) infrastructure; Limited access to transport and resulting transport costs for low volumes; Poor maize grain quality control; Poor post-harvest handling; All maize marketed before official marketing season starts (July 5th 2019).
Wholesale	Few wholesalers; No marketing consistency; Limited short storage equipment; SME storage capacity limited; Limited capital; Need for low quality price penalties; Need for use of marketing contracts.
Processing	Periodic availability of produce; Short buying period; Fluctuating prices; Importance of quality of grain (colour, size, humidity); Absorption capacity; Limited interest in dialogue with other chain actors; Limited development role (no chain integration).

Retail	-
Consumption	Demand yellow maize for egg (yolk) production; Demand for high quality maize for beer production.
Seed system	General use of poor-quality seed; Poor seed storage facilities; New variety seed prices high; Seed prices kept high in the seed value chain; Poor technical assistance to farmers on seed issues; SEMOC (public seed company) dependency for seed processing leading to mixing.
Input supply system	Weak relations between agro-dealers and with distributors; Oscillating input prices; Very informal pricing by agro-dealers; No clear definition of agent and agro-dealer; Poor knowledge of the business; Inadequate financing of the system; Input market info system; Volumes and number of customers (at least 1,000) difficult to meet; Need for district agro-dealer associations.
Financial service system	High interest rates and other poor conditions; Limited interest in and knowledge of the agricultural sector; No agricultural insurance; High levels of bureaucracy; Distortion by unsustainable credit (e.g. Public District Development Fund); Opportunities for SME credit to VBA risk; Need for operationalisation of matching grants (AGRA, FDA, GAPI); Need for bankable contracts and plans.
Extension system	Low extension/producer ratio; Need for coherence in approaches, messages and between actors; Poor technical quality; Low levels of adoption of extension messages; Need for partnerships with extension providers by SMEs; More private service provision and community radio use.
Policies and state capacity	Poor implementation of regulations; Bureaucracy e.g. company registration (*cadernetas*); High transaction costs.
Coordination and partnerships	Mix of donors and NGOs; Poor collaboration between intervening actors; Different policies (e.g. in relation to seed donations in the aftermath of cyclone Idai); larger traders operate as miners rather than chain partners; Existing new ideas for private sector development (INOVA).

Source: This study

Soybean market system performance

Soybeans are predominantly grown in the Nacala Corridor, Upper Zambézia and Upper Nampula provinces and parts of Niassa Province. Some soybeans are also grown in the Beira Corridor, notably in Angônia and north of Manica (Barué).

The current state of the soybean market system has been analysed and is presented below in Table 9. More detailed information on the soybean system is presented in Annex 11.

Up to 50,000 MT of soybeans are produced by more than 30,000 households in some specific areas in Mozambique, notably Upper Zambézia and Nampula, as well as Angônia in Tete Province. Average production per hectare in these areas is relatively high, but significantly lower in other production areas. Some large national buyers in the chicken industry and exporters dominate the market. National seed production has started, nationally released varieties are coming up, while Rhizobium is mostly imported.

Table 9: State of affairs in the soybean market system

Soybean market system	State of affairs in the soybean market system
Production	33,038 HHs with 12,012 ha (CAP, 2009); MT44,000-50,000 (2012-2016); Yields are 1.5-2.0 MT/ha;
Bulking and trade	Soybean purchases (90%) come from Tete, Zambézia, and Gurué, and the remaining (10%) is purchased locally;
Wholesale	Estimated demand for soybean in Mozambique in 2018 was 120,000 MT compared to an estimated domestic supply of 85,000 MT.
Processing	Abilio Antunes Manica, Novos Horizontes and SBS are the main buyers of soybean for chicken feed production; Small-scale agrifood industry is growing (WINNUA, Miruku, etc.);
Retail	Novo Horizontes has its own feed and chick outlets;
Consumption	Human nutrition projects are small scale (NOSSARA Cooperative);
Seed system support	Development and the 2011 release in Mozambique of a set of IITA-developed improved varieties of soybean; COPAZA produces Generation 3 seed; Phoenix supplier of quality soybean seed;
Input system support	Rhizobium is imported; seed is locally produced.
Finance system support	TNS-facilitated support by GAPI, BCI, Millenium BIM Bank and Opportunity Bank for bulking and purchasing by agro-processing; Private investment in processing in Gurué;
Extension system support	Soybean manual (IIAM); Technoserve works with small commercial farmers (PACs), who are similar to VBAs;
Policies (Governance)	MASA agreed not to subsidise soybean seed before start of the Technoserve programme;
Stakeholder collaboration (Governance)	Limited interaction between local actors and large national actors; oil seed platform in Nampula 2012-2015 (soybean, sesame and groundnuts);

Source: Document review and interviews

The farm household survey conducted as part of this outcome report focuses on the marketing practices in 2018 of soybean farmers supported by AGRA in the provinces of Manica, Tete, and Nampula (see Part 2 of this report). It yields the following observations.

First, farmers mainly produce soybean for commercial purposes. In fact, the average farmer sells about 79% of the soybean produced – the rest is primarily kept for seed or "consumed" by the household. The revenue generated from sale of soybean is on average US$41.5 per farmer. Per kilogramme, the farmers receive US$ 0.31, on average.

Secondly, 60% of farmers sell their soybean produce to traders or middlemen. Other outlets that are used are wholesalers, other companies, farmer organisations, or direct sales to consumers. About 2% of farmers sell their harvest under a formal contract. Half of the contract farmers receive inputs on credit as part of the contract.

Thirdly, about 9% of the farmers have access to formal market information channels, such as through SMS, radio, television, internet, or the farmer organisation. The main sources of market information are, however, informal, such as through produce buyers – this is the case for 65% of households – or they received information from other farmers or via the market.

Some of the most significant changes in the last 10 years in the soybean market system – identified through a stakeholder workshop – include: enhanced production support by NGOs, the emergence of some large producers; the expansion of national chicken production (increasing demand for soybean as poultry feed); and existence of the soybean platform.

The development constraints and challenges existing in the system were identified In the soybean market system stakeholder workshop and through interviews (see Table 10).

Constraints and challenges with the primary soybean market actors (producers, local and wholesale traders, processors and consumers) need to be addressed by service systems (seed and input supply, finance, extension, policies, and coordination), which equally face many challenges. The primary actor challenges are on technical knowledge use (quality seed, plant protection, post-harvest handling including threshing), resource security (climate, crop financing), organisation of the marketing (bulking, quality control), use diversification challenges. The support systems challenges are on availability of quality seed of new varieties and Rhizobium at affordable prices, more information sharing on technology and finance, value chain development and actor coordination.

Table 10: Soybean market system development constraints and challenges

System components	Constraints and challenges
Production	Poor agricultural practices; Climate and pest risks are increasing; Post-harvest handling; Need for mechanisation; Crop financing non-existent.
Bulking and marketing	Volume of bulking; Quality control of soybeans; No or limited supply contracts; Marketing fund issues.
Wholesale	Aggregation challenges; Poor marketing network; Traders are not investing in production.

Processing	Quality control of large grain volumes; Cleaning in border areas done abroad; No supply contracts; Supply chain rather than value chain.
Retail	Limited investment in soybean food; Few shops (only in towns).
Consumption	Limited knowledge on soybean food processing;
Seed system	Low effective demand (attitude); Technical knowledge; Slow variety release (e.g. 10E); Soybean seed prices high (not for COPAZA); Sometimes provided subsidized (some NGOs).
Input supply system	Distance to large distributors (Tete, Chimoio, Beira); High transaction costs; Input quality control (seed, Rhizobium); Risks are subsidies, climate and ands demand; Overall supply contracts for inputs needed.
Financial service system	No production credit; More info on existing instruments; Financial illiteracy of agro-dealers.
Extension system	Poor collaboration with other extension providers (public, private and NGO); Poorly harmonised approaches (VBA and PITTA (public extension) not compatible); More knowledge on varieties for VBAs; Few female VBAs.
Policies and state capacity	Prices fluctuating, side selling, unsustainable marketing attitude ('mining') of some traders; High transaction costs; Complicated trader certification.
Coordination and partnerships	No system platform since 2015; Need for multi-stakeholder coordination and platform development; Emphasis on need for balanced soybean value chain.

Source: This study

4.2 AGRA change ambition

During a specific workshop with AGRA staff, maize market system change ambitions were formulated. Based on the document review and interviews, some observations are provided in Table 11. AGRA ambitions mapped against projects and programmes are detailed in Annex 5.

In Table 11, a summary of AGRA ambitions is presented. Maize will be produced using nationally produced seed of hybrid varieties with fertiliser application. At grassroots level, VBAs will provide extension combined with input supply and bulking linked to SME agro-dealers and traders. Upstream value chain linkages are seen through agro-dealer networks, from district to the provincial and national level, and improved links with larger milling and other processing companies, as well as through commodity platforms.

Important challenges for reaching these ambitions were identified as: the interaction (of VBAs and SMEs) with the public sector at all levels, notably with public extension at grassroots and district level, and the interaction in the input supply chain (seed and fertiliser) through agro-dealer networks at different levels (including at national level with the Mozambican Seed Trade Association). Similarly, interactions in the produce value chain with traders and processors are challenged by the limitations in the availability of produce aggregation (bulking) and input (seed and fertilisers) stock credit. In both produce and seed and fertiliser value chains, input and output quality control deserves major attention.

Table 11: Envisioned maize system change ambitions as formulated by AGRA and mission observations

Maize market system components	AGRA envisioned system change
Production	Market-oriented extension for smallholder maize production combined with input supply and bulking.
Bulking and trade	Way of doing business by VBAs (input and output markets); Agro-dealer network developed (distributor, hub, agro-dealer, VBAs).
Wholesale	Facilitating links between district (hub) agro-dealers, SMEs and VBAs (input and output wholesale).
Processing	Linking processors like ECA with farmers; Quality emphasis in the produce chain, notably on mixtures and humidity.
Retail	Not available
Consumption	Not available
Seed system support	Breeders and breeding programme in place for sustained supply of marketable varieties (stress tolerant) for lowland maize production; Seed production of hybrid varieties.
Input system support	Agro-dealer network development; Capacity Development for soil fertility management (UEM, Eduardo Mondlane University).
Finance system support	Not available
Extension system support	Awareness and demand creation through VBAs; Mind change in public extension.
Policies (governance)	Fertiliser policy change needed; No current regulation (fertiliser imported as chemical, as agricultural input tax exempted, not for micronutrients.
Stakeholder collaboration (governance)	Consortium approach can lead to commodity platforms.

Similarly, AGRA change ambitions for the soybean market system were recorded in a meeting with AGRA staff and observations resulting from stakeholder interviews. AGRA ambitions mapped against projects and programmes are detailed in Annex 6.

In Table 12, a summary of the AGRA ambitions for the soybean market system is presented. AGRA pursues an outcome of adoption by smallholders of new national varieties through

quality EGS and certified or guaranteed seed produced by private enterprises and the use of nationally produced Rhizobium. Extension services are provided by VBAs, also supplying inputs (seed, Rhizobium and fertiliser), who also organise bulking. VBAs will have strong links with agro-dealers for inputs and with SME traders for links with large processing companies. Input and output quality control are important elements in these links. Bulking credit can be improved through AGRA leverage actions. Soybean value chain and market system coordination will be further enhanced by a commodity platform.

Furthermore, there are challenges in the sustainability of the soybean breeding programme, which currently depends on external breeders and financing. Soybean production has a clear market purpose – currently animal feed – but, in order to reduce risks, other uses need pursuing and developing. Development of a national soybean seed value chain (varieties, EGS, certified and guaranteed seed) and national Rhizobium production remain a central challenge. Large processors currently have their own buying agents and (foreign) traders, who are in competition with VBAs.

Table 12: AGRA envisioned soybean market system change and corresponding mission observations

Soybean market system change	AGRA Envisioned system change
Production	New soybean varieties adopted.
Bulking and trade	VBAs and SMEs involved in bulking and trading with wholesalers and processors.
Wholesale	Large trading companies (ETG, Export Trading Group) buy from SMEs/VBAs.
Processing	Large processing companies (Abilio Antunes, Novos Horizontes) buy from SMEs/VBAs.
Retail	No specific ambition
Consumption	No specific ambition
Seed system support	Opening up of IIAM to private sector for EGS production; National quality soybean seed production by private entrepreneurs.
Input system support	Capacity development for soil fertility management (through Universidade Eduardo Mondlane, UEM).
Finance system support	Bulking credit leverage by AGRA.
Extension system support	Awareness and demand creation through VBAs.
Policies (Governance)	Fertiliser policy change; State capacity: extension, coordination, variety development.
Stakeholder collaboration (Governance)	AGRA consortium approach could lead to platforms.

4.3 AGRA system change results

Table 13 reports the main results achieved by AGRA in the maize and – to a lesser extent – the soybean bean market system for the period 2008-2017. The emphasis in this period has

been on production and its required inputs and the organisation of producers. Extensionists and farmers were trained on soil fertility management and use of quality seed produced by supported national seed companies. AGRA has supported seed legislation reform as well as lending schemes. The previously mentioned activities have led to the adoption of soil fertility management practices, fertiliser and hybrid seed use, as well as farmer group formation for ease of maize sales.

Table 13: AGRA results in maize (mostly) and soybean market system (2008-2017)

Market system components	Outputs
Production	185,445 farmers adopt integrated soil fertility management (ISFM) on 164,905 ha cropped area. 8,126 lead farmers, 1,510 extensionists and 3,309 farmer organisations (FO) trained in ISFM; 92,217 farmers trained in post-harvest handling; 122,099 farmers trained in group formation.
Bulking and marketing	37,283 MT commodity aggregated at a value of US$14.1 million.
Wholesale	Linked with previous
Processing	No AGRA interventions
Retail	No AGRA interventions
Consumption	No AGRA interventions
Seed system	12,665 MT seed produced.
Input supply system	59,981 MT inorganic fertiliser sold by agro-dealers; 1,114 agro-dealers trained and farmers trained in ISFM.
Financial service system	AGRA/CEPAGRI/Standard Bank Mozambique lending scheme.
Extension system	1,510 extension workers trained in ISFM.
Policies and state capacity	Regulations and administrative procedures for the seed industry.
Coordination and partnerships	No AGRA interventions

4.4 Analysis of AGRA results

Maize market system

Information from the document review, maize marketing system stakeholder workshop and key informant interviews was analysed. National maize production is mainly for rural food security. In Central and Northern Mozambique, urban consumption of maize is, however, decreasing, while use of maize for feed is increasing. Investment in maize production (fertiliser, pesticides and quality seed of hybrid varieties) remain limited, also due to abiotic (cyclones, droughts and floods) and biotic factors (fall armyworm and other borers). An average of 20% of maize produced is marketed. Market security has been an incentive for maize planting and notably quality seed and other input use.

Relevance

AGRA is investing in the link between maize marketing (bulking), maize production and maize input supply in the main maize production areas of Mozambique. Improved links are highly relevant for the maize market system, particularly given that the approach explicitly involves community entrepreneurial producers for aggregation, extension and input supply, as well as district level SMEs and agro-dealers.

Interaction with larger volume actors (processors and wholesale input suppliers) is, however, essential for establishing longer-term relationships for years to come with higher produce volumes and lower input prices.

Effectiveness and sustainability

Production:

Maize yields (less than an average of 1,000 kg/ha) remain low compared to neighbouring countries. This will grow with the increase in market security for those farmers that are market oriented. Commercialising farmers are expected to start using inputs, such as hybrid seed and fertiliser. A focus on market-oriented farmers is therefore more likely to facilitate the adoption of external inputs. Affordable prices of these inputs and information about markets and available inputs is expected to stimulate this change process. With regard to extension, the system of mounting CDRs (on-farm demonstrations) by VBAs and involvement of agro-dealers and SME bulking companies, combined with follow-up handouts of small packs of seed and fertiliser, is an approach which requires sharing and adoption by public extension agents to become sustainable.

Bulking and marketing:

The SME/VBA aggregation chain competes with local agents that are acting as middlemen who sell produce to large traders. These agents are expected to slowly disappear. The emergence of ETG and Olam-contracted Bengali traders, who take claim a share of the market, illustrates that this is not an automatic process.

Wholesale:

Large traders used to have – and still have – their local agents, and shy away from working with – let alone signing contracts – with SMEs and/or VBAs. Some traders, such as ECA, have started outreach programmes on quality and support for adoption of quality seed of hybrid varieties; need for quality grain is driving this process. In particular, large traders and processors require large white grain for beer, grains with less than 3% white off-colour for maize flour (white flour needed for human consumption), and yellow grain or a mixture for animal feed. ‘Gema’ (yellow grain maize) might even get a premium for feed production, as egg producers require yellow maize for yellow yolks.

Processing:

The amount of maize used for purposes other than traditional processing into flour, e.g. in beer brewing and animal feed production is increasing.

Retail

With regard to consumption, the maize market is changing as maize is losing market share in urban areas. Adding value in quality maize flour, such as vitamin and mineral fortification can possibly slow down this trend.

Policies
Fertiliser and seed legislation requires improvement but, in terms of marketing, the challenge is mainly in the implementation of the regulations. Reduction of high transactions costs and fair distribution of revenue within the maize value chain are needed in order to sustain the chain (from supply chain to value chain) With regard to the financial service system: credit by wholesale traders and processors to SMEs and VBAs can be facilitated and leveraged with the revolving funds used by the maize marketing consortia. More innovative financial products for marketing/bulking, production credit and capital investment credit are needed.

Stakeholder collaboration
Interaction between market actors and the formed consortia requires strengthening for sustaining the developed concept. Maize marketing platforms are required.

Additionality
Although there are many actors involved in the support of the maize market system, AGRA is supporting an essential element i.e. the referred output and input marketing at local community level; essential in the sense that links between local marketing and other chain actors will contribute to development of a true value chain, rather than having a supply chain of spot markets.

Some of the other maize market system interventions are by: Clusa; Rama; FAO; Concern; Semear; Finagro; Feed the Future; ADVZ; Heineken; CdM; Seeds; Simlesa; Agrifuturo; AFAP; Ide; Speedplus; APROSE; INOVAGRO; Sustenta. Sharing of information and experience between these different interventions and AGRA needs improvement.

Different programmes/projects using the VBA concept need to share their experiences, such as such as between the AGRA-supported consortia and Sustenta, IDE, Clusa (associations for bulking and input supply).

Soybean market system
Information from the document review, soybean marketing system stakeholder workshop and key interviews was analysed.

Relevance
The emphasis of the AGRA interventions on soybean bulking, marketing and extension for enhanced market-oriented production is highly relevant. Previous investments in variety development and seed production are to bear fruit. Many interventions take place in the soybean system which requires investment in coordination and PPPs.

Effectiveness and sustainability
Some concern exists about the sustainability of the soybean market which drives the whole soybean value chain, as is expressed by the price development (i.e. somewhat down in 2019). Soybean markets are dominated by the demand for animal feed. SUSTENTA (World Bank-funded) is shifting its emphasis to agro-food industries to widen the demand for soybeans beyond the single use in animal (mostly chicken) feed. The soybean producing areas in Mozambique are all bordering soybean producing areas in either Malawi or Zimbabwe (and Zambia), which creates a special market dynamic, also because production costs are sometimes lower in those countries.

Production

Triggered by the demand and the right conditions (soils and climate, NGO extension support, good seed, etc.) production by small and medium commercial farmers is rapidly increasing. Production is focusing on animal (mostly chicken) feed production although this dependency on one use has a certain market risk. Another challenge is the involvement of small-scale emerging farmers, not yet fully market-oriented, as soybeans are currently purely a cash crop. Many new protein rich and multi-purpose varieties have been released. Larger grain and more oil rich varieties are needed for upcoming alternative demands. Dependency on imported Rhizobium can also constitute a risk. The VBAs in the soybean value chain in Upper Zambézia are very satisfied with their agribusiness activities; if the VBA business is growing, the individual farmers become the new VBAs.

Bulking and trade

Large chicken feed processing companies have developed a bulking system through their own agents (not based in the community) and foreigners (mostly Bengali). This system competes with the VBA/SME system supported by AGRA and puts pressure on the pricing at the farm gate. It also stresses the importance of cash payments, which VBAs and SMEs cannot always afford to do.

Wholesale

Storage of soybeans in the bulking chain (farmers, VBAs, SMEs, wholesale) requires attention to quality. Concerns exist for humidity and the emergence of aflatoxins, which can be transferred to chicken and eggs; adequate storage is required.

Processing

Currently, most soybeans produced in Mozambique are used for chicken feed, notably mills of Novos Horizontes (two mills using 8,000 MT annually); Abilio Antunes Ltda, Mobeira de Beira, Xavier da Barca, Higest, CIM, UGC etc. A small-scale food industry based on soybeans is emerging and contributes to diversification of the market demand. Soybean oil extraction (using solvents) is currently not done in Mozambique, while large amounts of soybean oil are imported.

Retail

Soybean products, such as chicken feed, are sold through the agro-dealer network and in special shops of Novos Horizontes and others. In Nampula, a local shop sells soybean-based food products such as *bajia*. For consumption aspects, soybeans are largely consumed in the form of locally produced chicken, as well as through imported products (food and vegetable oil).

Policies

Import policies, such as the restriction on chicken imports from Brazil or soybean imports from Zimbabwe, are of significance; change in these can lead to major shifts in the soybean market system. Most of the financing for soybean marketing is through the chain. AGRA credit interventions can be in addition and linked to marketing investments by large processors. AGRA aims to achieve this through credit leverage with Bank (GAPI) funding for local marketing.

Stakeholder collaboration

Coordination in the chain is a risk. If Novos Horizontes involves South African service providers, because they are not aware of the capacity in Mozambique, this is a coordination

concern. Similarly, the supply of good quality seed depends on timely and good coordination between producers, seed companies and EGS suppliers

Additionality

Many programmes and projects have either supported production or human consumption of soybeans. The demand for soybeans for animal (chicken) feed has led to new dynamics in the soybean value chain. AGRA's investment in credit for bulking, input supply (seed etc.), in addition to a business approach to soybean production, is adding value to other investments in the soybean market system. Some of these other investments are on: production and marketing (Winrock, Sustenta, Clusa, Technoserve, INOVAGRO); trading and processing (ICM, PROMER, Sustenta, SBS feed, New Gurue feed plant); and, seed and input supply systems (IITA, AGRA-supported seed companies; PROSAVANA; FAO; GAPI, IFAD/PSP).

5 Extension system

In this chapter, the performance of the seed system in Mozambique is discussed (Section.5.1), AGRA's change ambitions for this system (Section 5.2), the results to date (Section 0), and an analysis of those results (Section 5.4).

5.1 System performance

Based on the document review and interviews with representatives of the seed systems in general, and specifically for maize and soybeans, the state of affairs and the role of AGRA in the seed system has been analysed and is presented below in Table 14. More detailed information on the seed system situation is presented in Annex 7.

AGRA has been supporting the seed value chains for maize, soybeans and rice. EGS production of newly released varieties was supported, private seed companies were strengthened and seed inspectors trained. Development of new seed legislation and establishment of a seed platform (APROSE) were realised, which led to higher amounts of certified seed sold and higher rates of maize variety adoption by smallholder farmers.

Table 14: State of affairs in the Mozambican seed system

Seed system components	Current state of affairs
Variety development	41 maize varieties released in total (54% hybrids) IIAM and CGIAR maize and soybean improvement programme (6 and 2 breeders, respectively) and some hybrid varieties developed abroad and registered in Mozambique Maize (2007-2015): 8 varieties released Soybeans (2007-2017) 9 varieties released Only 43% of released varieties fully commercialised Variety age: maize (11 years), soybean (5 years), rice (2 years) Some climate-smart varieties (maize and rice)
EGS production	Satisfaction rate of TASAI: maize (42%), rice (85%) and soybean (46%) MASA/USEBA: 4,340 MT of maize foundation seed in 2015 MASA/USEBA: 864 MT of soybean foundation seed in 2015
Seed multiplication	63 registered seed companies but only 15 active (maize), 3 (rice), 6 (soybean)
Seed marketing and distribution	Seed sales in 2016: 4,375 t maize, 650 t rice, 689 t of soybeans Seed market dominated by a few companies for rice and soybean, but good competition for maize Public seed company SEMOC has no market share anymore. Maize and soybean seed also imported (easy with average time of 21 days) MASA 2017: Only 211 agro-dealers (1 for 15,000 HHs) Small packs sales (less than 2 kg): maize (66%), rice (60%), soybeans (21%)
Seed use	8.2% adoption rate of improved maize varieties (5% AGRA recommended hybrids); Seed companies employ 49 extension agents Seed to grain price ratio: hybrid maize (4.8), OPV maize (3.8); rice (3.3), soybeans (1.6)

Seed quality control	DINAS/ANS mandate: 25 ANS seed inspectors, since 2018 there have also been 6 private inspectors

Certified area in ha	2016	2017	2018
Maize	617	471	1,185
Rice	103	272	202
Soybeans	97	96	226

Seed inspection satisfaction 59%

Fake seed control efforts satisfaction (52%)

Seed sector governance and collaboration	National Platform for Seed Sector Dialogue (PNDS) (2014) resulted in APROSE (2015) with one national and three regional platforms; not all seed companies are (paying) members; GoM subsidies (including vouchers) in 2016: 16% of maize sales, 0% soybeans and 1% rice seed. 29% of seed sold by companies to the government.
Seed policy and regulation	Diploma Ministerial 51/2012 is provisional, only VCU analysis (Value for Cultivation and Use) variety release regulations Comprehensive Seed regulation (Decree 12/2013) Plant Variety Protection (Decree 26/2014) but not operational

Source: TASAI, AGRA, ISSD

The farm household survey conducted as part of this outcome report focuses on the seed use practices in 2018 of maize and soybean farmers supported by AGRA in the provinces of Manica, Tete, and Nampula (see Part 2 of this report). It yields the following observations.

- About 13% of maize farmers make use of improved maize varieties. These improved varieties are either hybrids (7%) or improved open-pollinated varieties (OPVs) (14%). In Mozambique, the maize varieties promoted by AGRA are PRIS 601, SP1, PAN53 and PAN3M01, ZM523 and MRI514. In 2018, 3% of farm households used any of these endorsed varieties.
- About 13% of the soybean farmers report the use of improved soybean varieties. In Mozambique, the varieties promoted by AGRA are Jenguma, Songola, Suong-Pungun, TGX-6F, TGX-8F, Wamini, Wima and Zamboeni. In 2018, 10% of farmers used one of these endorsed varieties. It is striking that a large group of soybean farmers (57%) is unable to say whether the variety used is an OPV or a local variety.
- Most farm households consider both yields and taste the most important reason for choosing the specific maize or soybean variety they are cultivating.
- Seed packs with improved maize varieties are widely distributed. About 33% of the households reported having received a maize seed pack. For soybean, none of the farm households received a seed pack.

Some of the most significant changes in the Mozambican seed system in the last 10 years, as identified during the seed system workshop, are described below.

1. Variety development and release: The IIAM maize and soybean improvement programmes have been releasing varieties, which have also been facilitated by a new variety release regulation (Decree 12/2013). Although this new regulation allows for the provisional release of varieties only on VCU (criteria (Value for Cultivation and Use), it still takes an average of 24 months for the variety to be released. It has also resulted in two lists of varieties, the provisional list (only VCU) and final list of varieties (VCU and DUS - Distinctness, Uniformity and Stability), which complicates life for the seed inspection services

- AGRA has supported variety development (maize, cassava, soybeans) and variety release (AGRA performance indicator). This has addressed the number of available new varieties and not the system of variety development and release. AGRA has, however, supported the development of the new seed regulation of 2013.

2. USEBA and EGS production: The semi-autonomous Basic Seed Production Unit (USEBA) of IIAM was established in 2006 (after an ICRISAT pilot) with a mandate for the production of adequate amounts of foundation/basic seed of public varieties for private seed companies. A PPP role and even full privatisation was foreseen but not realised. Seed company satisfaction has remained low (40-50%), for the availability of maize foundation seed but is better for rice. SEMEAR (USAID funded) facilitates the availability of CGIAR-sourced and IIAM-released varieties through EGS production with private companies such as Oruwera Ltda.

- Emerging seed agro-dealers network: A change from a system dominated by the public sector and outlets of seed companies (SEMOC, PANNAR) to a system of independent agro-dealers stocking seed from different companies and providing many different agricultural inputs and other products.
- Improved quality control: A new legislation or its interpretation has led to the training of private seed inspectors, employed by seed companies
- New seed regulations: The new seed regulation Ministerial Decree 12/2013 and a number of Ministerial Diploma's (e.g. on variety release) has led to a seed system context which allows for a stronger role of the private sector in EGS production, and quality control.
- The emergence of the seed platform APROSE: The multi-stakeholder seed system dialogue platform, initiated by MASA, seed system actors and a number of larger projects in seed system development has led to the establishment of APROSE.

The seed system workshop and the interviews with key stakeholders in the seed system have resulted in the identification of the most important weaknesses and challenges, which are to be addressed in various programmes, including through AGRA's grants.

Producers use only a few new varieties and adoption rate is low, also caused by the low turnover in the use of f new varieties, and unavailability of affordable quality seed of these varieties. Privatisation of seed chain key functions (EGS production, seed production, inspection) is required. Many quality control challenges exist, both in the production of EGS, certified and guaranteed seed, as well as in seed marketing (existence of poor and fake seed). Issues in the seed sector are to be addressed by sector coordination and seed legislation. More details are provided in Table 15.

Table 15: Weaknesses and challenges in the national seed system

Seed system components	Constraints and challenges
Variety development	Many non-registered varieties used; Low variety turnover; No incentives for limited number of public breeders; Variety release process too centralised and slow; Institutional development of IIAM, rather than creating semi-parallel structures.

EGS production	Breeders have their own EGS production schemes; concern about pre-basic seed availability; Divergence of visions between breeders and IIAM management; Weak EGS forecasting system; USEBA was, in spite of three recommendations, never privatized (IIAM did not want it).
Seed multiplication	Poor control leads to poor seed company performance; Hybrid maize production requires irrigation; Existing public seed cleaning equipment is not used optimally.
Seed marketing and distribution	Quality control challenges (tainted grain as seed, fake seed, false packages and fake company bags) Agro-dealer margins too high; National companies (and hence national varieties) not in large public tenders.
Seed use	Many farmers faced with fake seed, resort to use of 2nd generation OPVs and hybrids; Seed subsidy programmes distort effective demand from farmers; Seed prices too high; Limited attention for agribusiness in public extension.
Seed quality control	Very limited quality control capacity (limited number of field inspections); Penalties not respected; No financial resources for inspection; Inspection costs paid by companies to inspector creating a dependency relation; Fake seed remains major issue; Private inspectors and laboratories not optimally used
Seed sector governance and collaboration	High and unbalanced transaction costs in seed value chains; APROSE requires strengthening; MOSTA not yet the agro-dealer network, as promoted by seed companies); Institutional development a challenge for public research.
Seed policy & regulation	Major risks for seed producers/companies: subsidies, climate and demand; Seed subsidies distorting the market; Legislation limits testing of GMO varieties; Breeder rights and royalty legislation not automatically a solution; Current seed regulation (no seed law) provides not enough security for large seed companies.

5.2 AGRA change ambition

In the new programme (2017-2021), AGRA focuses on three corridors in Central and Northern Mozambique. In terms of seed system change, the attention is shifting from variety improvement and EGS production to quality seed production, marketing and distribution and quality seed use promotion of priority crops, such as maize, soybeans, cassava and rice. The envisioned seed system change by AGRA is described in Table 16. AGRA seed system ambitions mapped against projects and programmes are detailed in Annex 4.

In Table 16, the AGRA ambitions are highlighted. AGRA aims at sustainable variety breeding programmes for the priority crops – cassava, maize, rice and soybeans – through qualified public breeders, PPPs and privatisation of EGS and certified and guaranteed seed production, efficient seed value chains resulting in affordable seed prices, and partial

privatisation of seed inspection and seed extension (VBAs), and a central role for APROSE for seed policies and regulation change.

Many challenges are faced such as the limited attention on institutionalisation of breeding programmes, as perceived by IIAM, and the privatisation of breeder and foundation seed production. The gradual replacement of seed companies' own agencies with an agro-dealer network can also lead to less control by seed companies of the recommended prices as the agro-dealers are inclined to use higher margins. Involvement of private sector inspection and district agro-dealer networks (and MOSTA) are important steps for seed quality control. With APROSE involvement, legislation development to overcome the distortion of seed value chains by chronic seed subsidies (as opposed to emergency subsidies) is also facing resistance from those larger companies that rely on government contracts.

Table 16: AGRA envisioned seed system change and mission observations

	AGRA envisioned system change
Variety development	Breeders and breeding programme sustained and constant pace of breeding and release of varieties.
EGS Production	Strengthening maize and soybean seed value chain through breeder and foundation seed production; Diversification of producers and PPPs in EGS production; Opening up of IIAM to private sector; Input into Africa-wide EGS recommendations.
Seed production	Certified seed and guaranteed seed production; Seed outgrower systems involving youth, thus becoming seed companies; Make quality seed of new varieties available to farmers through national seed production (now seed from PANNAR and K2 from abroad).
Marketing and distribution	Market development (also beneficial to others like K2); Fair price margin for agro-dealers in seed value chain;
Quality seed use	New ways of variety promotion are needed; VBA model and use of small packs (100 seeds); Agro-dealer demonstration plots with VBA involvement.
Seed quality assurance	Private seed inspectors (not supported, only candidates proposed);
Seed policies, governance and partnerships	Influencing change in: chronic seed subsidies; variety release processes; use of SADC regulations; EGS supply studies; APROSE's role in seed system dialogue platform. Policy and advocacy support (on 2012 new seed regulation).

Source: mission

5.3 AGRA system change results

AGRA's 2017-2016 investments, which have previously been discussed (Section 3.2), have led to significant outputs relevant for the Mozambican seed system.

The following performance indicators are being used:

- Number of seed varieties commercialised with AGRA support (AGRA performance indicator 8)

- Number of target seed varieties with distinct resilience traits commercialised with AGRA support for specific stress or shock situations (AGRA performance indicator 46)
- Quantity (MT) of quality seed of improved varieties of focus crops produced by enterprises supported by AGRA (AGRA performance indicator 9)
- Quantity (MT) of quality seed of improved varieties sold as a result of AGRA support (AGRA performance indicator 10).

Table 17: AGRA results in seed sector (2008-2017)

	Outputs
Variety development	45 varieties released; 37 varieties commercialised
EGS production	Unclear
Seed production	12,665 MT seed produced
Marketing and distribution	37,282 MT commodity aggregated
Seed use	8% use of improved maize varieties – less than 5% of this are hybrid varieties; 92,217 farmers trained;
Seed quality assurance	5 lab technicians trained
Seed policies, governance and partnerships	Capacity: 6 PhDs plant breeding; 21 MScs crop science; 1,114 agro-dealers trained

Source: AGRA, 2017

As of July 2019, the following results had been obtained for the new programme (2017-2021), note that rice and cassava activities were just starting:

- AGRA aims to reach 1.8 million households directly and a further 1.2 million households indirectly. So far, 81% has been committed and 14% (202K) reached.
- AGRA aims to produce 17,000 MT of seed over the life of strategy. To date, 2,970 MT has been produced of which 155 MT has been sold to farmers for US$10,800,000.
- AGRA aims to develop 500 agro-dealer shops in Mozambique and has so far set up 199.
- In partnership with the Africa Fertiliser Agribusiness Partnership (AFAP), AGRA is developing hub agro-dealers using the AFAP model and has 19 hub agro-dealers comprised of 240 retailers who have sold 75,000 MT valued at US$53 million.
- 33 MT of produce has been sold at about US$4.5 million.
- Policies (seed, fertiliser, warehouse receipt and farm investment tax exemption, ICT and agricultural finance) have been prioritised for reforms and are all at different stages of implementation.

5.4 Analysis of AGRA system interventions

The analysis is based on interviews with key stakeholders in the seed system, a small seed system stakeholder workshop with APROSE and review of seed system documentation. The analysis uses a system approach in which different components are interrelated and the weakest link determines the performance of the system.

Relevance

AGRA has provided major assistance in recent years to variety development in priority commodities, as well as the establishment of national seed companies for quality seed production of the newly released varieties. The focus of the current AGRA programme is much more on the marketing and distribution of quality seed of available improved varieties. In seeds, Otumiha and Kugulissa consortia support is provided to a network of agro-dealers at district level, which provides support to private VBAs, who make a partial living out of sales of inputs such as seed. Otumiha and Kugulissa also provide support to VBAs for the promotion of this quality seed which leads to better market access for the resulting improved quality produce.

This shift in emphasis from variety development and EGS production to marketing and distribution (from push to pull) is more than relevant, as access to quality seed and its use remains a limiting factor in the seed value chain.

Effectiveness and sustainability

For each of the components of the seed system, an analysis can be made as to what extent the AGRA interventions lead to sustainable changes in the system.

- Variety development: Notably in the soybean seed system, a concern exists about the sustainability of the variety development programme and breeder seed production. IIAM has limited capacity, while SEMEAR (CG programme) is ending. IIAM argues that this sustainability concern is also caused by donor-funded programmes, which operate outside the full responsibility (technical, administrative and financial) of IIAM.
- EGS production: The role of USEBA in facilitating access to EGS by private seed companies is currently being analysed by a Speedplus study. A sustainable supply of pre-basic (breeder) and/or basic (foundation) seed required by seed producers remains a challenge. The development of PPPs in EGS production is not well coordinated. IIAM breeders develop their own arrangements with seed companies.
- Seed multiplication: National seed companies are increasing their market share. National seed companies have been heavily supported by AGRA, but the current ones (at least two have failed) have sound business plans.
- Seed marketing & distribution: The public seed subsidy programme (now small due to public budget restrictions) and the FAO-supported voucher programme continue distorting the (maize) seed market. AGRA supported agro-dealers complain about constraints in seed sales due to these programmes (mindset of buyers and prices), while AGRA-supported seed companies have limited access to public tenders for seed subsidy programmes.
- Seed quality assurance: The capacity of the National Seed Authority (ANS or MASA's seed department) remains limited with regards to human and financial resources. The dependence of ANS on financial support of seed companies leads to unsustainable relations. AGRA is supporting the development of private seed inspection within the supported seed companies.
- Seed system stakeholder organisation: AGRA participates in platforms, such as APROSE and in other dialogue meetings with MASA, on the issue of seed system legislation and role of subsidies. Support for the role of APROSE by AGRA is important but, at the same time, leads to stronger dependency of APROSE to external support. Support for a seed agro-dealer network, such as MOSTA, can be considered in this challenging context.

- Seed policies: The current seed legislation is based on a Ministerial Decree (12/2013) and is not a seed law which is endorsed by the Cabinet of Ministers, which provides less long-term security for external private investors in the seed sector.

Additionality

The AGRA programme is well coordinated with MASA and other ministries and is operating within the context of PEDSA. AGRA makes a difference in the support for national seed production, seed distribution and marketing and seed use. New approaches and system changes are being introduced, which are more than complementary, and can change the national seed system.

Other mentioned investment actors for the seed system are: FAO, SEMEAR (CGIAR), SeedTrade, Speedplus, INOVA, INOVAGRO and many others depending on geography and commodity, as well as seed system component. Coordination between all these interventions remains a challenge for MASA, and hence AGRA.

Part II: Quantitative household survey

6 Methodology of the household survey

6.1 Introduction

One of AGRA's intervention instruments is funding farmer-level interventions through consortia projects and other investments. AGRA considers the continued use of outdated production technologies and practices as one of the biggest hurdles to increasing smallholder farmer productivity in Africa. However, farmers are known to adopt new technologies when they are useful, affordable, and available locally. In the past, AGRA has invested in the development and production of new crop varieties, which are higher-yielding, resistant to local pests and diseases, and are more resilient in the face of environmental and climatic stress. In addition, collaborations with the African private sector have contributed to 25,000 VBAs.

Under the PIATA programme, AGRA gives grants to consortia that promote market-oriented agriculture by focussing on improving the productivity and profitability of specific crop commodities (mostly cereals and legumes) for smallholder farmers. These value chain projects provide farmers with access to improved technologies and inputs, training and (structured) markets. The expectation is that smallholder farmers will be assured of a ready market for their produce, which triggers intensification of production, and the buyers (processors or aggregators) will get a steady supply of quality crop produce.

The household-level survey is designed to measure changes at farm level. This is part of the internal monitoring of change within the beneficiary population of AGRA's interventions against an agreed upon (restricted) set of indicators, which allows for the continuous tracking of progress towards its desired outcomes at farm level. The methodology targeted data collection by external local and international consultants under the guidance of and coordination by KIT.

The household survey monitored the following indicators:

- Goal indicator 2. Average number of months of adequate household food provision
- Goal indicator 6. Wealth assets index score
- Average yield (kg/ha) of focus crops
- Rate of application of target improved productivity technologies or management practices at farmer level
- Percent of farmers accessing Agricultural Advisory extension support services
- Average fertiliser use
- Percent of post-harvest losses
- 10. Value of smallholder incremental sales (value of additional volumes sold)
- 13. Percent of farmers accessing financial services of formal institutions
- 17. Average age of varieties of focus value chains on farmer fields
- Additional 1. Average distance to agro-dealer
- Additional 2. Hectares under improved productivity technologies or management practices
- Additional 3. Farmers' clients
- Additional indicator 4. 'Small seed pack' exposure and utilisation

6.2 Sampling strategy

As the purpose of this assignment is monitoring performance against specific indicators, AGRA and KIT have jointly decided to opt for a statistically sound, yet targeted sample strategy. Because the purpose is monitoring, AGRA and KIT also agreed not to make use of counterfactuals.

The target population for this study are all AGRA beneficiaries in the Nampula, Manica and Tete regions in Mozambique. Since reliable beneficiary lists for sampling were unavailable, a sampling of VBAs was done. Initially, a sample of 40 VBAs was randomly selected for each of the crops: maize and soybean. However, after data collection had started, it turned out that many households supported by VBAs in the soybean sample had in fact not cultivated soybean in that year. In order to reach a sufficient number of observations on soybean, an additional 15 VBAs were added to the soybean sample. The soybean sample thus consisted of 55 VBAs. The number of sampled VBAs per region was proportional to the number of VBAs/beneficiaries. A buffer of VBAs was selected, in case the VBAs that were sampled originally could not be found. Upon arrival in the community, the team, in consultation with the VBA, randomly sampled 25 beneficiaries per VBA to be interviewed. In some cases, communities/VBAs had to be replaced from the buffer list, based on non-existence of the community, and inability to reach the VBA after at least three attempts.

The total number of surveys was agreed between KIT and AGRA, based on budget availability, and power considerations. The sample size per crop was set at 1,000. With a sample size of 1,000 observations, it is expected to detect a change in yields of 10% among the survey population with a confidence level of 95% (see Figure 3).

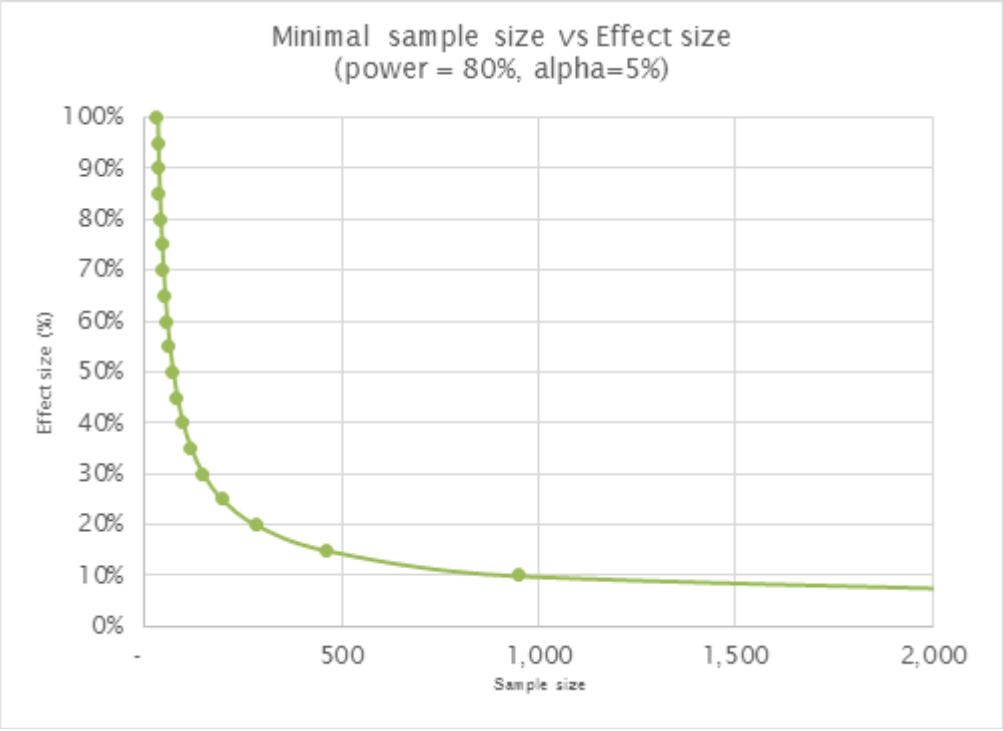


Figure 3: Power calculation

Uptake of soybean

Soybean was only cultivated by a small share of the target population. This section explores the patterns of soybean adoption. The aspects indicated below give some indications based on the information in our data, but to derive valid, generalisable conclusions, additional research will be required.

When assessing the regional distribution of soybean cultivation, it is noticed that soybean cultivation is currently concentrated in certain districts. Table 18 shows that of all districts in the sample, uptake was highest in Barue and Angônia (where 56% and 38% of the sampled population cultivated soybean, respectively), while it was lowest in Meconta and Murrupula (with adaptation rates of 2% and 0%, respectively).

Table 18: Uptake of soybean, per district

District	Number of households in sample	Number of households cultivating soybean in 2018	Number of households not cultivating soybean in 2018	Percentage of the sample cultivating soybean
Monapo	177	31	146	18%
Meconta	155	3	152	2%
Rapale	101	4	97	4%
Malema	51	10	41	20%
Ribaue	154	16	138	10%
Murrupula	76	0	76	0%
Barue	100	56	44	56%
Angônia	330	126	204	38%
Tsangano	254	46	208	18%
Total	**1,398**	**292**	**1,106**	**21%**

This difference in soybean cultivation is most likely linked to VBA activity since soybean cultivation rates differ per VBA. A comparison of soybean cultivation and the VBA serving the household shows a clear distinction: for some VBAs, almost all households cultivated soybean, while some VBAs were linked to no households cultivating soybean. This suggests that some VBAs have actively and successfully promoted soybean cultivation, while other VBAs have not yet done this. This hypothesis is supported by the fact that households cultivating soybean interacted significantly more with extension officers. While 64% of the soybean-cultivating households interacted with an extension officer at least once, it is only 36% for households that did not cultivate soybean. Additionally, among the households that did get visited by extension officers, the number of visits was higher for soybean-cultivating households. This difference is small but significant (soybean cultivators received, on average, 2.4 visits, versus 2.1 visits for households not cultivating soybean). Besides VBAs, SMEs also play a role here: farmers are more likely to adopt the crop in areas where SMEs actively engage in soybean marketing.

Apart from promotion of soybean by the VBA, tradition of soybean production should also be kept in mind when looking at this regional difference. Some districts, such as Angonia and

Barrue have been cultivating soybean for a while, while soybean is a new crop in many of the other districts.

Besides regional differences in the uptake of soybean as a cash crop, there are also some differences in household characteristics. Most strikingly, it is observed that the households that cultivate soybean have significantly higher DHS wealth index scores than households who do not cultivate soybean. Furthermore, our comparison shows that soybean-cultivating households are significantly larger, on average, and have better access to financial services (loans, bank accounts and agricultural insurance).

Besides the factors mentioned above, no significant differences were found for respondent sex, respondent age, sex of the household head, age of the household head, distance to input suppliers and food security status of the household.

6.3 Survey structure

The main unit of analysis is the household. Therefore, it is possible that multiple household members were involved in answering questions. The survey always started with AGRA's main beneficiary, but during the survey the respondent could switch depending on the section of the survey. Questions on agricultural production are answered by the person in the household who knows best about production. Questions on household food security are answered by the household member in charge of food and cooking in the household, which was usually a woman.

At the start of the survey, the enumerator selects the crop cultivated by the respondent. This ensures that only questions concerning that crop appear in the interactive form. The same applies for the respective seasons the farmer cultivated the respective crop.

The survey instrument was designed to collect detailed information on the following topics:

- General:
    - Demographics and wealth indicators
- Crop-specific:
    - Agricultural land
    - Production of the focus crop
    - Allocation of the focus crop
    - Revenues
    - Crop varieties and seed use
    - Use of productivity-enhancing technologies
    - Post-harvest practices
    - Farmers' clients
- General:
    - Agricultural extension
    - Financial services
    - Food security

The data was collected using tablets and Open Data Kit (ODK), in combination with the secured survey site Kobo Toolbox. ODK is the leading open-source platform for collecting, storing and processing quantitative survey data. The use of this application ensures quick and reliable data collection. The questionnaire programmed in ODK makes calculations during the survey, which allows for referencing to responses given previously. It also allows

for data checks since it reduces the chance of errors by warning enumerators when unexpected values are entered. The form also includes skip-logics that were programmed into the questionnaire, so that enumerators only ask relevant questions based on previous responses, which ensures efficiency in data collection. Data was georeferenced to ensure that the sampling strategy was correctly implemented by the team. As such, data collection process could closely be monitored from the Netherlands.

6.4 Limitations of the household survey

When interpreting this data, there are a few aspects that should be kept in mind. Firstly, the purpose of the assignment is 'internal' monitoring of change. As such the methodology is not designed to measure the impact of AGRA's and partners' interventions and therefore does not require measuring change against counterfactuals and attribution of results.

Secondly, a limitation arises concerning the size of the soybean sample. As the adoption rate of soybean is not very high, the majority of households in the soybean sample had not cultivated cultivate soybean in 2018. Despite an increase in sample size, the size of the soybean sample is low, which limits the ability to derive statistically sound conclusions. The low uptake of soybean is not unexpected, since AGRA's activities on promoting soybean only started at field level in 2018.[1] The results of this study therefore serve as baseline values.

Another limitation results from a mistake in the coding of the survey form. Due to this coding error, only a small subsample of respondents was asked about the planting practices they used for soybean. Consequently, the number of households was so low that no valid conclusions could be derived from the data. Therefore, a section on soybean planting practices is not presented in this report.

Furthermore, it is worth noting that at the time of field work, general elections were happening in Mozambique. In the run-up to the elections, the data collection team had trouble reaching communities and locating sampled households due to widespread campaigning activities. Consequently, data collection was postponed to the period after the elections, causing a delay in the schedule. However, this delay did not have consequences on the quality of the data.

The survey relies on recall data for the year 2018, while data collection occurred in 2019. Though many checks and quality control mechanisms have been implemented to ensure data quality, the recall process may introduce some variations between real and reported data.

Furthermore, in the case of Mozambique, the beneficiaries' lists were unavailable and KIT needed to use VBA lists to sample. It should be kept in mind that the sample is only representative of AGRA's beneficiary population and its representativeness cannot be extended to the wider region or nation.

[1] Activities focussed on demonstration plots and baby demonstration plots ('baby demos') for farmers that received seed. However, there were challenges in accessing quality seeds in the quantity required for use in demonstration plots and baby demos, which contributes to the low uptake of soybean by farmers in 2018.

7 Household-level results: maize in Nampula, Manica and Tete provinces (2018)

7.1 Sample description

Survey area

A total sample of 1,006 maize-cultivating households were interviewed in Nampula, Manica and Tete. Within Nampula Province, interviews were conducted in six districts: Monapo, Meconta, Rapale, Malema, Ribaue and Murrupula. In Manica Province, interviews were conducted in three districts: Barue, Vanduzi and Gondola. In Tete, interviews were conducted in three districts: Angônia, Tsangano and Macanga. Figure 4 shows the geographical spread of surveyed households.

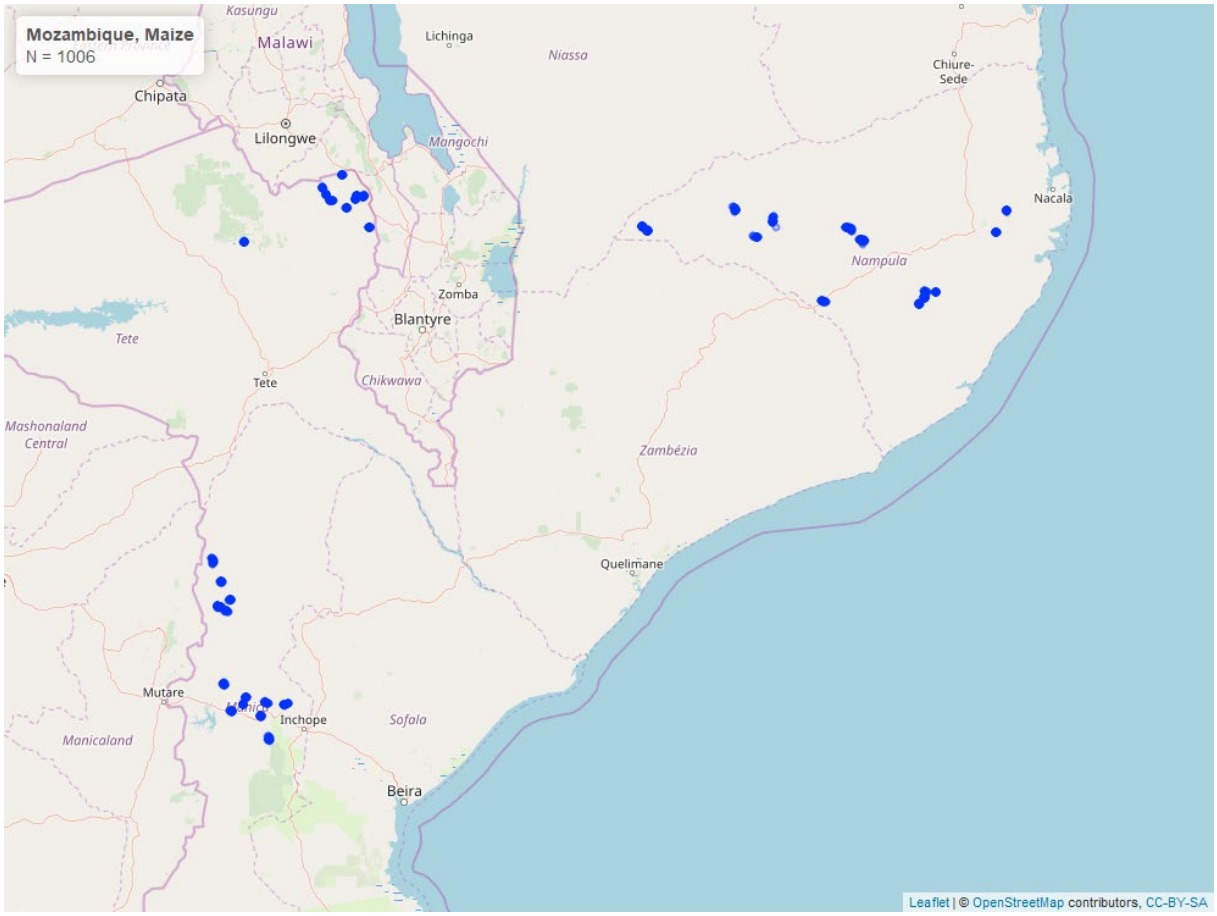


Figure 4: Location of farm household interviews, maize sample

Farm household characteristics (maize farm households)

Respondents were all beneficiaries of AGRA: 55% of respondents were male, 45% were female. In 71% of the cases, the beneficiary is also the head of the household. Respondents were, on average, 40 years old (see Figure 5).

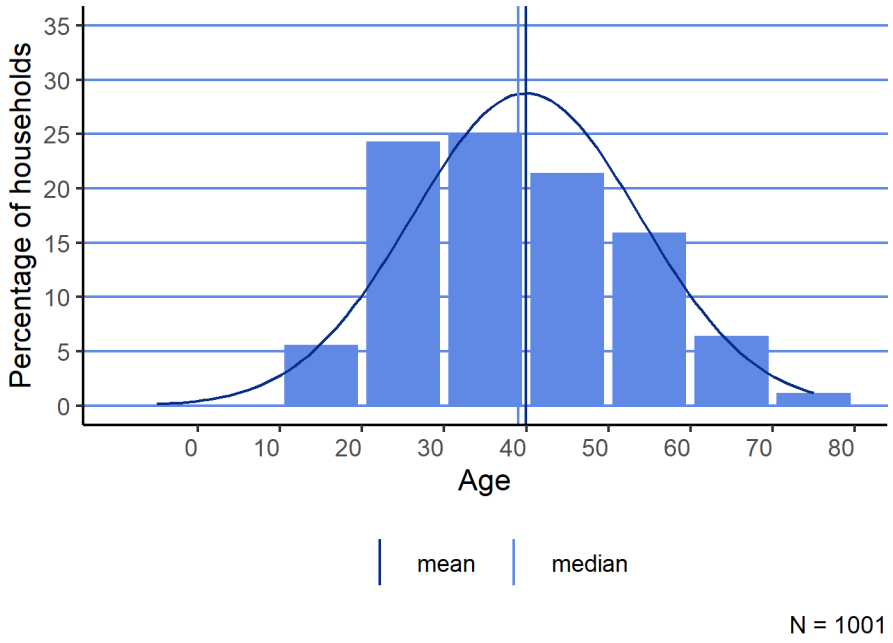


Figure 5: Distribution of respondent age

The majority (82%) of farm households are male-headed. Households, on average, consist of 5.5 members (2.3 adults and 3.2 children), with female-headed households being significantly smaller (see Table 19).

Table 19: Household composition

Adult/children	All	Male-headed	Female-headed	sig
Number of children in the household	3.2	3.3	2.7	***
Number of adults in the household	2.3	2.5	1.9	***
n	1,006	825	181	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

All households, without exception, own agricultural land. The average amount of land owned is 2.3 hectares (ha). Male-headed households own and cultivate significantly more agricultural land than female-headed households. Almost all land is usually used for crop cultivation. Figure 6 shows the land allocated to maize cultivation; most of the cultivated land (1.8 ha) is allocated to maize.

More than half of farm households (71%) have intercropped maize with other crops. Most commonly, maize is intercropped with beans (69%), cassava (38%) or groundnut (22%).

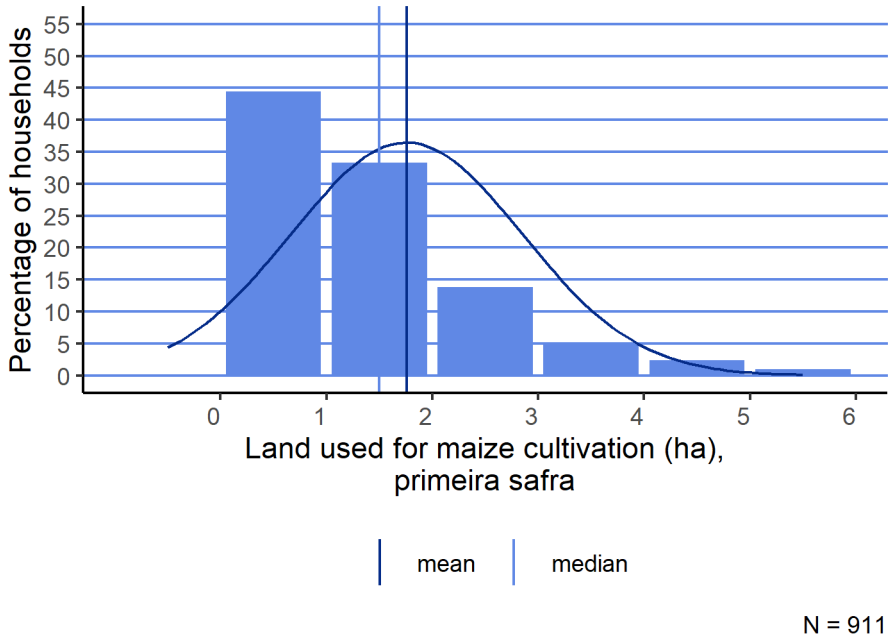


Figure 6: Distribution of land allocated to maize (ha), primeira safra

In Mozambique, there are two farming seasons for maize: the *primeira safra agricola* (or *saison principale*) and the *segunda safra agricola* (or *saison segunda*). The main season ranges from October until January. Table 20 shows that most households (97%) cultivated maize in the main season and that only 5% cultivated maize in the second season. Consequently, this report only presents data for the main season (or *primeira safra* in Portuguese).

Table 20: Percentage of households producing maize, per season

	All	Male-headed	Female-headed	sig
Primeira safra	97%	97%	96%	
Segunda safra	5%	5%	4%	
n	1,006	825	181	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

7.2 Main indicators

Table 21 gives an overview of the primary indicators collected. See Table 21 for definitions for each indicator. The indicators and the underlying behavioural patterns are discussed in further details in the following sections.

Table 21: Overview of main indicators maize farming households

	All	Male-headed	Female-headed
Goal indicator 2: Average number of months of adequate household food provision	**10.9**	**10.9**	**10.6**

Goal indicator 6: Wealth assets index score	**-0.684**	**-0.669**	**-0.752**
G6.1 Share of households in first wealth quintile (%)	15%	14%	22%
G6.2 Share of households in second wealth quintile (%)	30%	27%	41%
G6.3 Share of households in third wealth quintile (%)	38%	41%	22%
G6.4 Share of households in fourth wealth quintile (%)	16%	17%	14%
G6.5 Share of households in fifth wealth quintile (%)	2%	2%	1%
IWI International Wealth Index	24.0	25.0	19.6
1. Average yield (kg/ha)	**399**	**391**	**435**
3. Rate of application of target improved technologies or management practices	29%	31%	18%
3.1 Adoption of improved varieties (%)	21%	23%	13%
3.2 Adoption of endorsed varieties (%)	4%	4%	3%
3.3 Number of seasons variety is recycled	7.0	6.9	7.4
3.4 Adoption of endorsed planting practice (%)	8%	9%	8%
3.5 Adoption of inorganic fertiliser (%)	11%	12%	6%
3.6 Adoption of endorsed fertiliser (%)	9%	10%	5%
3.7 Adoption of organic fertiliser (%)	2%	2%	1%
3.8 Adoption of inoculants (%)	NA	NA	NA
3.9 Adoption of pest-management practices (%)	2%	3%	1%
3.10 Adoption of endorsed post-harvest practices (%)	54%	54%	51%
3.11 Adoption of improved storage (%)	14%	14%	14%
3.12 Use of designated storage facilities (%)	0%	0%	0%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	26%	27%	23%
Hectares under improved technologies or management practices (%)	**19%**	**19%**	**19%**
3.14 Area under improved varieties (%)	19%	19%	19%
3.15 Area under inorganic fertiliser (%)	13%	13%	13%
3.16 Area under pesticides (%)	2%	2%	2%

4. Access to agricultural advisory extension support services	**50%**	**49%**	**51%**
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.3	2.3	2.2
4.2 Received small seed pack (%) (additional indicator 4)	33%	33%	30%
4.3 Used small seed pack (%) (additional indicator 4)	82%	83%	76%
4.4 Distance to nearest agro dealer (minutes)	97.2	98.0	94.1
5. Nitrogen application (kg/ha)	**2.3**	**2.5**	**1.3**
5.1 Phosphorus application (kg/ha)	0.5	0.5	0.2
5.2 Potassium application (kg/ha)	0.3	0.3	0.0
Average fertiliser use (Total N + P + K, kg/ha)	**3.0**	**3.2**	**1.5**
6. Percent of post-harvest losses (%)	**1%**	**1%**	**0%**
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**29.6**	**29.6**	**29.6**
13. Access to formal financial services (%)	**9%**	**10%**	**6%**
13.1 Bank account (%)	8%	9%	5%
13.2 Agricultural loan (%)	1%	1%	2%
13.3 Agricultural insurance (%)	1%	1%	1%
17. Average age of varieties used (years)	**19.2**	**19.1**	**20.1***
33. Sale through structured trading facilities/arrangements (%)	**4%**	**4%**	**3%**
33.1 Selling to traders/middlemen (%)	70%	71%	66%
33.2 Selling to consumers (%)	17%	17%	17%
33.3 Selling to friends/neighbours (%)	18%	16%	27%
33.4 Selling to aggregation centre (%)	1%	2%	0%
33.5 Selling to farmer organisation (%)	1%	1%	3%
33.6 Selling to wholesalers (%)	11%	11%	9%
33.7 Selling to processors (%)	0%	0%	0%
33.8 Selling to retailers (%)	10%	10%	10%
33.9 Selling to company (undefined) (%)	6%	7%	4%
33.10 Selling to institutional buyers (%)	1%	1%	1%
37. Access to market information through formal channel (%)	**0%**	**1%**	**0%**

The composition of variables can be found in the data dictionary in Annex 13; N might vary across indicators
** indicates that the average has been calculated with less than 50 observations*

7.3 Number of Months of Adequate Household Food Provision (indicator G2)

Table 22 reports the average number of months of adequate household food provision as per the index of the same name (MAHFP). It shows that the AGRA-supported farm households have, on average, enough food to meet their family's needs during 11 months of the year. Female-headed households are less food secure than male-headed households. This difference is statistically significant but small.

Table 22: Average number of months of adequate household food provision (G2)

	All	Male-headed	Female-headed
G2: Average number of months of adequate household food provision	10.9	10.9	10.6

Figure 7 shows the MAHFP distribution. It shows that 62% of AGRA beneficiaries report having had enough food to meet their family's needs during the entire year. Only 3% of farm households did not have enough food during six months or more; only 1% reported being chronically food insecure.

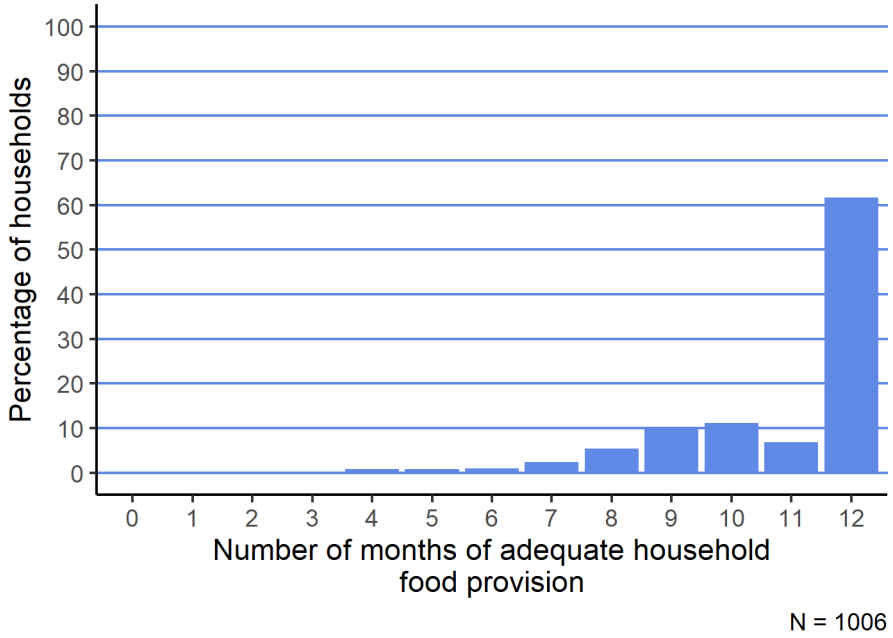


Figure 7: Distribution of number of months of adequate household food provision (G2)

Figure 8 shows the distribution of months with adequate household food provision over the year. The figure shows that November and December were the months in which food insecurity was highest. This is in line with expectations, as these months are in the middle of the main cropping season (*primeira safra*) and food insecurity is usually highest right before harvest.

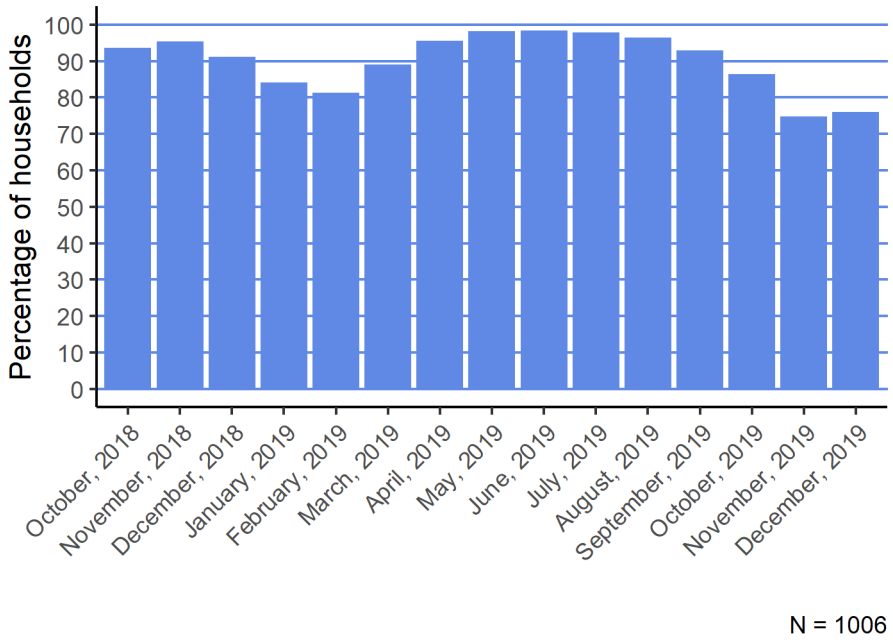


Figure 8: Distribution of months with adequate household food provision

7.4 Wealth asset index score (indicator G6)

Table 5 shows the quintile distribution of the Demographic and Health Surveys (DHS) wealth index. The DHS household wealth index is a composite measure of a household's cumulative living standard. It is composed of data on asset ownership, materials used for housing construction, and types of water access and sanitation facilities. Wealth index scores were compared with the national Mozambican DHS distribution for rural areas to determine the household's relative wealth compared to the country average. As can be seen from Table 23, most households are in the 2nd and 3rd quintiles, whilst 15% is in the 1st (poorest) quintile of the country; only 2% is in the 5th (wealthiest) quintile. Households with male heads are, on average, wealthier than households with female heads.

Table 23: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	-0.684	-0.669	-0.752
G6.1 Share of households in first wealth quintile (%)	15%	14%	22%
G6.2 Share of households in second wealth quintile (%)	30%	27%	41%
G6.3 Share of households in third wealth quintile (%)	38%	41%	22%
G6.4 Share of households in fourth wealth quintile (%)	16%	17%	14%
G6.5 Share of households in fifth wealth quintile (%)	2%	2%	1%
IWI International Wealth Index	24.0	25.0	19.6

7.5 Yield (indicator 1)

Maize yields are calculated by dividing the total maize production by the amount of land under maize cultivation. To enhance data accuracy, respondents were able to answer questions in units of their preference for both production and land size. The preferred unit for production was, in most, cases bags (usually of 50 kg), followed by kilogrammes, while the preferred unit of land size was, in almost all cases, hectares. Production and land data units were, when needed, converted to kilogrammes and hectares. Out of 1,002 interviewed households, 91 respondents did not know their maize production, while 25 respondents did not know how much land was used to cultivate maize.

Respondents reported an average maize production of 721 kg. Figure 9 shows the distribution of maize quantity harvested. Production seems higher among male-headed households but this difference is not significant (see Table 24).

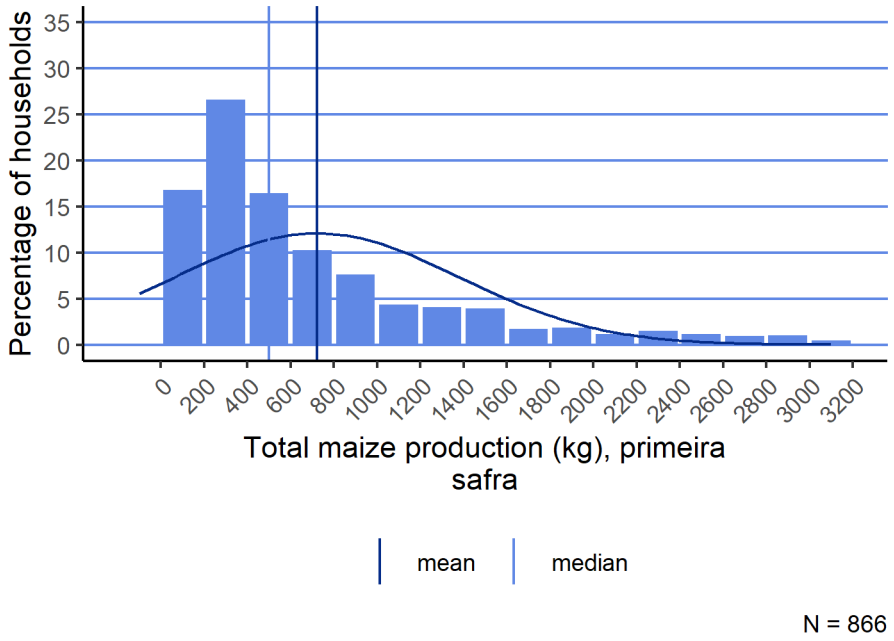


Figure 9: Distribution of total production of maize (kg), primeira safra

Table 24: Total production of maize (kg), primeira safra

Total maize production (kg), *primeira safra*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	721.5	734.2	661.9	
median	500.0	500.0	502.0	
n	866	714	152	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Maize yields are, on average, 399 kg/ha (see Table 26 and Figure 10). A substantial difference exists between male-headed and female-headed households: female-headed households have higher yields. This difference is 44 kg/ha and significant.

As indicated in Section7.1, intercropping is very common in Mozambique: 70% of households indicate having intercropped their maize with other crops. The percentage of

households intercropping maize in our sample is similar for male-headed and female-headed households: 71% and 72%, respectively, indicated having intercropped their maize.

Surprisingly, as Table 25 shows, there is no significant difference in yields between households that intercropped maize and households that did not. Also, there is no difference in households producing mainly for home consumption versus households producing mainly for the market: no significant relation was found between yields and the percentage of maize that is sold.

Table 25: Average maize yield (kg/ha), by intercropped (yes/no), primeira safra

Maize yield (kg/ha), *primeira safra*	**All**	**No**	**Yes**	**sig**
mean	399.0	394.6	400.7	
median	333.3	315.4	343.4	
n	817	231	586	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Yields in Mozambique are considerably lower than expected, which can be attributed to various reasons. In general, Mozambique has lower average yields than other PIATA-countries: the past five years, (country) average yields in Mozambique have been between 681 kg/ha and 930 kg/ha. However, the yields in our sample are still considerably lower than the average. The most likely explanation for the lower yields is the occurrence of a tropical depression in Nampula in January 2018, which reportedly destroyed a large share of the crops, and droughts in Manica and – to a lesser extent – Tete. Also, low use of agricultural inputs such as fertiliser and pesticides against, among others, fall armyworm are plausible explanations (see Section 4.6). Finally, seeds (even OPV and hybrid seeds) are generally recycled for many seasons, which can lead to decreasing yields over the years as seeds lose their favourable characteristics: 41% of the households had been recycling their seed stock between five and nine seasons, while 31% had even recycled it over 10 seasons.

Table 26: Average maize yield (kg/ha)

	All	**Male-headed**	**Female-headed**
1. Average yield (kg/ha)	399	391	435

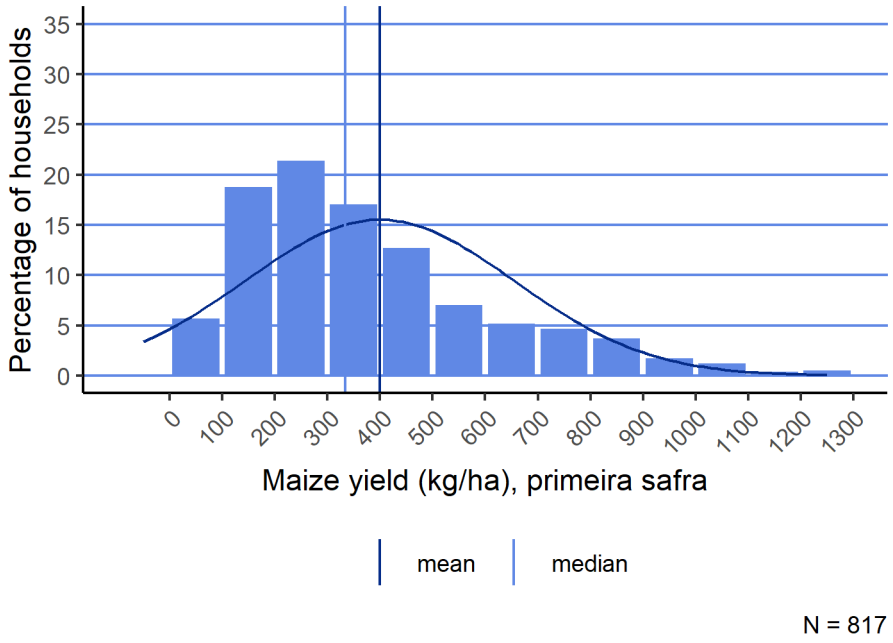


Figure 10: Distribution of average maize yield (kg/ha), primeira safra

Most farm households (54%), perceived the harvest of the wet season of 2018 to be similar to other seasons; 39% considered the season to be worse than usual. Only 8% indicated that the season of 2018 was better than usual (see Table 27).

Table 27: Ranking this season's maize harvest compared to other seasons (percentage of households per answer), primeira safra

This season's harvest relative to other seasons	All	Male-headed	Female-headed	sig
Normal	54%	54%	52%	
Worse than usual	39%	38%	43%	
Better than usual	8%	9%	5%	
n	880	726	154	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

7.6 Rate of application of target improved productivity technologies or management practices (indicator 3, 5, 17)

Improved varieties and recycling

Table 28 shows that 21% of farm households make use of improved maize varieties. These improved varieties are either hybrids or improved OPVs. In Mozambique, the varieties promoted by AGRA are PRIS 601, SP1, PAN53 and PAN3M01, ZM523 and MRI514. In 2018, only 4% of farm households used these endorsed varieties (seeTable 28).

Table 28: Main indicators for the use of improved varieties, recycling, and planting practices

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	21%	23%	13%
3.2 Adoption of endorsed varieties (%)	4%	4%	3%
3.3 Number of seasons variety is recycled	7.0	6.9	7.4
17. Average age of varieties used (years)	19.2	19.1	20.1*
Hectares under improved technologies or management practices (%)	19%	19%	19%

Table 29 lists the varieties grown. It shows that most households (57%) cultivate local varieties. The second-most popular variety is the OPV Matuba, which is cultivated by 12% of households. Among endorsed varieties, ZM 523 is used the most. However, with only 3% of households cultivating that variety, uptake is low. Furthermore, it stands out that female-headed households more often cultivate local varieties, while male-headed households indicated significantly more often having cultivated a variety from the company Pannar (without specifying the specific variety).

Table 29: Maize varieties used (percentage of households per variety), primeira safra

Varieties	All	Male-headed	Female-headed	sig
Local variety, unspecified	57%	55%	66%	***
Matuba	12%	13%	9%	
Yellow maize	10%	11%	8%	
Don't know	8%	8%	5%	
Other	7%	6%	10%	*
Pannar unspecified	6%	6%	3%	*
ZM 523 (promoted)	3%	3%	2%	
Hybrid, unspecified	1%	1%	1%	
PAN 53 (promoted)	1%	1%	1%	
n	972	799	173	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 0.5% are combined in 'Other'

Table 30 groups the varieties that are cultivated in the hybrid, local variety, or OPV categories. The table shows that local varieties are, by far, the most common. Furthermore, 14% of varieties used are improved OPVs. Only 7% of farm households have, in fact, cultivated a hybrid variety. For 22% of varieties, it was not possible to classify the type. This was mainly the case for households who did not know which variety they cultivated, or households that indicated having cultivated other varieties that could not be classified.

There are large differences between male and female-headed households; while 8% of male-headed households cultivates a hybrid variety, this is only 3% for female-headed

households. Male-headed households also cultivated OPVs more frequently. Female-headed households, in turn, were more likely to cultivate local varieties.

Table 30: Type of main maize variety (percentage of households per variety type), primeira safra

Type of main variety, *primeira safra*	All	Male-headed	Female-headed	sig
Local variety	57%	54%	67%	
Not able to classify	22%	22%	20%	***
OPV	14%	15%	10%	
Hybrid	7%	8%	3%	
n	57%	54%	67%	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Most households (52%) consider taste the most important reason for choosing a variety. Additionally, households select varieties based on yields (49%), favourable maturing time (35%), or simply because it was the only variety available. Since the majority of the sample mainly cultivates maize for home consumption (only 4% of the harvest is, on average, sold) the emphasis on taste is in line with expectations. Table 31 shows that colour and tolerance to pests, droughts and floods were significantly more important traits for male-headed households than for female-headed households.

Table 31: Type of main maize variety (percentage of households per variety type), primeira safra

Maize variety traits	All	Male-headed	Female-headed	sig
Taste	52%	51%	53%	
Yields	49%	50%	45%	
Maturing time	35%	36%	34%	
Only variety available	23%	23%	21%	
Conservation (storage time)	21%	21%	19%	
Colour	18%	20%	12%	**
Tolerance to pests	15%	17%	10%	**
It's the only variety that I know	15%	15%	17%	
Tolerance to droughts	14%	16%	6%	***
Tolerance to diseases	14%	15%	10%	
Processing	14%	15%	11%	
Tolerance to floods	13%	15%	6%	***
Appreciated by buyers (market)	13%	14%	11%	
Price and/or premium from buyers	9%	9%	6%	
It was free	5%	5%	5%	
Other	4%	4%	5%	
n	972	799	173	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Splitting up these characteristics per type of variety, it is apparent that hybrids and OPVs are often chosen for their favourable maturing time, tolerance to floods and droughts, suitability for processing, and buyer appreciation. Local varieties, on the other hand, are more often

cultivated because it is the only variety available, or because it is the only variety known by the household (see Table 32).

Table 32: Appreciated traits of the main maize variety used (percentage of households per trait) by type of variety, primeira safra

Maize variety traits	All	Local variety	OPV	Hybrid	sig
Taste	52%	58%	51%	52%	
Yields	49%	55%	60%	68%	
Maturing time	35%	32%	49%	58%	***
Only variety available	23%	24%	12%	7%	***
Conservation (storage time)	21%	22%	28%	20%	
Colour	18%	21%	18%	15%	
Tolerance to pests	15%	16%	26%	17%	**
It's the only variety that I know	15%	18%	5%	3%	***
Tolerance to droughts	14%	15%	24%	25%	**
Tolerance to diseases	14%	16%	23%	15%	
Processing	14%	12%	25%	22%	***
Tolerance to floods	13%	14%	21%	35%	***
Appreciated by buyers (market)	13%	12%	28%	17%	***
Price and/or premium from buyers	9%	9%	13%	12%	
It was free	5%	3%	4%	0%	
Other	4%	4%	2%	3%	
n	972	547	135	60	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

The average number of years since release in the national catalogue of hybrid and OPV varieties used by farming households is 10 years (see Table 33). Seeds are, on average, recycled for 7 seasons before they are renewed.

Table 34 shows the source of seeds, which varies per variety type. Seed from community members' fields are the most important sources for local varieties. OPVs, on the other hand, are most often obtained from seed companies, followed by community members' fields. Hybrids are most often acquired at market stalls and from seed companies. However, 11% of farm households that indicated cultivating a hybrid variety, shows that these seeds were, in fact, recycled from the field of a community member. This suggests that not all farmers have knowledge on the use of hybrids, since 2nd generation (recycled) hybrid seeds have lost their favourable variety traits and therefore should not be recycled.

Table 33: Age of main maize variety (years), primeira safra

Age of main variety (years), *primeira safra*	All	Male-headed	Female-headed	sig
mean	20.0	20.0	19.8	
median	24.0	24.0	24.0	
n	134	117	17	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

n = number of Hybrid/OPV varieties of which the age could be classified. Age could not be classified for % of Hybrid and OPV varieties.

Table 34: Source of seed of main maize variety (percentage of households per source), by type of variety, primeira safra

Source of the seed, primeira safra	All	Local variety	OPV	Hybrid	sig
Recycled from the field of friend/family/neighbour… etc.	52%	83%	22%	11%	
Seed producer	5%	2%	8%	14%	
Seed company	11%	1%	31%	19%	
Agro-dealer	2%	0%	5%	3%	***
Market stall (not specifically for inputs)	21%	14%	18%	38%	
Farmer Organisation	3%	0%	5%	5%	
NGO distribution	5%	0%	6%	8%	
Other	1%	0%	5%	2%	
n	331	127	80	37	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Categories smaller than 1% are combined in 'Other'

Some yield differences exist between different variety types, as shown in Table 35. In line with expectations, yields are highest for households cultivating hybrid varieties. However, contrary to expectations, local varieties had higher yields than OPV varieties, which might be due to the large number of seasons households recycle their seeds (which leads to OPVs losing their traits).

Table 35: Average maize yield (kg/ha), by type of variety, primeira safra

Maize yield (kg/ha), *primeira safra*	All	Local variety	OPV	Hybrid	sig
mean	399.0	410.4	367.3	468.2	*
median	333.3	368.0	300.0	387.5	
n	817	476	120	48	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Planting practices

Table 36 shows the percentage of farm households adopting endorsed planting practices (8%). In Mozambique, the planting practice promoted by AGRA concerns spacing and the number of seeds per hole: farmers are advised to plant two seeds per hole. In the different areas where AGRA is active, spacing of 80 cm intra-row and 50 cm inter-row, 90cm*40cm and 75cm*50cm is advised; around 22% of households use this endorsed planting practice.

Table 36: Main indicator for the adoption of endorsed planting practice

	All	Male-headed	Female-headed
3.4 Adoption of endorsed planting practice (%)	8%	9%	8%

In Mozambique, 66% of households plants their maize seeds using fixed spacing; 31% plant their seeds without measuring distances (scattering) and 2% broadcast their seeds. Out of the people planting in holes (that is, the people who plant using fixed spacing and the people scattering their seeds), 90% sows more than one seed per hole. Table 37 shows that 25-75cm is the most commonly used spacing, one of the spacing that was promoted by AGRA

and its partners. 20-80cm, also promoted is used by 17% of the households using fix-spacing.

Table 37: Spacing between maize seeds (percentage of households per method), primeira safra

Planting method, spacing, *primeira safra*	All	Male-headed	Female-headed	sig
25-75 cm	62%	59%	77%	
50-75 cm	5%	5%	3%	
20-80 cm	17%	19%	8%	***
40-90 cm	4%	4%	2%	
50-80 cm	6%	6%	9%	
Other	6%	6%	2%	
n	652	548	104	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Categories smaller than 1% are combined in 'Other'

Fertiliser use

Table 38 presents the main indicators on fertiliser use; only a small share of households (11%) applies inorganic fertiliser. Farmers that apply fertiliser typically do this on all their cultivated land, so in total, 13% maize land gets applied with fertilisers.

Table 38: Main indicators for the adoption and use of fertilisers

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	11%	12%	6%
3.6 Adoption of endorsed fertiliser (%)	9%	10%	5%
3.7 Adoption of organic fertiliser (%)	2%	2%	1%
3.15 Area under inorganic fertiliser (%)	13%	13%	13%
5. Nitrogen application (kg/ha)	2.3	2.5	1.3
5.1 Phosphorus application (kg/ha)	0.5	0.5	0.2
5.2 Potassium application (kg/ha)	0.3	0.3	0.0
Average fertiliser use (Total N + P + K, kg/ha)	3.0	3.2	1.5

In Mozambique, AGRA promotes a variety of fertilisers, which include NPK 12-23-0, Urea, Yara Milla Cereal (NPK 23-10-5 + Mg + Zn) and NPK 12-24-12. Despite the large number of fertilisers being promoted, only 8% of households took up these fertilisers. Other fertilisers used were NPK fertilisers with different formulas.

On average, NPK-users apply 54 kilogrammes of NPK per ha (not including Yara mixes). Urea-users application is on average 48 kg/ha, which is less than the promoted quantity, which is about 100 kg/ha for each of the fertilisers.

Nutrient application is low due to the low number of households applying fertilisers. Nitrogen is the macronutrient applied in the largest quantity (2.3 kg/ha), followed by phosphorous (0.5

kg/ha) and potassium (0.3 kg/ha). Male-headed households have higher average application rates for potassium. Almost no farmer in Mozambique applies micronutrients (see Table 39).

Table 39: Nutrients applied for maize (kg/ha), primeira safra

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), primeira safra	2.3	2.5	1.3	
Phosphorus application (kg/ha), primeira safra	0.5	0.5	0.2	
Potassium application (kg/ha), primeira safra	0.3	0.3	0.0	**
Sulphur application (kg/ha), primeira safra	0.1	0.1	0.1	
Calcium application (kg/ha), primeira safra	0.0	0.0	0.1	
Magnesium application (kg/ha), primeira safra	0.1	0.1	0.0	
Boron application (kg/ha), primeira safra	0.0	0.0	0.0	NA
Zinc application (kg/ha, primeira safra	0.1	0.1	0.0	
n	970	797	173	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

n = households that cultivated maize

The most common source of information on fertiliser types is households' own knowledge: 35% indicates being self-taught. After that, households often learn about fertiliser types from observation in the community (24%) and 16% of households stated they received information on fertiliser type from the VBA. Most households (64%) have been using fertiliser for longer than five years; only 5% started to use fertiliser only this season. The most common fertiliser application method is top dressing around four weeks after planting; 47% uses this method, which is promoted by consortium partners. Top dressing at other moments is popular as well: 32% of interviewed households used this method. Additionally, 16% applied fertiliser with the seed at the time of planting, and 10% applied fertiliser at land preparation.

Surprisingly, organic fertiliser use is even lower than inorganic fertiliser application; only 2% of households in the sample makes use of organic fertiliser. Among the households that do apply organic fertiliser, manure is most popular, followed (at a distance) by compost and crop residues (see Table 40). Information on organic fertilisers mainly comes from traditional knowledge; most farm households (67%) obtain information on organic fertiliser from other people in their household or community members. VBAs informed 17% of the households on organic fertiliser use. The large majority of farmers has used organic fertiliser longer than four years; only 12% started applying organic fertiliser this season or the season before.

Table 40: Types of organic fertiliser used for maize (percentage of households per type)

Types of organic fertiliser	All	Male-headed	Female-headed	sig
Granular	11%	12%	0%	
Compost	17%	19%	0%	
Manure	67%	62%	100%	
Crop residues	17%	19%	0%	
n	18	16	2	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

n = households that apply fertiliser

Table 41 shows a large and significant difference in maize production between households applying fertiliser and those that do not apply fertiliser. On average, fertiliser-applying households produce 273 kg more than the non-appliers; this difference is highly significant.

Table 41: Total production of maize (kg), by fertiliser use (yes/no), primeira safra

Total maize production (kg), *primeira safra*	**All**	**No**	**Yes**	**sig**
mean	721.5	689.0	962.3	***
median	500.0	469.2	750.0	
n	866	763	103	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

However, when looking at yields, this significant difference is no longer present (see Table 42). The households that apply fertiliser seem to have a slightly higher yield, but this difference is not statistically significant, which can be explained by looking at the characteristics of households that apply fertiliser. Fertiliser appliers have significantly larger amounts of land than household who do not apply fertilisers, which shows that there is no significant difference in yields. Although nothing can be concluded about the relationship between fertiliser and productivity, it can be concluded that fertilisers are usually taken up by larger farmers (in terms of farm size).

Table 42: Average maize yield (kg/ha), by fertiliser use (yes/no), primeira safra

Maize yield (kg/ha), *primeira safra*	**All**	**No**	**Yes**	**sig**
mean	399.0	394.3	435.1	
median	333.3	333.3	379.0	
n	817	724	93	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Pest management practices

Table 43 shows the percentage of households that have adopted pest management practices. Adoption of pest-management practices is defined as the percentage of households applying pesticides, herbicides and/or fungicides. The table shows that the uptake of pest-management practices is very low in Mozambique.

Table 43: Adoption of pest-management practices

	All	**Male-headed**	**Female-headed**
3.9 Adoption of pest-management practices (%)	2%	3%	1%

All three types of agro-chemicals (herbicides, pesticides and fungicides) are applied by only 1% of the sample (see Table 44). Among female-headed households, the use is even lower: only 1% of female-headed households applies herbicides. Fungicides and pesticides are (despite the large prevalence of the pest fall armyworm) not applied by female-headed households.

Table 44: Percentage of households applying agro-chemical inputs, primeira safra

	All	Male-headed	Female-headed	sig
Pesticide application, primeira safra	1%	1%	0%	
Herbicide application, primeira safra	1%	1%	1%	
Fungicide application, primeira safra	1%	1%	0%	
n	972	799	173	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Since the adoption rate of pest-management practices is low, the share of land treated with pesticides, herbicides and fungicides is equally low. Only 1% of the maize land gets applied with pesticides and herbicides, while less than 1% gets applied with fungicides (see Table 45). All households that do apply agro-chemicals, apply them on all of their maize land.

Table 45: Percentage of total land area used for maize cultivation under agro-chemical inputs, primeira safra

	All	Male-headed	Female-headed	sig
Percentage of total land area under pesticides, primeira safra	1%	1%	0%	
Percentage of total land area under herbicides, primeira safra	1%	1%	1%	
Percentage of total land area under fungicides, primeira safra	0%	1%	0%	
n	1,006	825	181	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Slightly more than half of households who apply herbicides (55%), apply them pre-emergence. Post-emergence application is done by 45% of households (see Table 46). While herbicide application is low, almost all households (97%) apply weeding. On average, people weed their crops between two and three times per season.

Table 46: Timing of herbicide application for maize (percentage of households per answer), primeira safra

	All	Male-headed	Female-headed	sig
Pre-emergence	55%	50%	100%	
Post-emergence	45%	50%	0%	
n	11	10	1	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

n = households that apply herbicides

When it comes to pesticides, most households (72%) do not know which type of pesticides they apply. The remainder of households applies Imperator (promoted by AGRA against fall armyworm) and Cipermetrina (see Table 47).

Most households started applying pesticides only recently (one or two seasons ago). Almost one third of households only started applying pesticides last wet season. Information on pesticide is most often obtained from NGO extension services; 55% indicated having learned about pesticides this way.

Table 47: Type of pesticides applied (percentage of households per type), primeira safra for maize (percentage of households per type)

Types of pesticides	All	Male-headed	Female-headed	sig
Imperator	9%	9%	NA%	
Cipemetrina	18%	18%	NA%	
Other	64%	64%	NA%	
n	11	11	0	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 0.1% are combined in 'Other'

n = households that apply pesticides

Post-harvest practices

Table 48 shows the main indicators on the post-harvest practices endorsed by AGRA with the purpose of minimising post-harvest losses. Various post-harvest practices are captured in four indicators. The adoption of endorsed post-harvest practices (indicator 3.10) is defined as the use of a sheet or tarpaulin at least once during maize processing (drying and threshing). The adoption of improved storage facilities (indicator 3.11) measures the percentage of farmers storing maize in silos or improved storage bags (such as Purdue Improved Crop Storage (PICS) bags, super bags and treated raffia). Households use designated storage facilities (indicator 3.12) when they store maize at farmer's organisations, private storage facilities, or through the warehouse receipt systems. Finally, post-harvest practices also include the adoption rate of tablets to preserve quality of recycled seed (indicator 3.13).

Table 48: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	54%	54%	51%
3.11 Adoption of improved storage (%)	14%	14%	14%
3.12 Use of designated storage facilities (%)	0%	0%	0%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	26%	27%	23%

More than half of the households (54%) use a tarpaulin at least once during processing; mostly, this happens in the threshing phase. Table 49 shows that the large majority of households (95%) let their maize dry in the field only. Among 5% of households that let their maize dry outside the field, a slight majority uses tarpaulins. However, the total share of farmers drying on a tarpaulin is low: only 3% of the sample uses them in the drying process. There is not much external information available about drying practices: 56% indicated having taught themselves how to dry maize, while 40% learned about it from other community members. Only 3% of the households received information on drying practices from external sources such as VBAs, NGO extension workers and farmers organisations.

A tarpaulin is used by 38% of households drying maize (a practice promoted by AGRA). Most people who do use a tarpaulin have been doing so for a long time already (over four years).

Table 49: Drying method for maize (percentage of households), primeira safra

Main method for drying maize, ***primeira safra***	All	Male-headed	Female-headed	sig
In field only	95%	94%	97%	
On the ground	2%	2%	1%	
On sheets/tarpaulins	3%	3%	2%	
Temporary shed	0%	0%	0%	
Drying sheds	0%	0%	0%	
Other	1%	1%	1%	
n	972	799	173	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Tarpaulin use is higher for threshing maize: among the households that manually thresh maize (about 90% of the sample), tarpaulin use during threshing was 58% (see Table 50). Again, household's main source of information on tarpaulin use is observation in the community (96%); 90% of households that use tarpaulins for threshing have been doing so over four years.

In addition to tarpaulin use, AGRA promotes the use of a drying shed and concrete slabs for drying. However, these practices were not (yet) widely taken up.

Table 50: Use of sheets for manual threshing of maize (percentage of households), primeira safra

Usage of sheet/tarpaulin when threshing maize, ***primeira safra***	All	Male-headed	Female-headed	sig
mean	58%	58%	56%	
n	903	744	159	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

AGRA promotes the use of threshing machines for maize. As can be seen in Table 31, the subset of households that manually threshes maize is low: only 6% manually threshes maize.

When it comes to improved storage facilities, AGRA promotes the use of silos, and various bags, such as PICS bags, super bags and treated raffia. Table 51 shows that about 13% of the households make use of silos for storing maize. An additional 1% stores maize in bags, which brings use of improved storage facilities to 14% in total.

Table 51: Use of preservative tablets for maize seeds, primeira safra

Usage of silos to store maize, ***primeira safra***	All	Male-headed	Female-headed	sig
mean	26%	27%	23%	
n	676	564	112	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

The use of preservative tablets that prevent losses in seed is shown in Table 52, 26% of farmers recycling seed makes use of tablets that prevent quality loss in their seed stock.

Table 52: Use of preservative tablets for maize seeds, primeira safra

Usage of preservative tablets for maize seed, primeira safra	All	Male headed	Female headed	sig
mean	26%	27%	23%	
n	676	564	112	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Besides stocking maize with the purpose of personal consumption later, it can also be stocked for the purpose of selling it later (when prices are higher). About 8% of households stock maize for this purpose. On average, households stocked 287 kg. The percentage of households using designated storage facilities is very low. Table 53 shows that the large majority of households (98%) makes use of their own storage facilities; only 2% of households that stock make use of the storage facilities at the farmers' organisation. However, as this only concerns a few households, the overall percentage of households making use of improved storage facilities is close to 0%.

Table 53: Type of storage used for maize (percentage of households per type), primeira safra

	All	Male-headed	Female-headed	sig
Own storage	98%	98%	100%	
Farmer organisation storage	2%	2%	0%	
Warehouse receipt system	0%	0%	0%	NA
Private storage rental	0%	0%	0%	NA
n	95	80	15	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Finally, AGRA promotes the use of a moisture meter when selling and stocking maize. The use of moisture meters has been taken up, but is not yet widely spread; about 14% of the households indicated having used a moisture meter when selling maize to a buyer. At the aggregation centre, uptake is much lower though. At the aggregation centre, a moisture meter was used by only one farmer.

7.7 Access to agricultural advisory extension support services (indicator 4)

Access to agricultural advisory extension support services is defined as the percentage of households that interacted with an agricultural extension officer during the last 12 months. During these months, exactly half of households were visited by an agricultural extension officer (see Table 54). On average, households that met with an extension officer were visited between two and three times.

Table 54: Main indicators for access to agricultural advisory support services

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	50%	49%	51%
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.3	2.3	2.2
4.2 Received small seed pack (%) (additional indicator 4)	33%	33%	30%
4.3 Used small seed pack (%) (additional indicator 4)	82%	83%	76%
4.4 Distance to nearest agro dealer (minutes)	97.2	98.0	94.1

Table 55 shows that extension officers were most often VBAs (80%). Households were also visited by NGO extension agents (in 35% of the cases) and extension agents affiliated with companies (19%). Male-headed households were more often visited by extension agents affiliated with NGOs, while female-headed households were more often visited by VBAs.

Table 55: Affiliation of extension service provider (percentage of households per provider)

Type	All	Male-headed	Female-headed	sig
Government	10%	10%	9%	
Company	19%	18%	24%	
NGO	35%	37%	26%	**
Farmer promoter/VBA	80%	79%	87%	*
Cooperative	7%	6%	10%	
Other	0%	0%	1%	
n	500	407	93	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

The extension method that is most common is support from the VBA (see Table 56): 38% of farmers indicated having received support from VBAs. Attending demonstrations on demonstration plots, mentoring by lead farmers and transfer of knowledge at the farmers' organisation were mentioned by 24%, 13% and 13% of the farmers, respectively. These activities are all part of AGRA's interventions.

Table 56: Type of extension method used (percentage of households per method)

Method	All	Male-headed	Female-headed	sig
None	47%	48%	46%	
Support by farmer promoter	38%	38%	39%	
Demonstration plot	24%	25%	23%	
Mentoring by lead farmers	13%	12%	15%	
Transfer of knowledge within farmer organisation//training of trainers	13%	13%	16%	

Method	All	Male-headed	Female-headed	sig
Farmer Field Schools	11%	11%	10%	
Technology packages	6%	5%	8%	
Don't know	3%	3%	3%	
Other	0%	0%	0%	
n	1,006	825	181	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Another aspect of advisory extension services is the distribution and use of promotional seed packs. Table 54 shows that only 33% of farm households has received a small maize seed pack in 2018. The uptake of the promotional seed packs is higher: 82% of households that received the seed pack indicates having planted the seeds from the seed pack.

Most households that planted the seed packs were appreciative of them. In total, 84% of the households liked the seeds from the seed pack, while only 14% did not like them. Table 57 shows that the main reasons for appreciating the seeds were maturing time (61%), taste (51%) and yields. Female-headed households were more often appreciative because of maturing time and buyer appreciation, while male-headed households were more often appreciative because of colour.

Table 57: Variety traits that are positively appreciated of the promotional maize seed pack (percentage of households per trait)

Maize variety traits	All	Male-headed	Female-headed	sig
Maturing time	61%	58%	77%	**
Taste	51%	48%	63%	
Yields	47%	47%	46%	
Colour	26%	29%	11%	**
It was free	24%	23%	29%	
Processing	19%	19%	23%	
Conservation (storage time)	17%	17%	17%	
Tolerance to pests	15%	16%	9%	
Tolerance to droughts	13%	12%	20%	
Tolerance to diseases	9%	9%	9%	
Tolerance to floods	8%	9%	6%	
Appreciated by buyers (market)	7%	5%	14%	**
Price and/or premium from buyers	4%	3%	9%	
Only variety available	2%	2%	0%	
Other	3%	3%	3%	
n	227	192	35	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

n = households that appreciated the seeds from the promotional seed pack

Access to agricultural extension services also includes distance to the nearest agro-dealer. Distance to agro-dealers is measured based on travel time. As can be seen in Table 58, average distance to agro-dealers is 11.6 km. Households report that it takes them, on average, 97 minutes to reach an agro-dealer.[2] This means that households in the sample live, on average, far away from agro-dealers. The average distance to agro-dealers in kilometres is 11.6. When visiting the agro-dealer, households most often travel by foot (53%), by bicycle (25%) and by car (17%).

Table 58: Average distance to agro-dealer (kilometres)

Distance to agro-dealer in km	All	Male-headed	Female-headed	sig
mean	11.6	11.5	12.1	
median	10.0	9.0	10.0	
n	306	255	51	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
n = number of people who answered in distance-unit

7.8 Access to formal financial services (indicator 13)

Table 59 shows that only 9% of surveyed households have access to formal financial services, which means that 9% of households have access to at least one bank account, formal agricultural loan, or agricultural insurance. This indicator only includes access to formal financial services (provided by formal financial institutions), and excludes access to informal financial services, such as services provided by village money lenders, relatives, or saving groups.

Table 59: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13. Access to formal financial services (%)	9%	10%	6%
13.1 Bank account (%)	8%	9%	5%
13.2 Agricultural loan (%)	1%	1%	2%
13.3 Agricultural insurance (%)	1%	1%	1%

The financial service that is used most is (by far) a bank account. Yet only 8% of households have a bank account. Only 1% of farmers took a loan through a formal arrangement (banks, microfinance institutions, savings and credit cooperatives or mobile money). However, in total, 6% of farmers took a loan in 2018. The remainder of the loans were informal. Only 1% of farmers had agricultural insurance in 2018.

Table 60 shows the types of loan providers that are being used. It shows that that 27% of loans are provided by formal financial institutions (SACCO, bank or MFI). Most common are loans from family or friends (62%). The table also shows that female-headed households more often took up loans from microfinance institutions (significant at the 1% level), but as

[2] Households that did not know the distance in miles or kilometres were asked to report travel time to the nearest agro-dealer.

only five female-headed households answered the question, this number is not very representative.

Table 60: Types of loan providers (percentage of households per provider)

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	62%	65%	40%	
Village money lender	5%	6%	0%	
Microfinance institution (MFI)	2%	0%	20%	***
Bank	25%	24%	40%	
Trader	5%	6%	0%	
Company	2%	2%	0%	
Other	0%	0%	0%	NA
n	56	51	5	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Excluding households that did not take loans

7.9 Post-harvest losses (indicator 6)

Post-harvest losses are measured by the maize that was lost after harvesting as a share of total production.

Table 61: Main indicator for post-harvest losses

	All	Male-headed	Female-headed
6. Percent of post-harvest losses (%)	1%	1%	0%

Table 61 shows that post-harvest losses are low; the average of 1% indicates that almost no maize was lost post-harvest. The majority of the sample (93%) did not lose any maize post-harvest. Losses of the remainder of the sample were low. Farmers lost between 2 and 500 kilogrammes, which is on average 81 kg. While interpreting this data, it should, however, be kept in mind that post-harvest losses are typically difficult to estimate for farmers, as losses are typically not measured.

7.10 Access to market information (indicator 37)

Access to reliable market information is extremely low in Mozambique. Almost none of the maize farm households (average 0%) has access to formal channels of market information, such as information through SMS, radio, television, internet and the farmer's organisation (see Table 62).

Table 62: Main indicator for access to market information

	All	Male-headed	Female-headed
37. Access to market information through formal channel (%)	0%	1%	0%

Farmers do, however, use informal channels to collect market information. Table 63 shows that amongst farmers that sell their maize, market information is mainly acquired from buyers (61%), at the market itself (22%) and from other farmers (21%). Only 1% of households received price information from the farmer's organisation.

Table 63: Sources of market information used by farmers (percentage of households per source)

Source of market information	All	Male-headed	Female-headed	sig
Buyer	61%	61%	62%	
Farmer to farmer	21%	20%	31%	**
Market	22%	21%	25%	
Farmer organisation	1%	2%	0%	
Other	1%	1%	2%	
n	397	333	64	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

n = households that sold maize

7.11 Sales channels (indicator 33)

Table 64 shows the main indicators for farmers' sales channels. It includes information on sales through structured trading facilities or arrangements, as well as information on farmers' clients.

Table 64: Main indicators on farmers' sales channels

	All	Male-headed	Female-headed
33. Sale through structured trading facilities/arrangements (%)	4%	4%	3%
33.1 Selling to traders/middlemen (%)	70%	71%	66%
33.2 Selling to consumers (%)	17%	17%	17%
33.3 Selling to friends/neighbours (%)	18%	16%	27%
33.4 Selling to aggregation centre (%)	1%	2%	0%
33.5 Selling to farmer organisation (%)	1%	1%	3%
33.6 Selling to wholesalers (%)	11%	11%	9%
33.7 Selling to processors (%)	0%	0%	0%
33.8 Selling to retailers (%)	10%	10%	10%
33.9 Selling to company (undefined) (%)	6%	7%	4%
33.10 Selling to institutional buyers (%)	1%	1%	1%

A household is considered selling through a structured trading facility when they sell at least part of their harvest through a formal contract. Only 4% of farmers sell their harvest under a formal contract. About 40% of them receives inputs on credit as part of the contract. In all cases, these inputs were seeds. In 50% of cases, this seed was supplemented with fertiliser.

Households selling though contracts received similar prices as households who did not sell through contracts. However, their revenues were significantly higher since, on average, they sold larger quantities (see Table 65).[3]

Table 65: Sales value (total revenue) of maize sold, primeira safra *with/without contract*

Revenue from sales of maize, primeira safra (MT)	**No contract**	**Contract**	**sig**
mean	4437.9	7762.5	*
median	2000.0	4400.0	
n	294	8	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Total revenue includes revenue from dry maize and green maize

Table 64 shows that farmers' clients are mainly traders or middlemen (70%). Households also regularly sell to friends and neighbours (18%), consumers (17%) and wholesalers (11%).

7.12 Value of incremental sales as a result of AGRA (indicator 10)

The value of incremental sales as a result of AGRA cannot be determined yet as only one round of data collection has been completed. Therefore, total revenues from maize sales are reported as a baseline value. Revenues were calculated by multiplying the quantity sold (in kg) by the common price received per kilogramme. Values were converted to kilogrammes in case quantities were reported in different units.

Table 66: Value of incremental sales as a result of AGRA

	All	**Male-headed**	**Female-headed**
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	29.6	29.6	29.6

On average, the revenue from selling maize is US$29. Total household revenues from maize sales in Mozambican Metical are shown in Table 67. There is no significant difference between male-headed and female-headed households.

Table 67: Sales value (total revenue) of maize sold, primeira safra *– calculated variable (IO5.3 – 36) – KIT indicator 10*

Revenue from sales of maize, *primeira safra* (MT)	**All**	**Male-headed**	**Female-headed**	**sig**
mean	1783.0	1782.8	1783.9	
median	0.0	0.0	0.0	
n	778	635	143	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Total revenue includes revenue from dry maize and green maize

[3] More information on prices and revenues can be found in the next section

Households, on average, receive MT20.8 per kg of maize. There is no significant difference in price received by male-headed and female-headed households (see Table 68).

Table 68: Price received for maize (MT)

Common price received for maize (MT/kg), primeira safra	All	Male-headed	Female-headed	sig
mean	20.8	20.3	22.7	
median	12.0	12.0	14.4	
n	266	213	53	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
n = households that sold maize

There are, however, quite some differences in allocation of maize between male-headed and female-headed households. Table 69 shows that male-headed households, on average, sell larger shares of their harvest. This difference of about 5% point is highly significant. Male-headed households also keep slightly larger shares of their harvest for seed stock, while female-headed households use significantly higher shares for consumption.

Table 69: Allocation of maize harvest for different household uses (percentage of total harvest)

	All	Male-headed	Female-headed	sig
Maize used for consumption (% of harvest), *primeira safra*	65%	64%	70%	**
Maize kept for seed (% of harvest), *primeira safra*	6%	6%	5%	*
Maize given away (% of harvest), *primeira safra*	4%	4%	4%	
Maize used as payment for inputs (% of harvest), *primeira safra*	1%	1%	2%	
Maize bartered or exchanged for goods (% of harvest), *primeira safra*	1%	1%	2%	
Maize sold (% of harvest), *primeira safra*	20%	21%	14%	***
Post-harvest losses of maize (% of total harvest), *primeira safra*	1%	1%	0%	
n	862	711	151	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

In addition to the value of the quantity that was sold, KIT also calculated the value of the total production, which was done by multiplying the total production by the common price received by the household. In 2018, the average value of total production (the share that was sold and the share that was not sold) was US$290 (MT17,485) per household.

Table 70: Crop value (Metical) of maize produced

	All	Male-headed	Female-headed
Average value of production in Metical	17,485	16,411	21,739
n = households that sold maize			

Table 71: Crop value (US$) of maize produced

	All	Male-headed	Female-headed
Average value of production in US$	290	272	360

n = households that sold maize

8 Household-level results: soybean in Nampula, Manica and Tete provinces (2018)

8.1 Sample description

Survey area
Soybean farming households were interviewed in the same provinces as maize farming households; though in different communities. For the soybean sample, only communities with VBAs known to work on soybean were included in the sampling. Soybean is a relatively new crop in Mozambique, but since it is gaining popularity as a cash crop (resulting from a more stable demand from the poultry industry) AGRA has been making efforts to introduce it among beneficiaries. However, since the data team had indications that the uptake of soybean as a crop was still low, the size of the soybean sample was increased to 1,375 households in order to have sufficient observations.

So, 1,375 households were visited and interviewed on soybean uptake. However, was even lower than expected. Out of the entire sample, only 292 households had actually cultivated soybean in 2018; this is 21% of the sample.

In Nampula province, interviews were conducted in six districts: Monapo, Meconta, Rapale, Malema Ribaue and Murrupula. In Manica province, interviews were conducted in the district of Barue. In Tete, interviews were conducted in two districts: Angônia and Tsangano. Figure 11 shows the distribution of interview locations on the map.

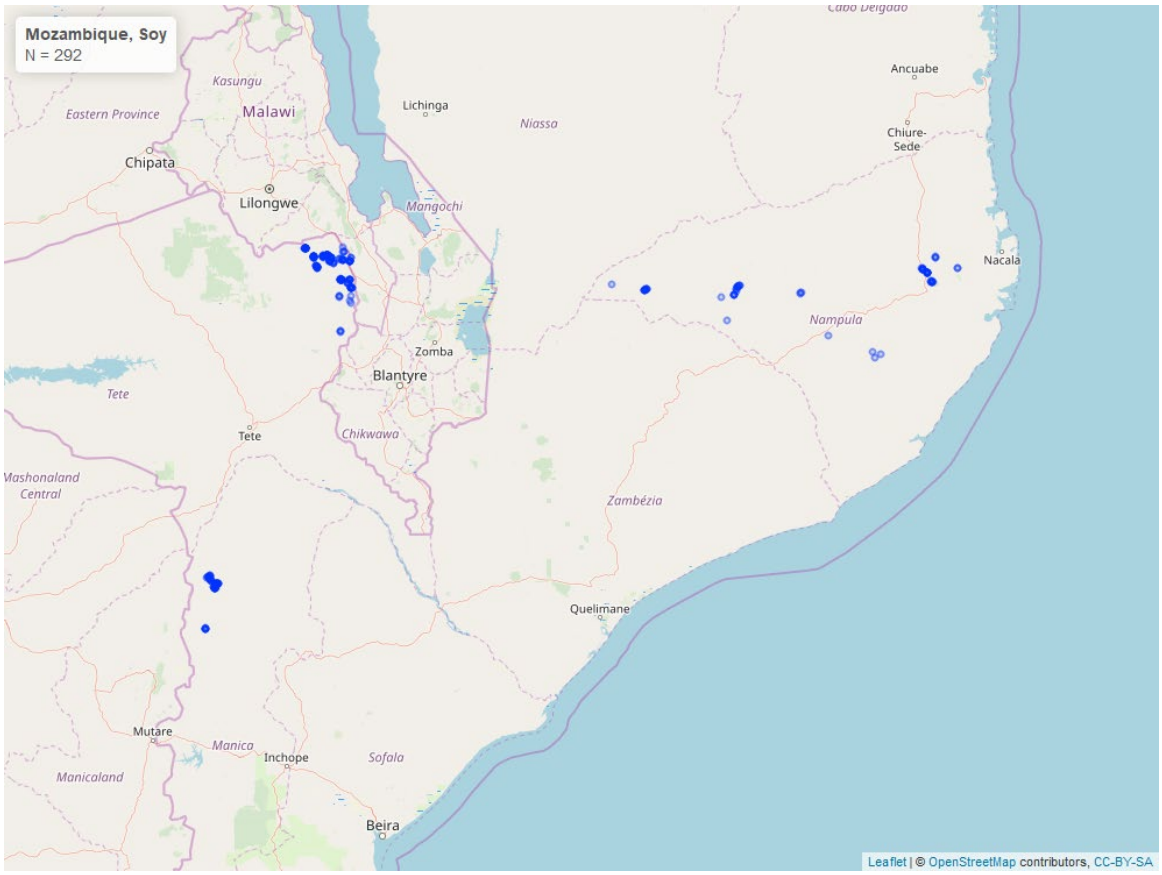


Figure 11: Location of farm household interviews, soybean sample

Farm household characteristics

Respondents were all beneficiaries of AGRA interventions. A small majority of respondents (55%) was male. In 68% of cases, the beneficiary was also the head of the household. Respondents are, on average, 40 years old (see Figure 12).

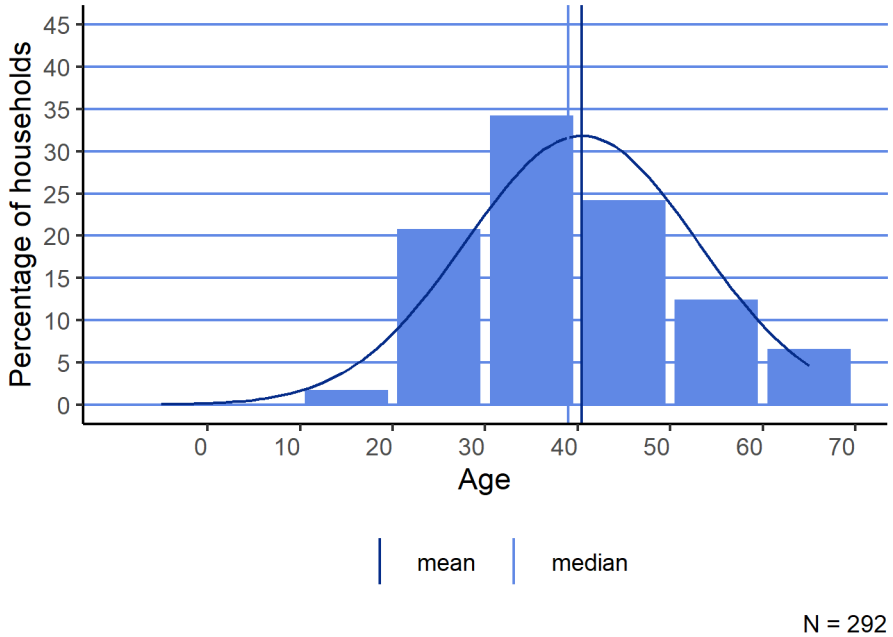


Figure 12: Distribution of respondent age

The share of female-headed households is about 18%. On average, households consist of 6 members: 2.5 adults and 3.4 children (see Table 72). It stands out that female-headed households have, on average, lower numbers of adults in the household; this difference is small, but highly significant.

Table 72: Household composition

Adult/Children	All	Male-headed	Female-headed	sig
Number of children in the household	3.4	3.5	2.9	
Number of adults in the household	2.5	2.6	2.2	***
n	292	247	45	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

All households, without exception, own agricultural land. The average amount of land owned is 2.5 ha. In almost all cases, households cultivate all their land. The average amount of cultivated land is therefore a little less than the land owned at 2.45 ha. Figure 13 shows that only 0.9 ha is, on average, used for soybean cultivation. The other part of the land is thus used for other crops. Besides soybean, farmers often cultivate maize or beans.

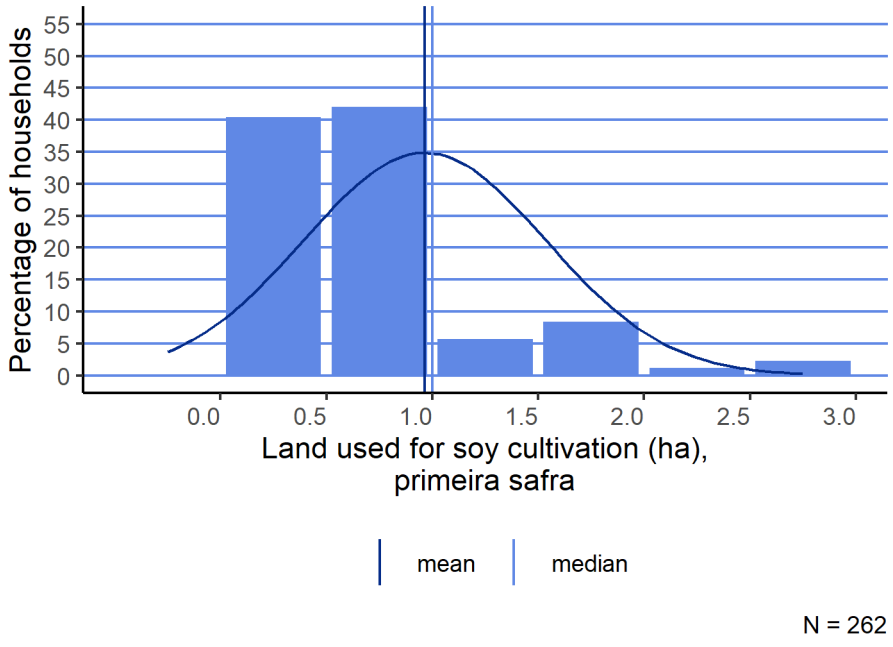


Figure 13: Land allocated to soybean (ha), primeira safra

Mozambique has two farming seasons for soybean: the *primeira safra agricola* (or *saison principale*), which is the main season, and the *segunda safra Agricola* (or *saison segunda*), which is the second season. The main season ranges from October until January. Table 73 shows that most households (95%) cultivated soybean in the first season and that only 5% cultivated soybean in the second season. As this 5% comes down to only 14 households, this report only presents data for the main season.

Table 73: Percentage of households producing soybean, per season

	All	Male-headed	Female-headed	sig
Primeira safra	96%	96%	98%	
Segunda safra	5%	5%	4%	
n	292	247	45	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

8.2 Main indicators

Table 74 gives an overview of the primary indicators collected. See Annex 13. Data dictionary of main indicators for a data dictionary with definitions for each indicator. The indicators and the underlying behavioural patterns are discussed in further detail in the following sections.

Table 74: Overview of main indicators for soybean-farming households

	All	Male-headed	Female-headed
Goal indicator 2: Average number of months of adequate household food provision	**11.0**	**11.1**	**10.5***
Goal indicator 6: Wealth assets index score	**-0.597**	**-0.574**	**-0.719***
G6.1 Share of households in first wealth quintile (%)	10%	9%	16%*
G6.2 Share of households in second wealth quintile (%)	22%	20%	36%*
G6.3 Share of households in third wealth quintile (%)	40%	41%	32%*
G6.4 Share of households in fourth wealth quintile (%)	26%	28%	16%*
G6.5 Share of households in fifth wealth quintile (%)	1%	1%	0%*
IWI International Wealth Index	27.0	28.3	19.8
1. Average yield (kg/ha)	**283**	**287**	**257***
3. Rate of application of target improved technologies or management practices	**16%**	**16%**	**18%***
3.1 Adoption of improved varieties (%)	13%	13%	16%*
3.2 Adoption of endorsed varieties (%)	11%	11%	16%*
3.3 Number of seasons variety is recycled	4.7	4.9	3.6*
3.4 Adoption of endorsed planting practice (%)	NA	NA	NA
3.5 Adoption of inorganic fertiliser (%)	4%	4%	2%*

3.6 Adoption of endorsed fertiliser (%)	15%	14%	16%*
3.7 Adoption of organic fertiliser (%)	1%	1%	2%*
3.8 Adoption of inoculants (%)	15%	14%	16%*
3.9 Adoption of pest-management practices (%)	4%	5%	0%*
3.10 Adoption of endorsed post-harvest practices (%)	62%	66%	39%*
3.11 Adoption of improved storage (%)	2%	2%	2%*
3.12 Use of designated storage facilities (%)	0%	0%	0%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	10%	11%	4%*
Hectares under improved technologies or management practices (%)	**12%**	**12%**	**12%***
3.14 Area under improved varieties (%)	12%	12%	12%*
3.15 Area under inorganic fertiliser (%)	3%	3%	3%*
3.16 Area under pesticides (%)	4%	4%	4%*
4. Access to agricultural advisory extension support services	**65%**	**65%**	**62%***
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.4	2.4	2.5*
4.2 Received small seed pack (%) (additional indicator 4)	NA	NA	NA
4.3 Used small seed pack (%) (additional indicator 4)	NA	NA	NA
4.4 Distance to nearest agro dealer (minutes)	96.2	92.4	113.5*
5. Nitrogen application (kg/ha)	**0.5**	**0.6**	**0.2***
5.1 Phosphorus application (kg/ha)	0.2	0.2	0.1*
5.2 Potassium application (kg/ha)	0.1	0.1	0.1*
Average fertiliser use (Total N + P + K, kg/ha)	**0.7**	**0.8**	**0.4**
6. Percent of post-harvest losses (%)	**2%**	**2%**	**2%***
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**41.5**	**39.4**	**50.0***
13. Access to formal financial services (%)	**12%**	**13%**	**9%***
13.1 Bank account (%)	11%	11%	9%*
13.2 Agricultural loan (%)	2%	3%	0%*

13.3 Agricultural insurance (%)	0%	0%	0%*
17. Average age of varieties used (years)	**8.8***	**8.8***	**9.0***
33. Sale through structured trading facilities/arrangements (%)	**2%**	**3%**	**0%***
33.1 Selling to traders/middlemen (%)	60%	61%	55%*
33.2 Selling to consumers (%)	9%	9%	10%*
33.3 Selling to friends/neighbours (%)	6%	5%	12%*
33.4 Selling to aggregation centre (%)	2%	1%	2%*
33.5 Selling to farmer organisation (%)	8%	9%	2%*
33.6 Selling to wholesalers (%)	9%	9%	8%*
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	7%	7%	8%*
33.9 Selling to company (undefined) (%)	10%	9%	10%*
33.10 Selling to institutional buyers (%)	1%	1%	2%*
37. Access to market information through formal channel (%)	**8%**	**9%**	**2%***

The composition of variables can be found in the data dictionary in Annex 13; N might vary across indicators
** indicates that the average has been calculated with less than 50 observations*

8.3 Number of Months of Adequate Household Food Provision (indicator G2)

Table 55 reports the average number of months of adequate household food provision (MAHFP). It shows that the AGRA-supported farmers have, on average, enough food to meet their family's needs during 11 months of the year. Male-headed households were significantly more food secure than female-headed households.

Table 75: Average number of months of adequate household food provision (G2)

	All	Male-headed	Female-headed
G2: Average number of months of adequate household food provision	11.0	11.1	10.5

Figure 14 shows the MAHFP distribution. It shows that 65% of AGRA beneficiaries report having had enough food to meet their family's needs during the entire year. Only 1.71% of the farmers did not have enough food during six months or more. Only one household reported being chronically food insecure.

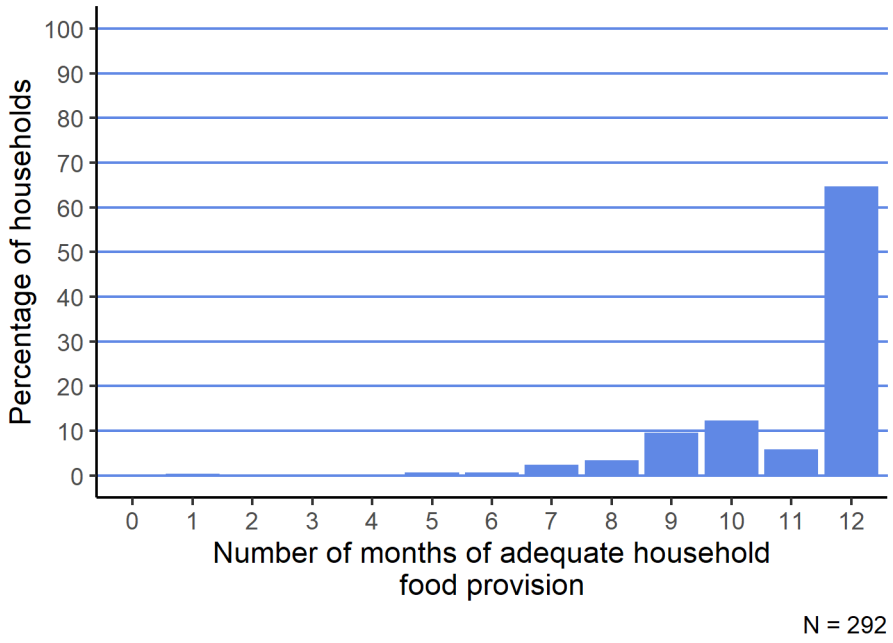


Figure 14: Distribution of number of months of adequate household food provision (G2)

Figure 15 shows the distribution of months with adequate household food provision over the year. The figure shows that food security was lowest in the period January to March. This is in line with expectations, as these months are in the middle of the main cropping season (*primeira safra*) and food insecurity is usually highest right before harvest.

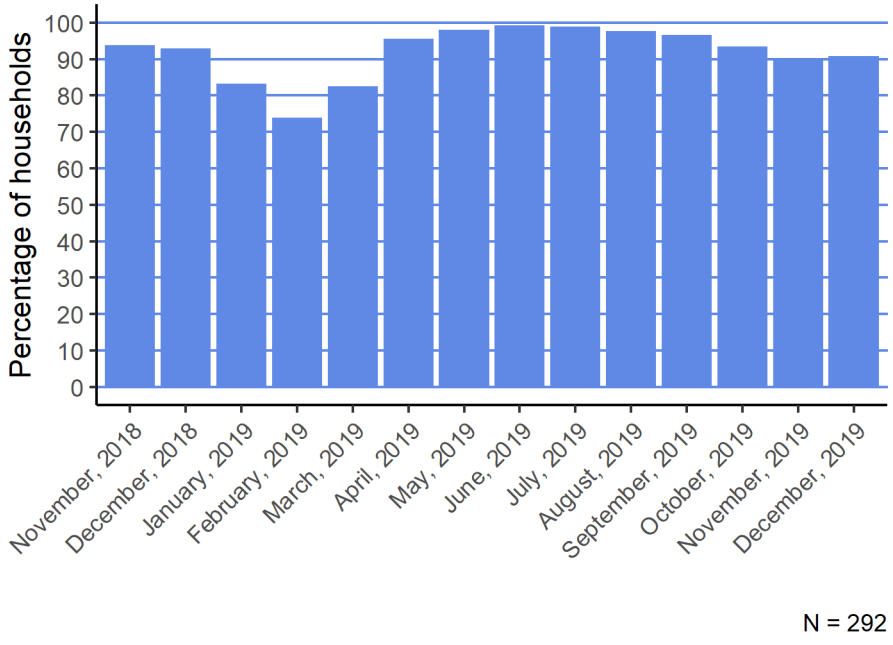


Figure 15: Distribution of months with adequate household food provision

8.4 Wealth asset index score (indicator G6)

Table 76 shows the quintile distribution of the Demographic and Health Surveys (DHS) wealth index. The DHS household wealth index is a composite measure of a household's cumulative living standard. It is composed of data on asset ownership, materials used for

housing construction, and types of water access and sanitation facilities.[4] Wealth index scores were compared with the national Mozambican DHS distribution for rural areas to determine the household's relative wealth compared to the country average. As can be seen from the table, most soybean households are in the 3rd and 4th quintiles. About 10% is in the 1st (poorest) quintile of the country and 1% is in the 5th (wealthiest) quintile. Male-headed households are significantly better off than female-headed households.

Table 76: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	-0.597	-0.574	-0.719
G6.1 Share of households in first wealth quintile (%)	10%	9%	16%
G6.2 Share of households in second wealth quintile (%)	22%	20%	36%
G6.3 Share of households in third wealth quintile (%)	40%	41%	32%
G6.4 Share of households in fourth wealth quintile (%)	26%	28%	16%
G6.5 Share of households in fifth wealth quintile (%)	1%	1%	0%
IWI International Wealth Index	27.0	28.3	19.8

8.5 Yield (indicator 1)

Yield figures are calculated by dividing total production by the amount of land under soybean cultivation. To enhance data accuracy, respondents were able to answer questions in units of their preference for both production and land size. The preferred units for production were generally bags or kilogrammes, while the preferred unit of land size was, in all cases, hectares. Respondents were asked to clarify on bag volume to get a good estimation of the amount of soybean per bag. Production and land data units were then converted to kilogrammes and hectares. Out of the interviewed households, six respondents did not know their soybean production, while 11 respondents did not know how much land was used to cultivate soybean.

Respondents reported an average soybean production of 286 kg. Figure 16 shows the distribution of quantity of soybean harvested. The figure shows a skewed distribution; due to some high production values, the median is lower (200 kg) than the mean.

[4] Source: https://dhsprogram.com/topics/wealth-index/Wealth-Index-Construction.cfm

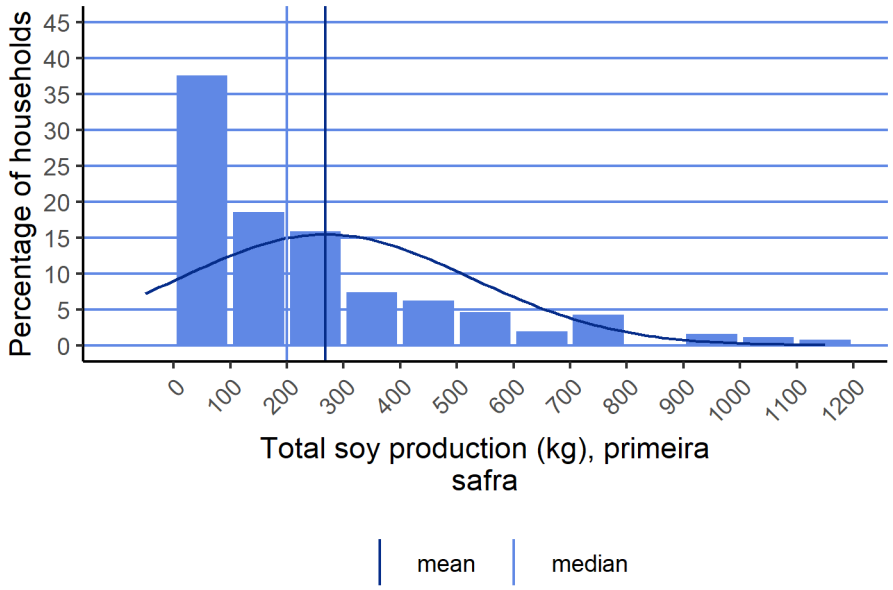


Figure 16: Total production of soybean (kg), primeira safra

Soybean yields are, on average, 282 kg/ha (see Table 77 and Figure 17). This number is very low. Although male-headed households report slightly higher yields, on average, this difference is not statistically significant.

Table 77: Average soybean yield (kg/ha)

	All	Male-headed	Female-headed
1. Average yield (kg/ha)	283	287	257

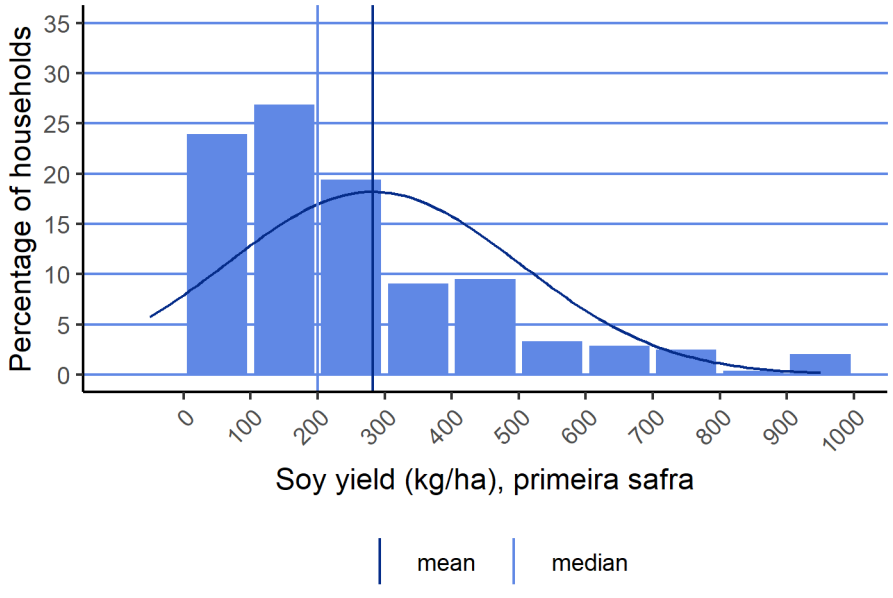


Figure 17: Distribution of average soybean yield (kg/ha), primeira safra

8.6 Rate of application of target improved productivity technologies or management practices (indicator 3, 5, 17)

Improved varieties and recycling

Improved varieties

Table 78 shows that 13% of the farmers make use of improved soybean varieties. In Mozambique, the varieties promoted by AGRA are Jenguma, Songola, Suong-Pungun, TGX-6F, TGX-8F, Wamini, Wima and Zamboeni. In 2018, 11% of farmers used one of these these endorsed varieties (see Table 78).

Table 78: Main indicators for the use of improved varieties, recycling, and planting practices

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	13%	13%	16%
3.2 Adoption of endorsed varieties (%)	11%	11%	16%*
3.3 Number of seasons variety is recycled	4.7	4.9	3.6*
3.4 Adoption of endorsed planting practice (%)	NA	NA	NA
17. Average age of varieties used (years)	8.8	8.8	9.0
Hectares under improved technologies or management practices (%)	12%	12%	12%*

Table 79 lists the soybean varieties grown. It shows that most households don't know the name of the variety cultivated. Most farmers that do know their variety use local varieties. After that, the most frequently-used variety is the promoted variety Wamimi.

Table 79: Soybean varieties used (percentage of households per variety), primeira safra

Varieties	All	Male-headed	Female-headed	sig
Don't know	52%	53%	52%	
Local variety, unspecified	30%	31%	25%	
Wamini (promoted)	9%	8%	14%	
Other	5%	5%	5%	
Dina	1%	1%	2%	
H18	1%	1%	0%	
TGX-8F	1%	1%	2%	
n	280	236	44	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 0.5% are combined in 'Other'

Table 80 groups the varieties that are cultivated in the categories local variety, or improved open-pollinated variety (OPV). It shows that 13% of the farmers have cultivated an improved OPV, while 30% has cultivated local varieties. However, it should be noticed that the large

majority of varieties used by farmers (57%) could not be classified. This results from the large number of farmers not knowing which variety they use.

Table 80: Type of main soybean variety (percentage of households per type), primeira safra

Type of main variety, *primeira safra*	**All**	**Male-headed**	**Female-headed**	**sig**
Not able to classify	57%	56%	59%	
Local variety	30%	31%	25%	
OPV	13%	13%	16%	
n	280	236	44	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

The average age of varieties (that is, the time since release in Mozambique) is 8.8 years. Seeds are, on average, recycled for five seasons before they are renewed. The source where farmers acquire their seed differs per variety type. Local varieties are most often obtained from the field of a community member, while OPVs are most often acquired from NGOs or seed companies (see Table 81).

Table 81: Source of seed of main soybean variety (percentage of households per source), by type of variety, primeira safra

Source of the seed, *primeira safra*	**All**	**Local variety**	**OPV**	**sig**
Recycled from the field of friend/family/neighbour… etc.	29%	45%	15%	
Seed producer	9%	22%	7%	
Seed company	17%	8%	22%	
Agro-dealer	5%	2%	4%	***
Market stall (not specifically for inputs)	12%	8%	11%	
Farmer organisation	8%	4%	0%	
NGO distribution	20%	8%	41%	
Other	0%	3%	0%	
n	171	49	27	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Categories smaller than 1% are combined in 'Other'

Table 82 shows a subset of yields per type of variety. At first sight, it looks like OPVs have substantially higher yields. However, this difference is not significant. There is thus no statistically significant difference in yields between variety types. As the sample size of the variety groups is low, additional research is needed to determine whether this difference is really absent.

Table 82: Average soybean yield (kg/ha), by type of variety, primeira safra

Soybean yield (kg/ha), *primeira safra*	**All**	**Local variety**	**OPV**	**sig**
mean	282.5	264.0	322.5	
median	200.0	200.0	245.0	
n	243	75	32	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Table 83 shows the reasons for choosing a certain variety. It shows that taste and yields are the most important drivers to choose for a certain variety, although many people also use a variety simply because it is the only variety available. The emphasis on taste particularly stands out, since soybean is almost exclusively produced as a cash crop and thus not consumed within the household itself. Interestingly, there are many significant differences in motivations to choose a local variety or OPV. For example, 'yields' is significantly more commonly cited as a motivation to choose for a local variety. Buyer appreciation and tolerance to diseases are also significantly more common motivations for local varieties. OPVs are chosen for many different reasons. What stands out is that 16% indicated having cultivated an OPV variety simply because it was given to them for free.

Table 83: Appreciated traits of the main soybean variety used (percentage of households per trait) by type of variety, primeira safra

Soybean variety traits	All	Local variety	OPV	sig
Taste	41%	31%	41%	
Yields	39%	69%	27%	***
Only variety available	32%	35%	35%	
Colour	25%	33%	22%	
Maturing time	23%	40%	27%	
Appreciated by buyers (market)	19%	37%	14%	***
Price and/or premium from buyers	19%	29%	8%	**
It's the only variety that I know	16%	14%	22%	
Tolerance to diseases	12%	29%	3%	***
Conservation (storage time)	12%	25%	11%	*
Tolerance to floods	10%	26%	3%	***
Tolerance to droughts	10%	25%	5%	**
Processing	10%	29%	5%	***
Tolerance to pests	9%	26%	3%	***
It was free	5%	0%	16%	***
Other	1%	1%	0%	
n	280	84	37	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Fertiliser use

Table 84 presents the main indicators on fertiliser use. Only a small share of farmers (15%) applies inorganic fertiliser. Organic fertiliser is used by an even lower share: only 15 households applied it (1%). Farmers that apply fertiliser typically do this on almost all of their cultivated land. In total, 3% of all soybean land gets applied with fertilisers.

Table 84 Main indicators for the adoption and use of fertilisers

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	4%	4%	2%
3.6 Adoption of endorsed fertiliser (%)	15%	14%	16%*

3.7 Adoption of organic fertiliser (%)	1%	1%	2%
3.15 Area under inorganic fertiliser (%)	3%	3%	3%
5. Nitrogen application (kg/ha)	0.5	0.6	0.2
5.1 Phosphorus application (kg/ha)	0.2	0.2	0.1
5.2 Potassium application (kg/ha)	0.1	0.1	0.1
Average fertiliser use (Total N + P + K, kg/ha)	0.7	0.8	0.4

In terms of nutrient application, nitrogen is the macronutrient applied in the largest quantity (0.5 kg/ha), followed by phosphorous and potassium (0.2 kg/ha and 0.1 kg/ha respectively). No farmer in Mozambique applies secondary macronutrients or micronutrients (see Table 85).

Table 85: Nutrients applied for soybean (kg/ha), primeira safra

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), *primeira safra*	0.5	0.6	0.2	
Phosphorus application (kg/ha), *primeira safra*	0.2	0.2	0.1	
Potassium application (kg/ha), *primeira safra*	0.1	0.1	0.1	
Sulphur application (kg/ha), *primeira safra*	0.0	0.0	0.0	NA
Calcium application (kg/ha), *primeira safra*	0.0	0.0	0.0	NA
Magnesium application (kg/ha), *primeira safra*	0.0	0.0	0.0	NA
Boron application (kg/ha), *primeira safra*	0.0	0.0	0.0	NA
Zinc application (kg/ha, *primeira safra*	0.0	0.0	0.0	NA
n	277	234	43	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

n = households that cultivated soybean

AGRA does promote the use of inoculants for soybean, especially MasterFix. Inoculants are adopted by slightly more than 15% of soybean farm households in Mozambique (see Table 86). Most households that apply inoculants, have learned about them from their VBA (37%). NGO extension workers also informed many households (22%) about inoculant use. Most households only started applying inoculants in 2017 or 2018; only 1% of the households use organic fertiliser.

Table 86: Innoculant use for soybean (percentage of households), primeira safra

Used innoculants, *primeira safra*	All	Male-headed	Female-headed	sig
mean	15%	14%	16%	
n	280	236	44	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

No significant yield differences are found between households who apply fertiliser and households who do not (see Table 87).

Table 87: Average soybean yield (kg/ha), by fertiliser use (yes/no), primeira safra

Soybean yield (kg/ha), *primeira safra*	All	No	Yes	sig
mean	282.5	286.0	220.0	
median	200.0	240.0	150.0	
n	243	230	13	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Pest management practices

Table 88 shows the percentage of households who have adopted pest management practices. Adoption of pest-management practices is defined as the percentage of households applying pesticides, herbicides and/or fungicides. In this sample, the application rates for pest-management practices are low. Only 4% of the sample makes use of these agro-chemicals. Herbicides are used most (albeit by a small share of the sample), followed by pesticides and fungicides (see Table 89).

Table 88 Adoption of pest-management practices

	All	Male-headed	Female-headed
3.9 Adoption of pest-management practices (%)	4%	5%	0%

Table 89: Percentage of households applying agro-chemical inputs for soybean, primeira safra

	All	Male-headed	Female-headed	sig
Pesticide application, *primeira safra*	1%	2%	0%	
Herbicide application, *primeira safra*	3%	3%	0%	
Fungicide application, *primeira safra*	1%	1%	0%	
n	280	236	44	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Since the share of households applying pest-management agro-chemicals is very low, the share of total agricultural soybean land under these chemicals is only 1%.

While the use of herbicides is low, most households apply weeding to get rid of unwanted plants: 96% of the households in the sample undertakes weeding for soybean. On average, households weed two times per season.

Post-harvest practices

Table 90 shows the main indicators on post-harvest practices endorsed by AGRA with the purpose of minimising post-harvest losses. Various post-harvest practices are captured in four indicators. The adoption of endorsed post-harvest practices (indicator 3.10) is defined as the use of a sheet or tarpaulin at least once during soybean processing (drying and threshing). The adoption of improved storage facilities (indicator 3.11) measures the percentage of farmers storing soybean in silos or double liner hermetic storage bags (such as PICS bags). Farm households use designated storage facilities (indicator 3.12) when they store soybean at a farmers' organisation, private storage facilities, or through the warehouse receipt system. Finally, indicator 3.13 measures the adoption of tablets that preserve the quality of recycled seeds.

Table 90: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	62%	66%	39%
3.11 Adoption of improved storage (%)	2%	2%	2%*
3.12 Use of designated storage facilities (%)	0%	0%	0%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	10%	11%	4%*

More than half of households (62%) use a tarpaulin at least once during processing. Table 91 shows that 47% of households use a tarpaulin when drying soybean. In most cases (69%), households learned about tarpaulin use from observation in the community or from their own knowledge. Three quarters of the households that use a tarpaulin have been doing so for more than four years. A large share of households (94%) let their soybean (partly) dry in the field; 80% of the households harvested the soybean when the beans were yellow in colour, which indicates that they are partly dried.

Table 91: Use of tarpaulin when drying soybean (percentage of households), primeira safra

Used tarpaulin for drying, *primeira safra*	All	Male-headed	Female-headed	sig
mean	47%	50%	30%	**
n	280	236	44	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Almost all farmers (99%) thresh their soybean manually. Tarpaulin use during the threshing of soybean is 57% (see Table 92). Half of households that use tarpaulins for threshing have been doing so for over four years.

Table 92: Use of tarpaulin when threshing soybean (percentage of households), primeira safra

Used tarpaulin for threshing, *primeira safra*	All	Male-headed	Female-headed	sig
mean	57%	61%	33%	***
n	269	227	42	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Although promoted, the uptake of improved storage facilities is very low. Only 5% of households uses improved storage facilities, such as silos or double-liner hermetic storage bags (such as PICS bags, which are specifically designed for the storage of legume crops). Table 93 shows that only 2% of households use PICS bags to store their soybean. Silos are used for soybean storage by 5% of soybean farm households.

Table 93: Percentage of households using PICS bags for storage of soybean, primeira safra

Usage of PICS bags, *primeira safra*	All	Male-headed	Female-headed	sig
mean	2%	2%	2%	
n	279	235	44	

Usage of PICS bags, *primeira safra*	All	Male-headed	Female-headed	sig

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

While the use of improved storage facilities is low, the use of preservative tablets that prevent losses in the soybean stock is a bit higher. Table 94 shows that 10% of households recycling seed use tablets that prevent quality loss in seed stocks.

Table 94: Use of preservative tablets for soybean seed stock, primeira safra

Use of preservative tablets, *primeira safra*	All	Male-headed	Female-headed	sig
mean	10%	11%	4%	
n	175	151	24	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Besides stocking soybean with the purpose of personal consumption later, soybean can also be stocked for the purpose of selling it later (when prices are higher). However, only 3% of farm households stock soybean for this purpose. On average, households stocked 99 kg. On these households used designated storage facilities to stock this soybean; instead, they all used their own storage facilities

8.7 Access to agricultural advisory extension support services (indicator 4)

Access to agricultural advisory extension support services is defined as the percentage of households that interacted with an agricultural extension officer during the last 12 months. During these months, 65% of households were visited by an agricultural extension officer (see Table 95). On average, households that met with an extension officer were visited between two and three times.

Table 95: Main indicators for access to agricultural advisory support services

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	65%	65%	62%
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.4	2.4	2.5
4.2 Received small seed pack (%) (additional indicator 4)	NA	NA	NA
4.3 Used small seed pack (%) (additional indicator 4)	NA	NA	NA
4.4 Distance to nearest agro dealer (minutes)	96.2	92.4	113.5

Table 96 shows that extension officers were most often VBAs (75%), followed by NGOs (50%). Female-headed households interacted more often with NGO-affiliated extension officers than male-headed households.

Table 96: Affiliation of extension service provider (percentage of households per provider)

Type	All	Male-headed	Female-headed	sig
Government	4%	5%	0%	
Company	18%	19%	11%	
NGO	50%	47%	68%	**
Farmer promoter/VBA	75%	73%	82%	
Cooperative	17%	16%	25%	
Other	0%	0%	0%	NA
n	189	161	28	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

The extension method that is most common is the use of a demonstration plot, closely followed by support from the VBA (see Table 97): 45% of farmers indicated having engaged in demonstrations and 42% received support from a farmer promoter/VBA. Farmer field schools and mentoring by lead farmers were mentioned by 17% and 15% of the farmers, respectively.

Table 97: Type of extension method used (percentage of households per method)

Method	All	Male-headed	Female-headed	sig
None	34%	33%	38%	
Farmer field schools	17%	15%	29%	**
Demonstration plot	45%	43%	51%	
Technology packages	3%	3%	4%	
Mentoring by lead farmers	15%	16%	9%	
Transfer of knowledge within farmer organisation//training of trainers	12%	13%	11%	
Support by farmer promoter	42%	44%	36%	
Don't know	1%	2%	0%	
Other	0%	0%	0%	NA
n	292	247	45	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Another aspect of advisory extension services is the distribution and use of promotional seed packs, but this is not applicable in the case of Mozambique, since none of the households received promotional seed packs for soybean.

Access to agricultural extension services also includes distance to the nearest agro-dealer. Distance to agro-dealers is measured based on travel time. Households live far away from agro-dealers. As can be seen in Table 98, average travel time is 96 minutes. However, the difference between the mean and the median of about half an hour indicates that there are quite some large values present, which skews the distribution despite the fact that outliers were removed. When visiting the agro-dealer, households most often travel by foot (66%), followed by bicycle (25%). The average distance to agro-dealers is 9.3 km (see Table 99).

Table 98: Average travel time to agro-dealer (minutes)

Distance to agro-dealer in minutes	All	Male-headed	Female-headed	sig
mean	96.2	92.4	113.5	
median	60.0	60.0	120.0	
n	212	174	38	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Table 99: Average distance to agro-dealer (kilometres)

Distance to agro-dealer in km	All	Male-headed	Female-headed	sig
mean	9.3	9.4	8.3	
median	5.0	5.0	3.0	
n	79	72	7	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

8.8 Access to formal financial services (indicator 13)

Table 100 shows that 12% of surveyed households have access to formal financial services, which means that 12% of households has access to at least one bank account, formal agricultural loan, or agricultural insurance. This indicator only includes access to formal financial services (provided by formal financial institutions), and excludes access to informal financial services, such as services provided by village money lenders, relatives, or saving groups.

Table 100: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13. Access to formal financial services (%)	12%	13%	9%
13.1 Bank account (%)	11%	11%	9%
13.2 Agricultural loan (%)	2%	3%	0%
13.3 Agricultural insurance (%)	0%	0%	0%

The financial service that is used most is a bank account: 9% of households have a bank account. Only 2% of households took a loan through a formal arrangement (banks, microfinance institutions, savings and credit cooperatives or mobile money). However, in total, 7% of households took a loan in 2018; most loans were thus informal. No farmer had agricultural insurance in 2018.

Table 101 shows the types of loan providers that are being used. It shows that that 35% of loans are provided by formal financial institutions (SACCO, bank or MFI). Most loans (70%) were acquired from family or friends.

Table 101: Types of loan providers (percentage of households per provider)

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	70%	67%	100%	

Loan providers	All	Male-headed	Female-headed	sig
Savings and credit cooperative (SACCO)//credit Union	20%	22%	0%	
Bank	15%	17%	0%	
Other	0%	0%	0%	NA
n	20	18	2	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

Excluding households that did not take loans

8.9 Post-harvest losses (indicator 6)

Post-harvest losses are measured by the soybean that was lost after harvesting as a share of total production.

Table 102 Main indicator for post-harvest losses

	All	Male-headed	Female-headed
6. Percent of post-harvest losses (%)	2%	2%	2%

Table 102 shows that post-harvest losses are, on average, 2% of total harvest. The majority of the sample (97%) did not lose any soybean post-harvest. The households that did lose part of their harvest lost, on average, 179 kg of soybean. While interpreting this data, it should be kept in mind that post-harvest losses are typically difficult to estimate for farmers, as losses are typically not measured.

8.10 Access to market information (indicator 37)

The percentage of households that has access to formal channels of market information (SMS, radio, television, internet and the farmers' organisation) is low. Only 9% received official price information (see Table 103).

Table 103: Main indicator for access to market information

	All	Male-headed	Female-headed
37. Access to market information through formal channel (%)	9%	10%	3%

Farmers do, however, often use informal channels to collect market information. Table 104 shows that farmers mainly receive market information from their buyers (65%) and at market stalls (16%). To a lesser extent, they also receive information from other farmers (12%) and farmers' organisations (9%). Female-headed households received information more often from market stalls than male-headed households.

Table 104: Sources of market information used by farmers (percentage of households per source)

Source of market information	All	Male-headed	Female-headed	sig
Buyer	65%	66%	56%	

Source of market information	All	Male-headed	Female-headed	sig
Farmer to farmer	12%	13%	8%	
Market	16%	15%	26%	*
Farmer organisation	9%	10%	3%	
Other	1%	1%	0%	
n	250	211	39	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Note: Multiple choices possible, therefore total does not need to add to 100%

Note: Categories smaller than 1% are combined in 'Other'

8.11 Sales channels (indicator 33)

Table 105 shows the main indicators for farmers' sales channels. It includes information on sales through structured trading facilities or arrangements, as well as information on farmers' clients.

Table 105 Main indicators on farmers' sales channels

	All	Male-headed	Female-headed
33. Sale through structured trading facilities/arrangements (%)	2%	3%	0%*
33.1 Selling to traders/middlemen (%)	60%	61%	55%*
33.2 Selling to consumers (%)	9%	9%	10%*
33.3 Selling to friends/neighbours (%)	6%	5%	12%*
33.4 Selling to aggregation centre (%)	2%	1%	2%*
33.5 Selling to farmer organisation (%)	8%	9%	2%*
33.6 Selling to wholesalers (%)	9%	9%	8%*
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	7%	7%	8%*
33.9 Selling to company (undefined) (%)	10%	9%	10%*
33.10 Selling to institutional buyers (%)	1%	1%	2%*

A farm household is considered selling through a structured trading facility when they sell at least part of their harvest through a formal contract; only 2% of households sold their harvest under a formal contract. Half of these households received inputs on credit as part of the contract. In all cases, these inputs consisted of seeds. In a few cases, the seed was supplemented with fertiliser.

Table 105 shows that households mostly sell to traders or middlemen (70%). To a lesser extent, soybean is also sold to companies (10%), wholesalers (9%) and consumers (9%).

8.12 Value of incremental sales as a result of AGRA (indicator 10)

The value of incremental sales as a result of AGRA cannot be determined yet as only one round of data collection has been completed. Therefore, total revenues from soybean sales

are reported as a baseline value. Revenues were calculated by multiplying the quantity sold (in kg) by the common price received per kilogramme. Values were converted to kilogrammes in case quantities were reported in different units. On average, the revenue from selling soybean is US$41.5 per farm household.

Table 106: Value of incremental sales as a result of AGRA

	All	Male-headed	Female-headed
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	41.5	39.4	50.0

As is expected for a cash crop like soybean, the largest part of the harvest is sold. Generally farmers sell 79% of their total harvest. The remainder is used for other purposes, such as keeping it for seed to sow in the next season (11%) or consumption (5%) (see Table 107). Households, on average, receive MT18.8 per kg of soybean (see Table 108).

Table 107: Allocation of soybean harvest (%)

	All	Male-headed	Female-headed	sig
Soybean used for consumption (% of harvest), *primeira safra*	5%	5%	3%	
Soybean kept for seed (% of harvest), *primeira safra*	11%	11%	12%	
Soybean given away (% of harvest), *primeira safra*	1%	1%	0%	
Soybean used as payment for inputs (% of harvest), *primeira safra*	1%	1%	0%	
Soybean bartered or exchanged for goods (% of harvest), *primeira safra*	1%	1%	0%	
Soybean sold (% of harvest), *primeira safra*	79%	78%	83%	
Post-harvest losses of soybean (% of total harvest), *primeira safra*	2%	2%	2%	
n	259	217	42	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

Table 108: Price received for soybean (MT)

Common price received for soybean (MT/kg), *primeira safra*	All	Male-headed	Female-headed	sig
mean	18.8	18.5	19.8	
median	20.0	20.0	20.0	
n	128	101	27	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
n = households that sold soybean

Total revenues from soybean sales in Mozambican Meticals (MT) are shown in Table 109. The large difference between the mean and median stands out here: the revenues are subject to some high (yet not unlikely) values. In this case, it means that there are many households with a low revenue, and a few households with a very high (though not unlikely) revenue. Whereas the average revenue from soybean sales is MT2,502, the median sales value is only MT1,500.

Table 109: Sales value (total revenue) of soybean sold, primeira safra – calculated variable (IO5.3 – 36) – KIT indicator 10

Revenue from sales of soybean, *primeira safra* (MZN)	**All**	**Male-headed**	**Female-headed**	**sig**
mean	2502.3	2376.1	3011.2	
median	1500.0	1800.0	1500.0	
n	146	117	29	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*

n = households that sold soybean

In addition to the value of the quantity that was sold, KIT also calculated the value of the total production, which was done by multiplying the total production by the common price received by the household. In 2018, the average value of the total production was US$68 (MT4,124) per household.

Table 110: Crop value (Metical) of soybean produced

	All	**Male-headed**	**Female-headed**
Average value of production in Metical	4,124	3,982	4,639
n = households that sold soybean			

Table 111: Crop value (US$) of soybean produced

	All	**Male-headed**	**Female-headed**
Average value of production in US$	68	66	77
n = households that sold soybean			

Part III: Small & medium enterprise survey

9 SME performance

9.1 Introduction

AGRA considers SMEs as important drivers of growth, and they account for up to 90% of all businesses in sub-Saharan African markets. In many agricultural commodity value chains, SMEs also take up many of the downstream activities of processing, storage, transportation, wholesale and retail that are necessary to send farmers' produce to the end market.

An important pathway for change of the PIATA programme is supporting the development of SMEs operating in, and providing support services to, agricultural value chains. AGRA works to stimulate both demand and supply sides of technical assistance and financial products for SMEs. Core interventions focus on:

- Identifying high-potential SMEs and supporting them with business and technical advisory services to scale up operations. These advisory services involve a performance-based model for service providers. The model requires them to produce business plans and achieve results through effective support to SMEs.
- Matching grants for emergence of medium-sized aggregation/storage businesses in under-served areas where smallholder farmers are increasing their yields, and marketing greater surpluses.
- Providing access to working capital finance for SMEs.
- AGRA influences the ecosystem within which SMEs operate by supporting the development of business, enabling goods and services, such as packaging, commodity handling and processing machinery, as well as payment processing services and market data.

To assess the changes in performance of SMEs benefitting from the AGRA-PIATA programme, a rapid survey instrument has been designed, and the baseline data collection was implemented and is reported here.

In the design of the monitoring tool the following needs were taken into consideration:

- A rapid and affordable tool to monitor SME performance
- A tool which can be tailored to different SMEs, but still allow comparison and use across very different types SMEs
- A tool which can be used for very different sizes of SMEs, including Micro enterprises.
- A tool which can monitor change of performance of SMEs over time
- A tool which can offer an immediate overview of SME performance
- A tool which is simple, open access, and can be implemented across countries by enumerators with a reasonable level of education

To answer to all these demands, KIT has developed a simple SME performance scorecard.

9.2 Methodology

Performance dimensions

The scorecard for SME performance is based on monitoring four dimensions of performance:

- Business resilience indicates the ability of the SME to adapt to disruptions while maintaining business operations, employment and assets. Variables used to determine business reliance are:
    - Years in business
    - Number of services offered
    - Diversity of clients
- Financial stability indicates the financial health and access to financial services of an SME. The variables used to determine financial stability are:
    - Estimated total annual turn-over
    - Proportion of capital need covered with formal credit
    - Capital investments made over the last three years
- Human capital indicates the education level and gender diversity of the SME workforce. The variables used are:
    - The proportion of staff having received a form of tertiary education
    - The proportion of staff with a permanent contract
    - The proportion of casual workers
    - The proportion of women among staff with a permanent contract
- Technology/assets indicates the SME assets and investments in R&D. The variables used are:
    - Investments in R&D
    - Value of buildings
    - Value of equipment

For all of the above indicators, four levels are predefined, either numeric or descriptive, representing progression, with 1 being the lowest score and 4 being the highest score. In a way, the highest level represents what could be considered as the desired state of the SME for the particular variable. The average of the scores gives the total score for each dimension. Performance scorecards are presented in Annex 14. An overview of all SME indicators and associated descriptive statistics is presented in Annex 15.

Sampling

Sampling was done among SMEs benefitting from AGRA support only. This has been done for the practical reason that SMEs not benefitting are not expected to be willing to answer questions about the performance of their enterprise. Also, the objective is monitoring the performance improvement of SMEs receiving support from AGRA, over time.

The targeted sample in each country consisted of:

- 10 commercial seed producers
- 5 seed companies
- 10 traders
- 10 processors
- 10 agro-dealers
- 5 input supply companies

Sampling was done randomly from a list of SMEs provided by AGRA, which was validated with the local AGRA team. The sample distribution of types of SMEs was only considered a guideline, and adapted based on the investment portfolio of AGRA in each country.

In Mozambique, it was not possible to locate a sample of 50 SMEs, so there 31 SMEs participated in the survey. The sample was composed as follows:

- 5 seed companies
- 9 commercial seed producers
- 8 agri-value chain actors (processors and aggregators)
- 9 input supply/agro-dealers

More information about SMEs participating in the interviews are in Annex 16. Overall the survey received limited enthusiasm from the SMES and a low response rate. A number of SMEs decided not to provide answers to questions perceived as sensitive in the survey.

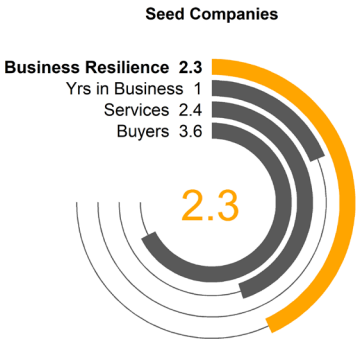
9.3 Performance dashboard

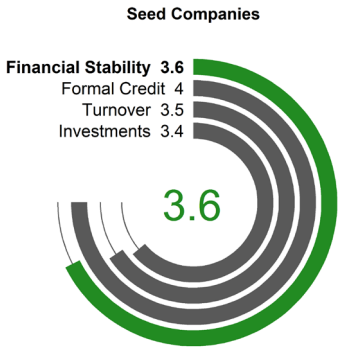
This section summarises the average performance per category of SMEs sampled in the performance dashboards. A colour coding is used to indicate poor performance (red, score 1-2), average performance (orange, score 2-3) and good performance (green, score 3-4). Similar scoring has been calculated for each separate SME, but this is too much information to present in this report.

The data presented are to be interpreted as a baseline of performance of the selected SMEs benefitting from AGRA interventions.

Seed companies

Five seed companies were sampled in Mozambique. The summary results are presented in Figure 20. For business resilience, the companies achieved an average score, mainly due to the fact that they are young enterprises and they have only been in business for three years, on average. The enterprises offer limited diversity of products (two services on average) but serve a considerable diversity of clients (see Table 119 in Annex 15). They deal with three buyers, on average, showing a good degree of market risk diversification, mainly government, individual buyers and associations (see Table 118 in Annex 15). In terms of financial stability, the companies have extremely good performance. The SMEs have an average annual turnover of around US$103,500 (see Table 116 in Annex 15). They have very good access to formal credit: 80% of these SMEs declared getting more than 90% of the credit from formal credit institutions. Also, the enterprises indicated investing quite intensively, on average, they declared three investments in the last three years (see Table 120 in Annex 15). With regard to human capital, the enterprises show a moderate balance between skilled staff and non-skilled staff. The enterprises have a reasonable proportion of full-time employed staff, but have a relatively low representation of female and skilled employees. In terms of technology, the results show that the SMEs mainly invested in equipment in the last three years.





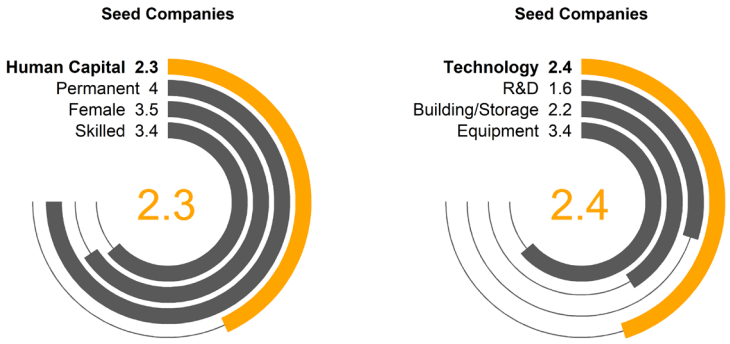


Figure 18: Seed companies' performance scorecard

Seed producers

We have nine seed producers in our sample. In terms of business resilience, enterprises score poorly. The low value is due to the fact that these SMEs are new enterprises, they have been in business for two years on average (see Table 113 in Annex 15). They offer limited services: only one on average. The main service provided is the production of EGS (see Table 119 in Annex 15). Companies only deal with one buyer on average which is, in most cases, the government. Market diversification is thus to be improved. Enterprises score quite good at financial stability: Figure 20 shows an average score of 2.3, indicating that they are close to good performance. Average annual turnover is around US$7,957. Access to formal credit is good: all SMEs declared getting more than 90% of credit from formal credit institutions (see Table 121 in Annex 15). Investments in technology are, on the other hand, low. On average, enterprises made one investment in the last three years. However, none of the SMEs made investments in R&D and storage facilities in the last three years. Scores on diversification of the workforce show that the surveyed SMEs have relatively low numbers of female and skilled employees.

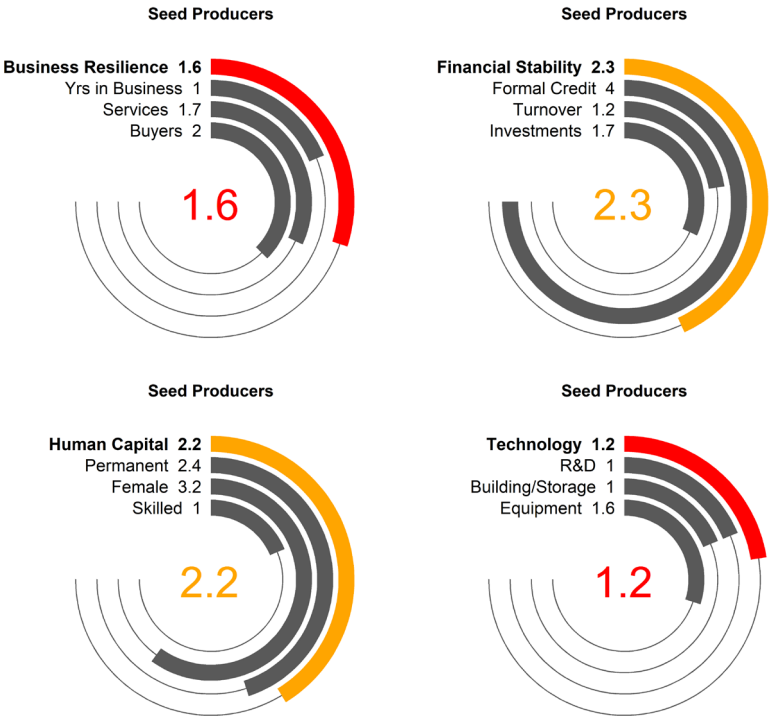


Figure 19: Seed producers' performance scorecard

Input supply or agro-dealers

Thirteen agro-dealers were sampled. Their business resilience seems weak, mainly as a result of the limited time they have been in business (two years on average). The diversity of services on offer is low (generally only one: retail chemical fertiliser and pesticides), and the diversification of client segments is fine: two on average. Individual buyers and associations are most frequently indicated as clients. Financial stability is moderate, mainly owing to limited proof of investment. Annual turnover was, on average, US$1,352. With regard to human capital, it can be concluded that agro-dealers do employ staff permanently, though these staff not often skilled. The proportion of women in the labour force is weak. Agro-dealers own few assets, and do not invest in R&D.

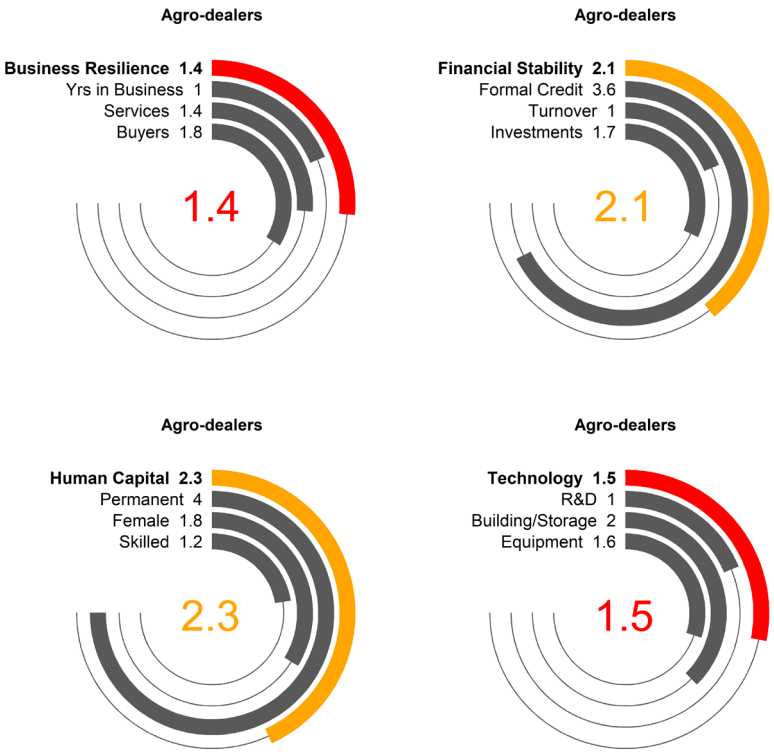


Figure 20: Input supply or agro-dealers' performance scorecard

Agri-value chain actors

Eight SMEs operating in agricultural value chain sector as aggregators or processors were interviewed. The results are summarised in Figure 21. As most processors are also aggregators, they were lumped together. The average business resilience score was fairly low with 1.4. On average, the businesses had been operating for three years, and most offered aggregation of produce as their sole service; mostly, they do not have a well-diversified portfolio of clients. Financial stability was fairly good with an average score of 2.4, which signals a positive pathway towards good performance. These companies have a fairly large annual turnover of average US$97,800. They have good access to formal credit: the majority gets 50% of their credit or more from formal credit institutions (see Table 121 in Annex 15). The enterprises have made few capital investments in the last three years (see Table 120 in Annex 15). In relation to human capital, the proportion of skilled staff among the workforce is weak, and also the proportion of women among employees is relatively low. Companies do own equipment, but have few fixed assets such as buildings. They make little investments in R&D related to their business.

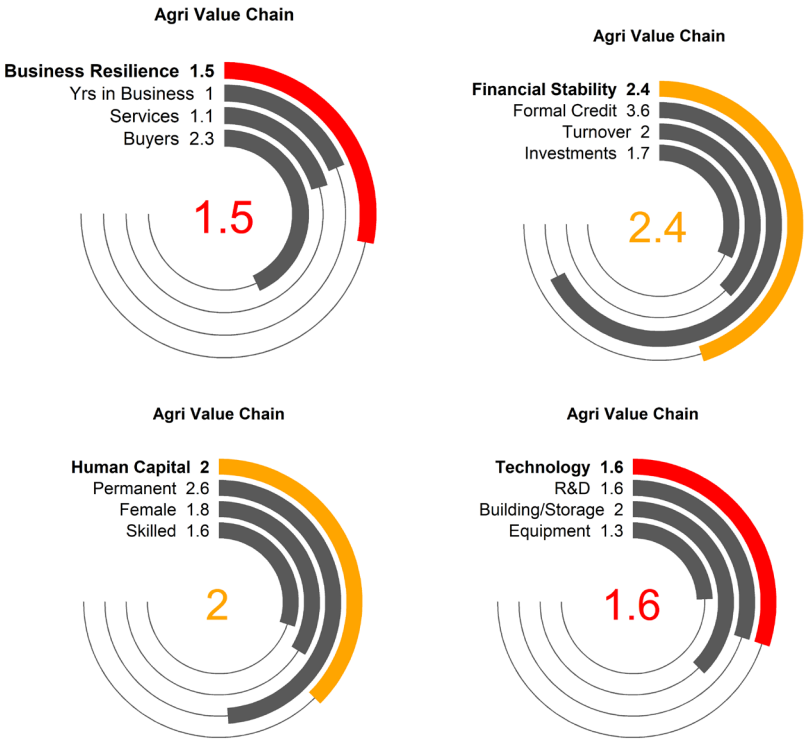


Figure 21: Agri-value chain actors' performance scorecard

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Annex 1. AGRA approved grants 2017-19

System	Grantee	Grant	Value (US$)
Market system	Agência de Desenvolvimento Económico da Provincia de Manica (ADEM)	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	1,599,472
Market system	União Provincial de Camponeses de Tete (UPCT)	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	844,330
Market system	MICAIA Foundation	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	742,638
Market system	Sustainable Development Organization for Agriculture and Markets (AGRIMERC)	Productivity, incomes through agribusiness development in the Zambezi valley	1,168,813
Input system	The African Fertilizer and Agribusiness Partnership, Inc. (AFAP)	Productivity, incomes through agribusiness development in the Zambezi valley	679,234
Market system	Adventist Development and Relief Agency (ADRA)	Productivity, incomes through agribusiness development in the Zambezi valley	955,259
Input system	Instituto de Investigação Agrária de Moçambique (IIAM)	Improving soil health, food security, and livelihood of smallholder farmers in Mozambique through development and use of appropriate fertiliser blends	267,189
Input system	Universidade Eduardo Mondlane (UEM)	Improving soil health, food security, and livelihood of smallholder farmers in Mozambique through development and use of appropriate fertiliser blends	211,796
Input system	National Directorate of Agriculture and Forestry	Improving soil health, food security, and livelihood of smallholder farmers in Mozambique through development and use of appropriate fertiliser blends	106,127
Seed system	Instituto de Investigação Agrária de Moçambique (IIAM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	289,841

Seed system	Oruwera Limitada	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	250,003
Seed system	Manica Higher Polytechnic Institute (ISPM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	209,850
Seed system	Zembe Company Limited	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	377,984
Seed system	Emilia Commercial	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	254,606
Seed system	Sementes Nzara Yapera LDA	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	384,276
Seed system	Agência de Desenvolvimento Económico da Provincia de Manica (ADEM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	356,093
Market system	Sociedade Cooperativa de Desenvolvimento e Serviços (Miruku)	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	1,343,325
Market system	Associaçao Nacional de Extensão Rural (AENA)	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	1,097,335
Market system	AGMARK Mozambique	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	710,012
Seed system	Instituto de Investigação Agrária de Moçambique (IIAM)	Capacity building of laboratory and field technicians in tissue culture cassava multiplication to improve food security and incomes for smallholder farmers in Mozambique	150,000
Markets	GAPI Sociedade de Investimento	Moz Arroz: strengthening rice production and marketing systems in Zambezia	525,239
Input system	African Fertilizer and Agribusiness Partnership (AFAP)	Moz Arroz: strengthening rice production and marketing systems in Zambezia	396,188
Input system	Sustainable Development Organization for	New start up-agro-dealers matching grant support in the Zambezi Valley	91,903

	Agriculture and Markets (AGRIMERC)		
Input system	AGMARK Mozambique	New agro-dealers development support in the Nacala Corridor	151,200
State capability	Ministry of Agriculture and Food Security (MASA)	Strengthening enabling environment of agriculture through sub-sectoral policy and regulatory reforms in Mozambique	543,717
State capability	Ministry of Agriculture and Food Security (MASA)	Enabling environment of agriculture through state capacity in Mozambique	631,534
Extension system	KULIMA	Build the capacity of extension agents in the Limpopo Corridor to help cassava farmers adopt good agricultural practices that raise productivity	149,524
Extension system	Universidade Eduardo Mondlane (UEM)	Scaling up cassava technologies for cassava value chain development in Maputo Limpopo Corridor	148,995
Finance systems	GAPI Sociedade de Investimento	Accelerating input supply system development and promoting increased access to agricultural technologies through inclusive financing models	615,184
Total granted until mid-2019			15,102,672

Annex 2. AGRA grants for market systems development since 2010

Reference number	Grantee	Grant	Value (US$)
2010 MKT 003	Agribusiness Systems International	Mozambique Market Linkages Programme	626,713
2011 MKT 002	MICAIA Foundation	Smallholder Market Access for Rural Transformation – Barue, Guru and Tete (SMART- BGT)	811,763
2011 MKT 008	Agência de Desenvolvimento Económico da Provincia de Manica – ADEM	Building the capacity of smallholder farmers and SMEs to access valuable markets and finance in Tete Province: Mozambique	685,978
2011 MKT 010	IKURU, SARL	Improving quality management systems among smallholder farmers in Nampula Province, Mozambique	451,400
2011 SHP 016	Agência de Desenvolvimento Económico da Provincia de Manica – ADEM	Boosting smallholder agricultural productivity and marketing in Mozambique through commercial farming out-grower schemes	852,508
2011 SHP 020	SNV – Netherlands Development Organisation	Improving food security and incomes of smallholder farmers through intensification of maize and pigeon pea (Cajanus cajan) production and marketing in Tete Province of Mozambique	800,000
2012 BBTE 005	Concern Universal	Building the capacity of smallholder farmers and farmer organisations (BCFFO) to engage in agricultural value chains in Sofala and Manica provinces in Mozambique	3,164,488
2013 FOSCA 003	Adventist Development and Relief Agency	Strengthening the ability of farmer organizations in Zambezia Province, Mozambique to access formal markets	780,807
2013 FOSCA 009	Uniao Provincial Dos Camponeses	Strengthening the ability of farmer organizations in Zambezia Province, Mozambique to access formal markets	200,000
2013 INT 003	Beira Agricultural Growth Corridor (BAGC)	The Beira Corridor small-scale farmers' support and market linkages programme (SFSP)	1,274,811
2015 MKT 001	Agência de Desenvolvimento Económico da Provincia de Manica – ADEM	Enhancing the performance of small holder farmers to participate in input and output markets in agricultural value chains in Tete province, Mozambique.	249,994

2016 MKT 001	TechnoServe, Inc	Research project on post-harvest losses in the soybean value chain in Mozambique.	601,192
2017 MZ 001-01	Agência de Desenvolvimento Económico da Provincia de Manica (ADEM)	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	1,599,472
2017 MZ 001-02	União Provincial de Camponeses de Tete (UPCT)	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	844,330
2017 MZ 001-03	MICAIA Foundation	Strengthening agribusinesses and inclusive market systems in Manica and Tete provinces of Mozambique	742,638
2017 MZ 002-01	Sustainable Development Organization for Agriculture and Markets (AGRIMERC)	Productivity, incomes through agribusiness development in the Zambezi valley	1,168,813
2017 MZ 002-03	Adventist Development and Relief Agency (ADRA)	Productivity, incomes through agribusiness development in the Zambezi valley	955,259
2017 MZ 006-01	Sociedade Cooperativa de Desenvolvimento e Serviços (Miruku)	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	1,343,325
2017 MZ 006-02	Associaçao Nacional de Extensão Rural (AENA)	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	1,097,335
2017 MZ 006-03	AGMARK Mozambique	Sustainable market for smallholder farmers in Nacala Corridor (SMaSh) – Otumiha	710,012
2018 MZ 002-01	GAPI Sociedade de Investimento	Moz Arroz: strengthening rice production and marketing systems in Zambezia	525,239
Total			**19,486,077**

Annex 3. AGRA grants for seed systems development 2007-2019

Reference number	Grantee	Grant	Value (US$)
2014 SSTP 003	International Fertilizer Development Center	Up-scaling the cassava value chain in Mozambique	1,003,969
2007 PASS 041	Alfredo Azarias Dique trading as Insumos Agricultura e Pecuaria	Availing seed to scale farmers in Tete Province of Mozambique	129,300
2008 PASS 031	Instituto de Investigação Agrária de Moçambique	Development and deployment of maize varieties with resistance to downy and mildew and maize streak	183,050
2008 PASS 039	Instituto de Investigação Agrária de Moçambique	Sorghum variety development and technology transfer research programme	185,000
2008 PASS 043	Instituto de Investigação Agrária de Moçambique	Rice variety development and adoption in Mozambique	185,000
2008 PASS 059	Instituto de Investigação Agrária de Moçambique	Improvement of local rice cultivars for lowland areas in Zambezia Province, Mozambique	183,500
2009 PASS 017	Semente Perfeita limitada	Uplifting the welfare of the small-scale farmers in Mozambique through the provision of improved seeds.	199,195
2009 PASS 019	IKURU, SARL	Availing improved seed to farming communities in the Northern provinces of Mozambique	92,190
2009 PASS 020	Instituto de Investigação Agrária de Moçambique	Multiplication and dissemination of cassava improved varieties, tolerant to cassava brown streak diseases in Northern Provinces of Mozambique.	226,500
2009 PASS 021	Lozane Farms Ida	Boosting the seed value chain and input system in Central and Southern Mozambique	150,000
2010 PASS 047	Oruwera Limitada	Straightening rural livelihoods project through local seed production, marketing and use in Nampula – Mozambique (SRLP)	198,500
2010 PASS 050	Instituto de Investigação Agrária de Moçambique	Development of multi-stress tolerant maize varieties for Mozambican tropical low land agro-ecologist	185,115
2011 PASS 028	MC – Morais Comercial	Production and dissemination of improved seeds to farmers in Nampula Region, Mozambique	150,000
2012 PASS 009	Instituto de Investigação Agrária de Moçambique	Collection, preservation, and utilisation of local groundnut landraces for breeding for early maturity, groundnut rosette disease	164,050

		resistance and better productivity in northern Mozambique	
2012 PASS 013	Instituto de Investigação Agrária de Moçambique	Development of stable sweet potato varieties of Mozambique for drought-prone environments	219,400
2012 PASS 018	Universidade Eduardo Mondlane	Development of high yielding, farmers' and consumers' preferred cowpea varieties to overcome major biotic and abiotic constraints in Mozambique	12,4449
2012 PASS 027	Instituto de Investigação Agrária de Moçambique	Sorghum variety development and technology transfer research programme	165,000
2014 PASS 023	Emilia Commercial	Improving productivity of smallholder farmers in Sussundenga district, Mozambique	122,802
2014 SSTP 001	Instituto de Investigação Agrária de Moçambique	Scaling up the production of high-quality foundation seed of improved cassava varieties to small-scale farmers to meet market demand in the corridors of Nacala and Limpopo, in Mozambique	297,188
2014 SSTP 001	Instituto de Investigação Agrária de Moçambique (IIAM)	Scaling up the production of high-quality foundation seed of improved cassava varieties to small-scale farmers to meet market demand in the corridors of Nacala and Limpopo, in Mozambique	297,188
2014 SSTP 002	Oruwera Limitada	To improve cassava, maize, soybean and groundnut productivity and incomes of small-scale farmers in Nacala Corridor through access to high quality seeds in Mozambique	235,773
2015 SSTP 007	Sustainable Development Organization for Agriculture and Markets (AGRIMERC)	Building awareness of improved varieties of maize and pigeon pea amongst smallholder farmers in Sofala and Manica Provinces.	624,328
2015 SSTP 031	Zembe Company Limited	Increase production and distribution of certified seed in Beira Corridor	218,484
2017 MZ 004-01	Instituto de Investigação Agrária de Moçambique (IIAM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	289,841
2017 MZ 004-02	Oruwera Limitada	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	250,003
2017 MZ 004-03	Manica Higher Polytechnic Institute (ISPM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	209,850

2017 MZ 004-04	Zembe Company Limited	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	377,984
2017 MZ 004-05	Emilia Commercial	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	254,606
2017 MZ 004-06	Sementes Nzara Yapera LDA	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	384,276
2017 MZ 004-07	Agência de Desenvolvimento Económico da Provincia de Manica (ADEM)	Strengthening the maize and soybean seed value chains by enhancing production of breeder, pre-basic and basic seeds of new and improved varieties in Beira Corridor and Zambezi Valley	356,093
2018 MZ 001	Instituto de Investigação Agrária de Moçambique (IIAM)	Capacity building of laboratory and field technicians in tissue culture cassava multiplication to improve food security and incomes for smallholder farmers in Mozambique	150,000
Total			**7,812,634**

Annex 4. AGRA ambitions for seed system change

Seed system components	Project or programmes	Timing	Envisioned system change	Scale and scope (Geographically, number of beneficiaries)	Intervention budget (incl. co-financing)	Implementation partners
Variety development	2012 PASS 027 (Sorghum)	011112-310817	Sustainable breeders and breeding programme in place and pace of breeding	Nampula (2 districts), Cado Delgado (2 Districts), Zambézia (2 Districts)	US$165,000	IIAM
	2010 PASS 050 (Maize)	010411-301117	Breeders and breeding programme sustained in place	National (Lowllands)	US$185,115	IIAM
Early generation Seed Production	2012 SSTP 001 (Cassava)	010814-310118	Diversification in EGS production; PPPs	Nampula (3 Districts) Maputo (1 District) Inhambane (3 Districts)	US$297,188	IIAM-USEBA
	2014 SSTP 002 (Five crops)	010814-310118	Opening up of IIAM to private sector	Nampula (5 Districts)	US$235,773	Oruwera Ltda
	2016 EGS study SSTP	2016	Input into Africa-wide EGS recommendations	National	USAID	IIAM/Moz Seeds
	2017 MZ 004-01 (maize and soybeans)	On-going	Strengthening maize and soybean seed value chain through breeder seed	Beira Corridor and Zambezi Valley	US$289,841	IIAM
	2017 MZ 004-02	On-going	Strengthening maize and soybean seed value chain through foundation seed	Beira Corridor and Zambezi Valley	US$250,003	Oruwera Ltda.
Seed production	2015 SSTP 031 (Maize and Soybean)	011115-310318	Make quality of new varieties available to farmers through national seed production (PANNAR and K2 from abroad)	Manica (Three districts)	US$219,377	Six: Zembe; Nzara Yapera; Emilia Commercial; ACOF; Oruwera;

			Outgrower systems involving youth. Outgrowers can become seed companies,			Two failed: Moraes and Dengo
	2017 MZ 004-04	On-going	Certified seed production	Manica	US$377,984	Zembe Company Ltda
	2017 MZ 004-05	On-going	Certified seed production	Manica	US$254,606	Emilia Commercial Ltda
	2017 MZ 004-06	On-going	Certified seed production	Manica	US$384,276	Nzara Yapera Ltda
Marketing and distribution	2015 SSTP 031 (Maize and Soybean)	011115-310318	Market development (also beneficial to others like K2) Fair price margin for agro-dealers in seed value chain	Manica (Macate)	US$219,376	Zembe
Quality seed use	2015 SSTP 007 (Maize, PP)	010815-310317	VBA model and use of small packs (100 seeds); agro-dealer demo and VBA link	Sofala (3 Districts) and Manica (1 District)	US$624,328	Sustainable Development Organization for Agriculture and Markets (AGRIMERC)
	2014 SSTP 03 (Cassava)	010914 – 280217	Market development (scaling up of cassava varieties and market development)	Nampula and Inhambane	US$1,500,000	IFDC
Seed quality assurance	No direct investment only through seed companies (2015 SSTP 031)	On-going	Private seed inspectors (not supported only with names)	Mostly Manica	USAID	Mostly through SEMEAR
Seed policies, governance and partnerships	Mostly supported by USAID, AGRA participating	On-going	Influencing: • Chronic subsidy change • Variety release processes • SADC regulations • EGS studies • APROSE	National		MASA-DINAS-ANS
	Supporting APROSE	In process	Policy and advocacy support			APROSE

Annex 5. AGRA ambitions for maize market system change

Maize market system chnage	**Project or programmes**	**Timing**	**Envisioned system change**	**Scale and scope** (Geographically, number of beneficiaries)	**Intervention budget (including co-financing)**	**Implementation partners**
Production	2015 MKT 001	151115-141117	Not known	Tete (four dstricts)	US$249,994	ADEM
	2013 INT 003	010714-300617		Tete (three districts)	US$1,274,811	BAGC
	2017 MZ 006-01	On-going	SMASH-Otumiha	Corridor de Nacala	US$1,343,325	Miruku, SCDS
	2017 MZ 006-02	On-going	SMASH-Otumiha	Corridor de Nacala	US$1,097,335	AENA
Bulking and Trade	2017 MZ 006-03	On-going	SMASH-Otumiha	Corridor de Beira	US$710,012	AGMARK Mozambique
	2018 MZ 04	On-going	New agro-dealer development support; way of doing business by VBAs (input and output markets)		US$151,200 matching grants	Agmark Mozambique
Wholesale			Facilitating links between district agro-dealers and VBAs			
Processing	No investment in processing (only some in rice)		Linking processors like ECA with farmers Quality emphasis in the chain			Chicken and Feed: Novos Horizontes Higest; Abilio Antunes
Retail	No investment in value addition					
Consumption						
Seed system support	2010 PASS 050 (Maize)	010411-301117	Breeders and breeding programme in place for	National (Low lands)	US$185,115	IIAM

			sustained supply of marketable varieties for lowland maize production			
	2015 SSTP 031 (Maize)	011115-310318		Manica (Three districts)	US$219,377	Five: Zembe; Nzara Yapera; Emilia Comercial; ACOF; Oruwera; 2 Failed: Moraes and Dengo
Input system support	2013 SHP 011 (Soil health)	150414-14-0417	UEM capacity development for soil fertility management	National	US$579,988	FAEF-UEM Maputo
Finance system support	Building linkages for inclusive finance					BNI, GAPI
Extension system support	2017 MZ 004-003	On-going	Awareness and demand creation through VBAs; Mind change in public extension	National	US$209,850	ISPM
Policies (Governance)	2018 MZ 005	On-going	Fertiliser policy change since there is no current regulation (fertiliser imported as chemical, as agricultural input tax exempted not for micronutrients	National	US$543,717	MASA/MOZfert/DPCI
	2018 MZ 008	On-going	State capacity building	National	US$631,534	MASA
Stakeholder collaboration (Governance)			Consortium approach platforms			

Annex 6. AGRA ambitions for soybean market system change

Maize market system change	Project or programmes	Timing	Envisioned system change	Scale and scope (Geographically, number of beneficiaries)	Intervention budget (including co-financing)	Implementation partners
Production			Steady supply of new varieties			
Bulking and Trade	2016 MKT 001 (Soybean)	010616-311218	SME and VBA aggregation system change	Zambezia (Gurue)	US$601,192	Technoserve Inc.
Wholesale			Large trading companies buy from SMEs and VBAs			
Processing			Large processing companies buy from SMEs and VBAs			
Retail						
Consumption						
Seed system support	2014 SSTP 002 (Five crops)	010814-310118	Opening up of IIAM to private sector	Nampula	US$235,773	Oruwera Ltda
	2015 SSTP 031 (Soybean)	011115-310318		Manica (Three districts)	US$219,377	Five: Zembe; Nzara Yapera; Emilia Comercial; ACOF; Oruwera; *2 Failed: Moraes,Dengo*
Input system support	2013 SHP 011 (Soil health)	150414-14-0417	UEM capacity development for soil fertility management, Rhizobium inoculum supply	National	US$579,988	FAEF-UEM Maputo
Finance system support			Bulking credit leverage by AGRA;			
Extension system support	2017 MZ 004-003	On-going	Awareness and demand creation through VBAs	National	US$209,850	ISPM

Policies (Governance)	2018 MZ 005	On-going	Fertiliser policy change	National	US$543,717	MASA
	2018 MZ 008	On-going	Not known	National	US$631,534	MASA
Stakeholder collaboration (Governance)			Consortium approach, but envisioned change not clear.			

Annex 7. Seed system situation assessment

Tool 1 Significant change analysis

Change	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Variety development							30 varieties released in the last five years (See Presentation Ecole; Check with AGRA EGS study)				
EGS production	USEBA mandated to produce EGS of public varieties. Contrary to advice, it was never privatised					Some private companies started producing EGS (CGIAR)					USEBA feasibility study to start (Speedplus)
Seed multiplication			AGRA has supported a number of emerging seed companies in Manica (Dengo, Zembe, Emilia, Nzara Yapera)								
Seed marketing and distribution			Before seed companies had their own shop. Now seed companies are often distributors or sell to distributors, who sell to agro-dealers who, in turn, sell to VBAs								
Seed use					Quality seed use has increased due to project intervention. Link with MOFER on developing seed +fertiliser packages (blends) has helped. New hybrid maize seed production in the North (short duration, less demanding, high-yielding)						
Seed quality assurance									Introduction of private inspectors has increased capacity		
Seed policies, governance and collaboration				MOSTA established, but dormant	New seed regulation	Seed dialogue platform with AGRA participation in management committee		APROSE, some financial support from AGRA for some activities			New AGRA support for APROSE

Tool 2 Seed value chain analysis

Seed system component	Actors	Current strengths	Current weaknesses	Opportunities for improvement	Priority for improvement (1=very high; 5 = low)
Variety development	IIAM CGIAR Seed companies outside the country (K2, PANNAR, Syngenta, vegetable seed)	More varieties are becoming available	No incentives for public breeders	Breeder incentives to be introduced	1 (Main priority)
EGS production	USEBA (public varieties) Some private companies	EGS production has become more diverse	USEBA was, in spite of three recommendations ,never privatised (IIAM did not want it)	USEBA is to be improved for timely delivery of adequate quantities of EGS, hence requires privatisation	4
Seed multiplication	Some 15 active seed producing companies (with outgrowers)	Dynamic with strong activities (maize, etc.)	Poor control leads to poor seed company performance	Value chains are crying out for high quality in the chain. Farmers need good seed, but some have lost interest	7
Seed marketing and distribution	Agro-dealers VBAs	Wider network	Quality control challenges (tainted grain as seed, fake seed, false packages and fake company bags)	Training of agro-dealers on seed business (large quantities at competitive prices rather than small quantities at high prices) and quality maintenance.	5
Seed use	Two main customer segments: Market-oriented farmers Surplus farmers	Commercial farmers in frontier areas are stable, others vary from year to year	Many farmers faced with fake seed, resort to use of 2nd generation OPVs and hybrids	Public extension to be strengthened. INOVAGRO is also training private extension (employed by seed companies: 5-10 each company)	2
Seed quality control	ANS Private inspectors SeedTrade	Overall capacity increasing; seed labels to be produced	Penalties not respected. Inspection costs paid by companies to inspector creating a dependency relationship	Support for seed regulation enforcement. Seed label printing (10 million each year) to be privatised	3
Seed policy & regulation **Seed sector governance and collaboration**	MASA/DINAS/ANS-DS SADC	Regulation not in conflict with SADC Seed Regulation is satisfactory, no law needed	Seed Regulation not enough security for large companies, require seed law which cannot be changed by a single minister	A seed law would be needed in the long run, and leads to more seed protection, enforcement, but also exclusion	6

Tool 3 Intervention landscape analysis

Seed system component	Project or programme	Timing	Envisioned change	Scope and scale	Intervention budget	Implementing partners	Link to AGRA efforts
Variety development	• FAO • CGIAR	Continuous Continuous	• Release of varieties; Local variety registration • New varieties	National			High
EGS production	• SeedTrade • SEMEAR • Speedplus	2017-2020 -- --	• USEBA capacity development • Seven crops (Ma, PP, CP, CB, GN, SB, SS) • USEBA study	National			High
Seed multiplication	• AGRA • INOVA • INOVAGRO	2018-2023 -- --	• Three corridors (Ma, Ri, Ca, SB) • Innovation support (up to 100%) • Seed extension (training and support)	Centre and North National Centre and North			Good
Seed marketing and distribution	• INOVA	2019 annually	Contest for best seed companies (quality emphasis etc.)	National			Limited
Seed use	• INOVA	2019 annually		National			Limited
Seed quality control	• SeedTrade • INOVAGRO	2017-2020 2019-2022	• Seed labels printing for MASA; Laboratory support. • Private inspector training	National; Centre and North National	• . • 2 million US$/year		Limited
Seed policy & regulation **Seed sector governance and collaboration**	• SeedTrade • INOVAGRO • AGRA	2017-2020	• Several studies • APROSE and MOSTA support • APROSE institutional support; training; studies				Limited

Annex 8. Seed system change interviews

Actor	System component	System change strength	Constraints	Solutions	AGRA
APROSE	Branch organisation for the seed sector (all actors in the seed value chain, services and enabling environment): hosting MOSTA (Mozambican Seed Trade Association)	42 seed sector members (more than just producers) supported with communication, advocacy and capacity development; General Assembly annually and three regions (North, Centre, South)	List provided	List provided	Preparation of grant with CTA and other partner (unknown) for institutional support.
Helvetas (Ali Magido)	President of APROSE in Northern Region; NGO working seed system extension;	Training (of trainers) and extension experienced seed production; Seed sector is growing (outgrowers; seed use)	Seed quality remains an issue: inspection capacity (5x) too limited for large number of small-scale outgrowers; many non-registered varieties used; fake seed is major issue.	Private inspector training; new ticketing system; more technical staff; training in use of descriptors; more inspections (also in agro-dealers);	No direct link with AGRA
Oruwera (Amilcar Lucas Benate)	Certified seed (120 MT in 2019: GN, SB, Ma, CP, SS, onion and lettuce) grown by 19 outgrowers, and EGS production	Seed market growing fast (almost doubling every year); good varieties provide by IIAM and IITA; Oruwera seed trusted with good reputation;	Major risks are subsidies, climate and demand; concern about steady flow of new varieties (also food and oil) and pre-basic seed availability; seed inspection only twice at best in the field;	Quality attention with small seed lab and private inspectors; IIAM soybean improvement strategy and breeders;	AGRA 2nd grant ; Some more attention needed for policy issues (subsidies, pre-basic and breeding programmes)'and seed lab investment;
IITA (Carlos Malita)	IITA develops new varieties with IIAM; IITA organises basic seed production with SEMEAR and private producers;	Steady supply of varieties to be released; Pre-basic seed of released varieties;	Slow release process; Uncertain seed demand of new varieties; Seed to be sold to farmers (not always respected);	Producers to become more productivity focused; Producer to be more quality focused);	AGRA has invested heavily in new varieties

Tongai from Gurue	Hub agro-dealer for Gurue (with supply contracts) and seed producer;	Production of 30 ha of certified soybean seed; Basic seed bought form SBS (Sociedade de Beneficiamento de Sementes); SBS has seed processing plant;	Seed prices are under pressure (e.g. soybean price considered high);	FAO voucher scheme which benefits also local agro-dealers; Looking for options of cheaper seed production	Seed production supported by AGRA (Oruwera, Morais Comercial, etc.)
Americo Tamissai	OPV maize seed producer on contract with K2 on 30 ha of Matuba at 25 MT/kg	K2 provides basic seed, provides transport (deducted) and organizes 2-3 inspections by K2 and ANS; no fertiliser used;	Limited price increase (needs 30 MT/kg).; reduction avoided due to Cyclone Idai; 2018/2019 all seed smaller than sieve 18 (minimum last year) due fall armyworm and Idai	Early planting (not always possible); irrigation; Consider fertiliser application	Seeds and Adem;
Companhia do Zembe (CZ) Antonio Manjate	Produces certified seed with 60 outgrowers (SP1 hybrid and ZM 523, Gemo)	Competing for quality and price with seed importers (PANNAR and Seedco); Supported small packs (133 demos);	Hybrid maize production requires irrigation (four units from IDE); agro-dealers take too high margin (30 MT) making seed expensive; national varieties not in large national tenders (notably in emergency markets); quality inspection limited (numbers and resources); no basic seed (soybeans), not good by Semear or IIAM;	Support for MOSTA (seed agro-dealers) needed; Yellow maize will be promoted by Agrimerc and is for a Maputo-based company; Works with provincial agro-dealers (JBE/Nampula, Matuel Comercial/Quelimane, Munguambe Filhos/S ofala); New agro-dealers will wipe out others; Branding needs attention	AGRA supported companies have same varieties (Zembe, Nzara Yapera, Emilia Comercial); Not good for Dengo Commercial (no proper due diligence by AGRA);
IIAM Zonal Centre Sussundenga (Carlos Quembo)	Production of varieties of maize in national programme and (pre-) basic seed of OPV varieties. SEEDS coordinator	SEEDS is organising variety demonstrations with VBAs and follow-up with small seed packs of seed companies	No market structure for seed leading to too high prices; Quality control; Storage infrastructure for seed; Seed cleaning and processing capacity not used;	Role of APROSE and MOSTA, as well as capacity development; More (private) inspectors and laboratories; Cold storage for soybean seed;	AGRA supports SEEDS Consortium;

			low adoption of quality seed to be bought; limited agrobusiness content in public extension; seed subsidies distorting the market and no national varieties;	optimise seed cleaning equipment (SEMOC too expensive); lower seed prices; quotas for the WFP; include preferences in the tender; association of national seed companies in the tender;	
IIAM National maize Improvement Programme (Pedro Chauque)	Variety development, OPVs and increasingly maize hybrids	Varieties developed and pre-basic seed made available to seed companies. Non-exclusive handing over, but allowing companies to profile with a particular (hybrid) variety.	Limited resources (only one breeder outside Maputo); limited institutional support; limited attention for interdisciplinary and crosscutting research; legislation restricts the testing of GMO varieties; breeder rights and royalty legislation not automatically a solution;	Pre-basic seed sold to seed companies directly for basic seed production; more investment needed for variety development; legislation to be updated;	Mostly past support from AGRA
IIAM (Director Crops, Carvalho ECole)	Director Crops, including maize and soybean improvement	Maize (Maputo and Sussundenga) breeders; One young soybean researcher in Lichinga;	Programmes like SEMEAR, FAO, AGRA and others handing seed directly to companies undermines institutional development; shortage of young breeders, no recruitment and general lack of capacity development; USEBA revolving fund (from EGS sales) still with USAID;	More direct investment in IIAM is needed; IIAM is the only sustainable way forward; training existing soybean staff (agronomist); intellectual property right to go to IIAM and not to the treasurer (IIAM is not autonomous);	AGRA investment in basic seed production by Oruwera and Zembe;
Seed Department (Head Elsa Timana)	Director Seed department; Centres in Nampula (3x); Zambezia (3); Chimoio (5x); Chokwe (2x); Maputo (9-10);	Seed law development with a number of changes (FAO, FtF); Seed regulation before the seed law	Regulation (include number of ministerial diplomas) to be reviewed (agro-dealer quality control; invasive weeds; vegetatively produced crops; Royalties for CG varieties	Regulation to be updated; DUS testing of all varieties to remove obsolete ones; some basic descriptors for agro-dealers;	AGRA supported the seed regulation development;

	seed system policy development needed;

Annex 9. Maize market system situation assessment

Tool 1: Significant changes registered in the maize market system and the role of AGRA

	Maize market system components	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Value chain	Production	Availability of quality seed of improved varieties					Drought; civil strife	Civil strife; maize price reaches 25 MT/kg	Quality seed and inputs; technical assistance (Kugulissa);	Fall armyworm epidemic	Cyclone Idai
	Bulking and marketing		Association and cooperative development triggered also by WFP contracts			Warehouse and other infrastructure development	Agroindustry leads to stronger market demand		Maize price down (2017-2018)	Market information improved through Kugulissa platform	
	Wholesale				Emergency programmes distort the market			Foreign middlemen for ETG and Olam distort market	AGRA funds through ADEM help SME bulking		
	Processing	Since 2008, increase in number of grain processors							ECA starts support programme for quality maize production	Maize for beer production (by ECA);	
	Retail	No data									
	Consumption	No data									

	Seed system	AGRA supports national seed companies					Bankruptcy Moz Seed and expansion of Klein Karroo	Effective agro-dealers in seed and other inputs			
	Input supply system					SME and agro-dealer network supported by AGRA;	Illegal import of inputs; increase in number of agro-dealers	Inadequate supply system for quality inputs;	Kugulissa input supply strategy	Reduction of distance to agro-dealers	
	Financial service system	Poor finance system for agricultural sector		Group loans Opportunity Bank			Shortage felt of marketing credit lines	Recognition by financial services of need for special products for agriculture	Rapid increase in financial services	Funding options (e.g. FDA) better known;	Limited increase in SMEs with credit;
Support services	Extension system	Improvement pluralist extension system	AGRA supports extension through projects	System with public, NGO and company extension (2012-2019)							
	Policies and state capacity	PEDSA (Agricultural Strategic Plan)			Marketing strategic plan		No policy on markets and emergencies; development programmes affected;	Political instability (2012-2017)	External budget support halted (2015-2019)	Agricultural market actor registration introduced	Disintegrated markets (no focus);
State	Coordination and partnerships								Many actors and poor coordination		

Tool 2: Rapid maize market system analysis

	Maize market system components	Actors	Current strengths	Current weaknesses	Opportunities for improvement	Priority ranking
Value chain	Production	Larger and small-scale producers	Secure land rights for smallholders; number of producers and availability of labour;	Poor quality maize seed; No land titles (DUAT); limited knowledge; limited external input use; seasonality of rainfall;	Access to DUAT; maize technology knowledge; access to capital;	1
	Bulking and marketing	Bulking by VBAs, cooperatives and associations; medium enterprises;	Capacitated actors (SMEs); VBAs with community confidence;	Limited bulking funds and finance; bulking very informal; limited business knowledge; limited availability of (storage) infrastructure; inadequate bulking volumes; access to transport;	Business capacity development; registration; access to capital;	3
	Wholesale	Export Trading Group (ETG); Luteari; Anuario;	Available storage space;	Few wholesalers; no marketing consistency; limited short storage equipment; limited capital;	Access to capital for SMEs; develop access to public warehouses; opportunity for information dissemination;	3
	Processing	Abilio Antunes; ECA; DECA; Moagem Sandra; Small hammer mills;	Milling infrastructure; secure market for maize meal and feed concentrates; volumes needed; large market; ready payments;	Periodic availability of produce; fluctuating prices; absorption capacity; short buying period; not interested in dialogue with other chain actors;	Access to capital for small millers; Platform for wholesales, bulking agents and processors; Year-long buying strategies;	
	Retail	Supermarkets; local markets (hammermills); local shops;	-	-		
	Consumption	WFP (maize meal); national consumers; chicken producers;	-	-		

Support services	Seed system	Seed companies (K2, PANNAR, Zembe, Phoenix, Nzara Yapera, Emilia etc.)	Involvement many seed producers (enterprises and producers); good varieties (hybrids and OPVs); attractive prices for producers;	Poor quality seed used; poor storage facilities; seed prices kept high in the chain; poor technical assistance to farmers; SEMOC dependency for processing leading to mixing;	Quality control system improvement; capital for enterprises; qualified human resources;	
	Input supply system	ETC; AgriFocus; MozFert; Omnia; APROSE; Bayer; Yara; Q-Chem; Snow International;	Existence of many agro-dealers and distributors;	Weak relations between agro-dealers and with distributors; oscillating prices; very informal; no clear definition of agent and agro-dealer; poor knowledge of the business; inadequate financing of the system;	Need for coordinating platform; quality control needed; links between agro-dealers and the large distributors; access to capital (collateral); capacity development;	3
	Financial service system	GAPI, Banco Terra (taken over by Mozabanco), Barclays, BCI, FDA	Existence of the banking sector and other financial services; available credit lines;	High interest rates and other poor conditions; limited interest in and knowledge of the agricultural sector; no agricultural insurance; bureaucracy; distortion by unsustainable credit (e.g. public district development fund)	Links between banks and potential beneficiaries; improved dissemination about different existing funds; improved access to insurance for producers;	2
	Extension system	Public extension: DNEA, ISPM, NGO extension: Clusa, MICAIA private extension;	High (national) coverage by the entire system;	Low extension/producer ratio; coherence in approaches, messages and between actors; technical quality; low levels of adoption of extension messages;	Use of community radio; improve extension/producer ratio; harmonisation of extension packages;	3
State	Policies and state capacity	MASA; MIC; MITADER;	Many regulations;	Poor implementation of regulations; bureaucracy; high transaction costs;	Coordination of extension at district and national level;	
	Coordination and partnerships	AGRA/USAID; Clusa, BAD, AFAP; GIZ; BAGC; ADVZ;	Many donors and actors with resources;	Mix of donors and NGOs; Poor collaboration between intervening actors; different policies (e.g. in relation to seed donations in the aftermath of cyclone Idai);	Need for a platform for aggregators, SMEs and large companies and processors;	

Tool 3: Maize market system intervention landscape

	Maize market system components	Projects	Timing	Desired Change	Scale and focus	Investment (MT//US$)	Partners	Link with AGRA
Value chain	Production	CLUSA; RAMA; Kugulissa; FAO; Concern; SEMEAR;	- - 2017-2020 Annual Closed -	Conservation agriculture; technology (research); production and aggregation; inputs for producers; - quality seed of improved CG varieties;	Some districts; Manica province; Beira Corridor; - -		Districts; - Three partners; - - IIAM;	- - AGRA; - - AGRA related;
	Bulking and marketing	FINAGRO; Revolving Fund for Agricultural Marketing;		Transport financing; Agricultural marketing;	Manica Province;			No No
	Wholesale	Feed the Future		Warehouses	Some districts		MIC;	No
	Processing	ADVZ Heineken and CdM		Rice mills; maize mill support; beer breweries sourcing locally;	Zambezi valley		MIC	No
	Retail							
	Consumption							
Support services	Seed system	ADVZ/MOZ 230 SEEDS; SIMLESA AgriFuturo	2015-2019 ------ – 2021 Closed	Seed sector capacity development; Seed system development; New maize varieties;	Zambezi valley	Euro 4 million; National Manica province		No AGRA funded; Indirect links; No
	Input supply system	ADVZ; AFAP; Feed the Future	2018-2022 -------2023	Privately managed agricultural machine parks; Agro-dealer; Input distribution	Zambezi valley; - Manica/Nampula;	Private entrepreneurs; Agro-dealers; Casa de Agricultor		No No Indirect

	Financial service system	FINAGRO	Credit line for SMEs;	Some districts;	No
	Extension system	IDE; Kugulissa; CONERN; BAGC;	Extension/aggregation/VBAs; village-based agribusinesses/agents; extension; Hub Nhamatanda/Samora Machel storage;	Some districts; Beira Corridor; - Beira Corridor	AGRA involved; AGRA funded; No No
State	Policies and state capacity	SpeedPlus;	EGS policies;		AGRA involved;
	Coordination and partnerships	APROSE (INOVAGRO,	Seed sector coordination		AGRA involved;

Annex 10. Maize market system change interviews

Actor	System component	System change strength	Constraints	Solutions	AGRA
Horacio Manuel (Gondola)	Small enterprise buying maize from three VBAs for district association (UAGO) and DECA and sells inputs	Business model (1 MT margin) supported with small credit from ADEM	Transport problems; Poor market price; Small market due to Idai	Demonstrations (five varieties and intercropping); training post-harvest by ADEM	Adem-supported Kugulissa
Lourenço Antonio (Chikungwe, Gondola)	Aggregator and extension, VBA	Selected and trained and works with 10 groups and lead farmers	Only 10 out of 250 sold maize (40 bags); new technology not adopted, not even after CDRs; Quality control in bought maize (dirt and humidity);	250 small packs distributed; Priss 601 most liked variety; Sieves for VBA and agro-dealer and moisture meter for agro-dealers, as well as scales	Kugulissa
Chikungwe producer group, Gondola	Production of maize benefited with varieties, GAP, input and market training and pest management	Group of 17 women and 13 men. They are one of the 10 groups supported by VBA.	Need implements and lost some of the inputs (seed) Some other crops destroyed by cyclone (bananas, yams)	Continued support by VBAs	Micaia-supported Kugulissa
Jose Choara	Agro-dealers (1 demo, 5 VBAs),	Sell to VBAs and monthly agricultural markets on credit. No relation with hub agro-dealers (Luteari)	Credit (small stock) to VBAs is a financial risk; transport (poor distribution far away clients); No input market info system	Gets credit from PANNAR and, in 2020, also from K2 More training needed (also his staff)	Supported by Agrimerc
Micaia (Rodrigues Vilankulos)	Extension coordinator for 200 VBAs (three districts); two technical staff per district	40% VBAs are youth; VBAs selected with community	Few VBAs rejected (not performing); seed of new varieties too expensive; cropping cycle shorter; late planting leads to fall armyworm; marketing starts (too) early;	Distribution of small packs (50 g maize; 100 g NPK, 50 g urea); early planting and insecticide (Bayer); government starts marketing too late;	Kugulissa
Adem (Sergio Cachalote)	SME technical staff, operating in six districts with 180 SMEs	Link between VBAs and large buyers (Abilio Antunes, DECA,	Only 75 have storage capacity; 120 also sell inputs;	Support with tarpaulins; supply contracts needed;	Kugulissa

		ETG, Maputo buyers, emergency organisations)	Price fluctuation; quality price penalties (dirt, yellow grain, humidity above 15%)	Price information;	
Agrimerc (Ritchon Felix)	Agro-dealer technical staff, training in six districts;	Way agro-dealers are selected. Criteria (existing business, bank account, licenced, mobile phone)	Matching grant not yet; operational, fertiliser sales limited	District agro-dealer association development; Training (post-harvest, business, technical knowledge)	Sub-contract with Adem (AGRA grantee);
Paulino Sozinho (Nvumbe)	VBA, buys maize (20 MT) and sells inputs (planned) and has demos (PRISS 601 wanted)	Each VBA works with eight groups and three to four VBAs are linked to one agro-dealer	Marketing funds are limited; collected maize is high in yellow grains; no receipt of small packs, used his own seed; no access to transport, sells in village to PME; needs to contact Adem to get him seed;	VBA needs to be able to distinguish different varieties; scales and sieve help	Kugulissa
Jetro Joaquim Ernesto Deysse Comercial	SME with storage (200 MT), shop, maize mill; bought 23.75 MT, no interest in being agro-dealer (yet)	VBA networks works (2-3 MT between producer and his sales), quality is now good; sells to DECA and Abilio Antunes, keeps some strategic reserve for local use;	ADEM credit (150,000) Ok but small (revolving until September for inputs);	Training (bulking, post-harvest, storage, business plans); Opportunity Bank loan was for the maize mill; no other access yet (talked to GAPI);	Kugulissa, linked to Luteari
Manuel Queiroz (ADEM)	SME support for maize marketing and input supply;	Business model: large buyers, SMEs 30 MT capacity), VBAs agribusiness forum (Adem); revolving fund	Agro-dealers need 1,000 customers to sustain (not yet); financial system (access to banks or E-pesa), not bankable; written contracts not accepted by wholesale; long sales lines at Abilio Antunes; post-harvest handling; due diligence; guarantee fund or lost fund needed;	Producer should get at least 75% of price (20% SME and 5% VBA);	KUGULISSA
Americo Tamissai (Sussundenga)	Buying and selling of maize, also seed producer (for K2)	PME aggregating maize and storing for price going up; buys below 13% humidity;	Company is not yet registered; marketing funds are limited;	Adem provided marketing budget and moisture meter, scales and	Adem

				sieves. K2 seed company only pays 30/10/2019	
Luteari (celia Ribeiro)	(Hub) agro-dealer and PME, buying maize (AA and WFP), legumes (PP, CB) and sesame, and sells inputs	Operates with 15 agents (some are VBAs) working with 200 (four groups of 50 each with VBA); Works with 20 extensionists (one for 500 farmers);	Capital and risk (lost with pigeon pea market collapse and Idai); Partnerships needed for extension such as with GIZ (farmer business schools); access to credit for medium size companies (interest rates, conditions, payback period)	Would like to work with Kugulissa and/or AFAP for extension on Farming as a Business; buying maize (7MT is minimum for farmers or 70%, 10% for VBA and 20% for agro-dealer/SME;	Working with Agrimerc
Agricultural Association Samora Machel (simao Joaquim Belo, presidente)	Association of 1,753 members, producing and aggregating maize;	In 2018, 175 MT of maize was aggregated in the warehouse; provide extension services to their members (APCs: market promotion groups)) in the communities;	No sales contract for the maize (ECA, ETG and Abílio Antunes); price is not what it was before; used to have contracts with WFP (2011-2013) with price indication;	Elaboration of contracts with agreed prices; contracts to be based on quality (they have no complaints); margins for the association have been 1.5-2.5 MT per kg.	Kugulissa
GAPI-Manica	Financial services with three main credit instruments and BDS services as well as building linkages;	Credit modalities offered: Agrogarante; Agroempreender; Credit Line for Agricultural Marketing (LCCA);	Guarantee problems (collateral) which has to be 100%; approval process takes three weeks and the coaching trajectory two weeks if not approved; low total credit volume	Partnership with ICM;	Colaboração com AGRA;
Agrimerc (Gil Mucave)	Support for agro-dealers involved in input marketing;	Now with 94 agro-dealers with six hub agro-dealers in six districts, with a target of 15 agro-dealers in each district; building links with distributors and VBAs;	Very low input volumes are being sold; required as lot of costly promotion; capacity to aggregate demand for inputs and the corresponding capital; logistics of input distribution, notably in remote areas;	District associations of agro-dealers (agro-dealers and VBAs) to link up with MOSTA;	PRODAZAV Zambezia
INOVA	Financing new ideas in agricultural market system development	Market system change (marketing; inputs; cross-cutting issues; support services; BDS) through new ideas and a co-creation process;	New ideas in private sector development are needed, which are owned by the actors themselves; many interventions are not sustainable	Examples are on community radio; bulking clubs; private service provision development; supporting VBA concept of: Luteari, K2 and Miruku);	Opportunities for collaboration with the

					AGRA programme;
Large wholesale maize traders (DECA, ECA, Abilio Antunes)	ECA takes a development role (quality maize for beer brewers), others just buy	Large traders make use of the bulking network (SME and VBAs)	Quality of grain (colour, size, humidity); development role is often limited; most act as miners;	ECA has a development programme for producers (inputs and marketing) for the supply of quality maize to brewers (CdM and Heineken);	

Annex 11. Soybean market system situation assessment

Tool 1: Significant changes registered in the soybean market system and the role of AGRA

	Soybean market system components	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Value chain	Production	Some production in Manica, Angônia		TNS, Clusa and Inovagro support	Large companies (Hoyo Hoyo, Agromoz, Rei de Agro)				Otumiha start with more small-scale producers		
	Bulking and marketing			NH started its 2,000 chicks outgrower scheme	TNS and Clusa support bulking	Soybean demand in Manica for Abilio Antunes				VBA bulking points	
	Wholesale				Bangladeshi traders (Olam and RTG)					Abilio Antunes and ETG expansion	
	Processing	NH small feed plant				New NH feed plant	NH buys King Frango feed plant		WINNUA (Mocuba) enriched flower		SBS expansion with feed; new Portuguese feed plant in Gurue. Miruku Agrifood
	Retail						New NH feed+chicks outlets in				

					Nacala, Nampula and Pemba		
	Consumption		NOSSARA food project		Rapid expansion feed use	Expansion NOSSARA activities	
Support services	Seed system	Oruwera , Ikuru, Morais, Miruku for (soybean) seed	Local seed from Chimoio and Tete multiplied (TNS, Clusa, Ikuru)			SBS seed plant in Gurue	
	Input supply system					VBA-AD: seed, inoculant, fertiliser, pesticide	
	Financial service system		Short-lived production credit by King Frango, Inovagro, Opportunity Bank[5]				Agmark facilitation of input (guarantee fund)
	Extension system		NGO and private company extension			VBA (400x) and facilitator (4,000) system	
State	Policies and state capacity		No soybean seed subsidies	New seed regulations		SUSTENTA and paces for extension and support	Presidential initiative production

[5] Now MB Corporation

		increase (chicken)
Coordination and partnerships	Oilseeds platform in Nampula (soybeans, sesame and groundnuts)	

Tool 2: Rapid soybean market system analysis

	Soybean market system components	Actors	Current strengths	Current weaknesses	Opportunities for improvement	Priority ranking
Value chain	Production	Producers	Good soils	Crop financing; post-harvest handling; poor agricultural practices; mechanisation	Increase number of VBAs and technical extension; thresher introduction; training of producers; organisation in blocks for mechanisation	1,1,1
	Bulking and marketing	VBAs SMEs associations and cooperatives	Knowledge about bulking points	Quality; no or limited supply contracts	Post-harvest practices; storage improvement; model contract for sme-vba-producers	
	Wholesale	SMEs; ETC; Novos Horizontes; etc.	Marketing funds; equipment; storage infrastructure	Poor marketing network; not investing in production;	Partnership facilitation; organisation of marketing season;	1, 3
	Processing	Novos horizontes; Abilio Antunes; Food agro-industry (WINNUA, Miruku)	Local sourcing	Quality grain volumes; cleaning in border areas done abroad	Quality of grain during the marketing process;	2,2
	Retail	NH shops NOSSARA	Chicks and feed package;	Limited investment in soybean food; Few shops (only in towns)	Can VBAs and SMEs be chicken feed shops	4
	Consumption	IITA and Technoserve	Promotion of bajia and soybean milk	Knowledge on soybean food processing	Training and partnerships with nutrition projects	3, 5
Support services	Seed system	COPAZA; Oruwera; K2 and IITA	Good varieties (e.g. 10E in Gurue and others for lower altitudes)	Slow variety release (e.g. 10E); technical knowledge low effective demand (attitude)	Harmonisation of information and approach; Training Sustenta, VBAs)	2, 3, 4

	Input supply system	Agro-dealers (SMEs);	SME and VBA collaboration; increased agro-dealers network	Distance to large distributors (Tete, Chimoio, Beira); high transaction costs; quality control	Opening new branches; contracts with hub agro-dealers;	
	Financial service system	GAPI	Some very few marketing credit arrangements	No production credit	Facilitation of links between financial services and producers and traders;	2, 4,4
	Extension system	Public extension, VBA network, private extension, NGOs, projects (PROMER)	VBA extension network	Collaboration;	District coordination meetings every two months; joint action plan	3,5
State	Policies and state capacity	National, provincial and local government		Prices fluctuating, side selling, mining attitude of some traders	Need for soybean production support policy	5
	Coordination and partnerships	Stakeholder platforms	Some extension platform in Gurue at district level	No system platform since 2015	Soybean platform to be created	5

Tool 3: Soybean market system intervention landscape

	Soybean market system components	Projects	Timing	Desired Change	Scale and focus	Investment (MT//US$)	Partners	Link with AGRA
Value chain	Production	Winrock	2018-2019	Mechanisation and irrigation	Nacala Corridor	??	DAI	No
		Sustenta	2017-2021	PACES and marketing	Zambezia and Nampula	US$80 million	MITADER	Some
		Clusa	2012- open	Extension and market structuring	Alta Zambezia	??	SDAEs	Good
		Technoserve	2010-2018	Extension, marketing and mechanisation	Nampula, Zambezia, Niassa	Check	Province, Districts	No
		Inovagro	2015-2019	Extension and seed	Nampula, Alta Zambezia	Check	National	No
	Bulking and marketing							
	Wholesale	ICM	??	Silo construction rented to ETG etc.	Nampula		-	-
		PROMER	2010-2021	Rural markets (inout, outputs), Storage and outlet infrastructure;	Nacala Corridor		MITADER	On outlets
	Processing	Sustenta		Food industry (Miruku)	Zambezia and Nampula		MITADER	Limited
		SBS Feed		Local feed processing				
		New Gurue feed plant		Export market???				
	Retail	Novos Horizontes		More local shops	Nampula, Zambezia, Cabo Delgado	??		Limited
	Consumption	NOSSARA		Local processing soybeans	Nampula			Good
Support services	Seed system	K2	2017-	New variety promotion	National	??	ANS	-
		IITA	2015-	New variety development	North, Centre	??	IIAM	Some
		AGRA (Oruwera, Ikuru, Clusa)	2010-2017	Seed business development	Nampula, Zambezia	Check		Some
	Input supply system	PROSAVANA	2010-2019	Research, Extension, agro-processing	Nacala Corridor	?	MASA/DPA	None
		FAO	Annual	Input voucher system	National, also soybean	?		

								Post-harvest training
	Financial service system	GAPI		Some marketing credit	Upper Zambezia			
	Extension system	IFAD/PSP	2010-2019	Public extension, soybean demos	National	?	MASA/DNEA	Some
State	Policies and state capacity							
	Coordination and partnerships	SNV	2012-2015	Oil crop platforms	Nacala Corridor	?	Various	

Annex 12. Soybean market system interviews

Actor	System component	System change strength	Constraints	Solutions	AGRA
Miruku Business Development Services (Haje Antonio; Osvaldo Agostinho)	BDS for SMEs	SMEs are linked up with VBA (commission) input/output combination	Post-harvest handling and quality; marketing fund issues; aggregated volume	Improved threshing; Credit (GAPI, FDA/BNI) to include BDS; collateral challenges	PME-VBA BDS support Otumiha
Miruku Agro-Food Industry (Haje Antonio)	Processing 150 MT (-300 MT) into enriched flower/porridge	Market exists and business plan developed for 70 SMEs	Getting the investment from SUSTENTA takes long		No direct link
AENA (Jose Abacar)	Local aggregators and input suppliers by local entrepreneurial; technical staff in each district (with motorcycle);	VBA business model (commissions) and working with 250 Producers. Many youth and 20% women. VBA selection process	Poorly harmonized approaches (e.g. PITTA) Attitudes of producers Increasing risks (climate, pests)	Local and national meetings Demos and follow-up Providing options	Otumiha
GAPI-North Joao Faustino Maunze; Alberto Mariano Caetano	Financial services for production, trade and agro-processing	*Agro-garante* system to overcome collateral problems; micro-finance centres; some credit instruments	Poor info on instruments; lack of collateral; poor business plans	Support for immoveable and movable good registration of VBs; Introduction of warehouse receipt systems	Rice system collaboration, for other corridors being developed
Helvetas (Ali Magido)	Training in seed systems and post-harvest handling	Training (of trainers) and extension; experienced seed production	No quality control in the chain (from field to shop); quality control in the field needed	Post-harvest training of VBAs; visual material (for VBAs) and community radio needed; more training on soy as food crop	Otumiha partner
Novos Horizontes Tinashe Tsvaki)	Chicken feed processing (7,500-8,000 MT annually) and trading	Good local soybean production (no imports needed); trade with large companies, rest from SMEs	Quality is major challenge; No soybean platform High transaction costs	AFGRI (RSA) invited to assist; market information, platform development and backward integration;	Limited

				direct sourcing with associations (MT10 to be collected)	
Oruwera (Amilcar Lucas Benate)	Production of certified seed (120 MT in 2019: GN, SB, Ma, CP, SS, onion and lettuce) grown by 19 outgrowers, and EGS production	Market growing fast (almost doubling every year); good soybean varieties and produce market requiring quality, hence Oruwera seed; trusted	Major risks are subsidies, climate and demand; concern about steady flow of new varieties (also food and oil) and pre-basic seed availability; inoculant production;	Quality attention with small seed lab and private inspectors; IIAM soybean improvement strategy;	AGRA 2nd grant; some more attention needed.
VBA in Rapale (Artur Bernardo Capataz)	Operates input and output system with 10 facilitators and 300 producers (150 kg soybeans)	VBA business concept with links with producers and SMEs (Fernando, 5 k); demonstrations and follow-up with small packs;	Limited knowledge about soybean varieties; cost and benefit calculations;	Training (five modules) and demos as start and initial KIT (clothing and some inputs);	AGRA support through AENA;
VBA in Rapale (Vindo Joao)	VBA for 10 facilitators and 300 producers - 300 maize and 50 soybeans;	VBAs and producers: 50 demos of three varieties (Lundi, Mwenezi, Sana). 2nd year buy seed; VBA and agro-dealer/SME: good price;	Limited knowledge of soybean seed and varieties; climate risks; few female VBAs	Training; solar powered drip irrigation pump; female VBAs need training with husbands;	AGRA support through AENA;
Sustenta/FNDS (Felicidade Muiocha);	PACES (79 currently) are supporting producers with inputs and mechanisation as well as marketing;	Strong support for production but less for marketing; machines for PACES partially on credit;	Soybean market concerns; marketing funds; produce bulking volumes; mechanisation efficiency (>low rates of return); multi-stakeholder coordination needed	Investment in food processing; attention for young people selection; sector platforms required;	No relation, but PACES model built on VBA model;
Tongai (hub agro-dealers from Gurue)	Hub agro-dealer for Gurue (with supply contracts) and seed producer;	Local agro-dealer and trader (commission 1MT/kg) links with VBAs and wholesale (SBS); Contract with associations for supply;	Increasing local competition by Bangladeshi traders; no contract with Abilio Antunes; buying starts long before marketing season, affecting quality;	Trader certification at district level; marketing regulation needed;	AENA and Agmark supported;
Jaime Jaquissom from Gurue	VBA (10 facilitators and 250 producers) and producer;	Good variety (10E); He and facilitators each get 1 MT commission/kg; same for input	Soybean seed prices too high (6 x grain);	Looking for options of cheaper seed production (QDS); training of trainers;	AENA supported;

	input provider and bulking	supply; price negotiator for registered soybeans still at farmers place;	shortage of soybean technical staff;		
IITA (Carlos Malita)	IITA develops new soybean varieties with IIAM; IITA organises basic seed production	Steady supply of varieties, to be released; pre-basic seed of released varieties;	Slow release process; uncertain seed demand of new varieties; seed to be sold to farmers (not always respected);	New high oil and snack varieties developed (6 x each); producers to become more productivity focused; producer to be more quality focused	AGRA has invested heavily in new varieties
Agmark (Moises Raposo)	Supporting 88 agro-dealers (hub in each district) linked to VBAs and suppliers through district hub agro-dealer	Guarantee fund for agro-dealers with Casa de Agricultor or direct contract suppliers (no guarantee fund); 100 MT stock capacity;	Price management of inputs (seed etc.) (transaction costs); financial illiteracy of agro-dealers; registration of inputs, also outputs?; shop opening fund of US$350 not very high; quality management;	Business development training (nine high quality hubs; 35-40 OK; 50 are still to be trained); quality management training (seed, etc.); publicity material to be extended; basic training requirement to be increased	AGRA supported
Casa de agricultor (TECAP) Nampula	Supply of soybean seed: Lundi, Mwenezi (K2); Zamboane); and NPK ((23:10:5); soybean threshers (MT 400,000)	Casa de Agricultor supplies all Agmark supported agro-dealers (some have direct contract with supplier); Agmark Guarantee Fund	Margins relatively high	Overall contracts with Casa de Agricultor for lower transaction costs (MT 125-155 kg of seed);	AGRA through Agmark

Annex 13. Data dictionary of main indicators

Indicator	Definition
G2: Average number of months of adequate household food provision	The average number of months of adequate household food provision.
G6: Wealth assets index score	The DHS household wealth index is a composite measure of a household's cumulative living standard. It is composed of data on asset ownership, materials used for housing construction, and types of water access and sanitation facilities. Wealth index values typically range between -2 and 2, with 0 being on the centre of the distribution.
G6.1 Share of households in first wealth quintile (%)	The share of households in the first wealth quintile (based on the country average).
G6.2 Share of households in second wealth quintile (%)	The share of households in the second wealth quintile (based on the country average).
G6.3 Share of households in third wealth quintile (%)	The share of households in the thirds wealth quintile (based on the country average).
G6.4 Share of households in fourth wealth quintile (%)	The share of households in the fourth wealth quintile (based on the country average).
G6.5 Share of households in fifth wealth quintile (%)	The share of households in the fifth wealth quintile (based on the country average).
IWI International Wealth Index	The International Wealth Index (IWI) is the first comparable asset based wealth index covering the complete developing world. It is based on data for over 2.1 million households in 97 low and middle income countries. Based on DHS household wealth index variables.
1. Average yield (kg/ha)	The average harvest quantity of the crop in the main season (kg) divided by the amount of land on which the crop is cultivated (ha) per farm household. In case respondents reported production and cultivated area in different units, conversions to kilogrammes and hectares were made respectively.
3. Rate of application of target improved productivity technologies or management practices (indicator 14)	The percentage of farm households using improved varieties or inorganic fertiliser.
3.1 Adoption of improved varieties (%)	The percentage of farm households using improved OPVs or hybrids. Farm households cultivating varieties that could not be classified were counted as not using improved varieties.
3.2 Adoption of endorsed varieties (%)	The percentage of farm households using varieties that are endorsed by AGRA and its partners.
3.3 Number of seasons variety is recycled	The average number of seasons the variety has been recycled.
3.4 Adoption of endorsed planting practice (%)	The percentage of farm households using the specific spacing of seed as promoted by AGRA and partners.
3.5 Adoption of inorganic fertiliser (%)	The percentage of farm households applying inorganic fertiliser.
3.6 Adoption of endorsed fertiliser (%)	The percentage of farm households applying fertiliser endorsed by AGRA and its partners.

Indicator	Definition
3.7 Adoption of organic fertiliser (%)	The percentage of households applying organic fertiliser.
3.8 Adoption of inoculants (%)	The percentage of households applying inoculants.
3.9 Adoption of pest-management practices (%)	The percentage of households applying pesticides, herbicides or fungicides, or a combination of the three.
3.10 Adoption of endorsed post-harvest practices (%)	The percentage of households making use of a tarpaulin while drying and/or threshing their harvest.
3.11 Adoption of improved storage (%)	The percentage of households making use of improved storage facilities, such as PICS bags or silos.
3.12 Use of designated storage facilities (%)	The percentage of households storing their produce using storage at the farmer's organisation, a warehouse receipt system, or private storage.
3.13 Adoption of tablets to preserve quality of recycled seed (%)	The percentage of households using tablets to preserve the quality of their seed stock.
Hectares under improved technologies or management practices (%)	The total land area under improved varieties or inorganic fertiliser as a share of the total land area on which the crop is cultivated.
3.14 Area under improved varieties (%)	The total number of has under improved varieties (hybrid or OPV) as a share of the total land area on which the crop is cultivated.
3.15 Area under inorganic fertiliser (%)	The total number of has on which inorganic fertiliser is applied for the cultivation of the crop as a share of the total land area on which the crop is cultivated.
3.16 Area under pesticides (%)	The total number of has on which pesticides, herbicides, or fungicides were applied for the cultivation of the crop as a share of the total land area on which the crop is cultivated.
4. Access to agricultural advisory extension support services (indicators 16)	The share of households that is visited by an agricultural extension agent during the last 12 months.
4.1 Average number of visits per year by agricultural advisory extension support services	The average number of visits by an agricultural extension agent during the last 12 months among farm households that have been visited at least once.
4.2. Received small seed pack (%) (additional indicator 4)	The percentage of households that received a promotional seed pack.
4.3 Used small seed pack (%) (additional indicator 4)	The percentage of households that used the seeds from the promotional seed pack received.
4.4 Distance to nearest agro-dealer (minutes) (additional indicator 1) (indicator 15)	The average distance to the nearest input supplier in minutes. Considers only households that could estimate this in minutes. Households that could only report this in distance are reported separately.
5. Nitrogen application (kg/ha)	The average amount of nitrogen (in kg) applied per ha of land on which the crop is cultivated.
5.1 Phosphorus application (kg/ha)	The average amount of phosphorus (in kg) applied per ha of land on which the crop is cultivated.
5.2 Potassium application (kg/ha)	The average amount of potassium (in kg) applied per ha of land on which the crop is cultivated.
Average fertiliser use (Total N + P + K, kg/ha) (Indicator 21)	The average sum of nitrogen, phosphorus and phosphorus (in kg) applied per ha of land on which the crop is cultivated.

Indicator	Definition
6. Percent of post-harvest losses (%) (indicator 22)	The share of harvest that is lost and thus not consumed, stored, given away, sold, bartered, or used as payment in kind.
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	The revenues from selling the crop, converted from local currency to US$ by using the 2018 average exchange rate.
13. Access to formal financial services (%)	The percentage of households that have access to formal financial services (either a bank account, a loan, or insurance)
13.1 Bank account (%)	The percentage of households that have a bank account.
13.2 Agricultural loan (%)	The percentage of households that took a loan from a formal financial institution in 2018. Formal financial institutions include banks, microfinance institutions, savings and credit cooperatives and mobile money.
13.3 Agricultural insurance (%)	The percentage of households that took crop insurance in 2018.
17. Average age of varieties used (years)	The average age of varieties used (in years).
33. Sale through structured trading facilities/arrangements (%) (indicators 30)	The sale through structured trading facilities or arrangements is defined as the number of households selling their harvest through formal contractual arrangements as a percentage of the total number of households selling at least some of their harvest.
33.1 Selling to traders/middlemen (%)	The percentage of farm households selling their harvest to traders/middlemen.
33.2 Selling to consumers (%)	The percentage of farm households selling their harvest to consumers.
33.3 Selling to friends/neighbours (%)	The percentage of farm households selling their harvest to friends/neighbours.
33.4 Selling to aggregation centre (%)	The percentage of farm households selling their harvest to aggregation centres.
33.5 Selling to farmer organisation (%)	The percentage of farm households selling their harvest to farm organisations
33.6 Selling to wholesalers (%)	The percentage of farm households selling their harvest to wholesalers.
33.7 Selling to processors (%)	The percentage of farm households selling their harvest to processors.
33.8 Selling to retailers (%)	The percentage of farm households selling their harvest to retailers.
33.9 Selling to company (undefined) (%)	The percentage of farm households selling their harvest to a company (in an undefined sector).
33.10 Selling to institutional buyers (%)	The percentage of farm households selling their harvest to institutional buyers.
37. Access to market information through formal channel (%)	The share of farm households receiving market information through formal channels (SMS, radio, television, farmer's organisation).
Numbering according to ToR, in parenthesis numbering of AGRA ToC	

Annex 14. Performance scorecards

Table 112: Business resilience performance scorecard

Business resilience		Performance category 1	Performance category 2	Performance category 3	Performance category 4
Years in business	Ranges (years)	1-5	5-10	10-15	>15
	Score	1	2	3	4
Number of services	Ranges (#)	1	2	3	>3
	Score	1	2	3	4
Number of buyers	Ranges (#)	1	2	3	>3
	Score	1	2	3	4

Table 113: Financial sustainability performance scorecard

Financial Sustainability		Category 1	Category 2	Category 3	Category 4
Percentage using formal credit	Ranges (%)	0%	0%-33%	33%-66%	>66%
	Score	1	2	3	4
Annual turnover (US$)	Ranges (thousands)	1-10	10-25	25-50	>50
	Score	1	2	3	4
Number of investments	Ranges (#)	0	1	3	>3
	Score	1	2	3	4

Table 114: Human capital performance scorecard

Human capital		Category 1	Category 2	Category 3	Category 4
% Female	Ranges (%)	0%	0%-33%	33%-66%	>66%
	Score	1	2	3	4
% Skilled	Ranges (%)	0%	0%-33%	33%-66%	>66%
	Score	1	2	3	4
% Permanent	Ranges (%)	0%	0%-33%	33%-66%	>66%
	Score	1	2	3	4
% Casual	Ranges (%)	0%	0%-33%	33%-66%	>66%
	Score	1	2	3	4

Table 115: Technology performance scorecard

Technology		Category 1	Category 2	Category 3	Category 4
Investments in R&D	Ranges (#)	0	-	-	1
	Score	1			4
Building storage	Ranges (#)	0	-	-	1
	Score	1			4
Equipment	Ranges (#)	0	-	-	1
	Score	1			4

Annex 15. SMEs descriptive statistics

Table 116: General SME characteristics

General SME Characteristics	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
Years of business	3.2 (1.09)	2.22 (1.48)	2.22 (0.98)	2.75 (1.03)
Average number of commodities				
Commercialized/traded	4.4 (1.14)	2.55 (1.33)	-	1.75 (1.03)
Processed	-		-	
Transported	-		-	
Main Commodities commercialized/traded				
Maize	100%	66.67%	-	75%
Groundnut		11.11%	-	
Soybean		22.22%	-	
Vegetables			-	12.50%
Other			-	12.50%
Permanent staff	20.6 (13.81)	4.22 (3.45)	2.11 (1.26)	9 (9.14)
Casual staff	51.6 (42.30)	18.11 (31.06)		21.66 (48.23)
Total annual turnover (USD)*	103500 (112337)	7957 (8867)	1352 (878)	97800 (180235)
Observations	**5**	**9**	**9**	**8**

*Standard Deviation in parenthesis. *Incomplete information for Annual Turnover*
Seed companies: Observations total annual turnover: 80%
See producers: Observations total annual turnover: 88%
Input supply/agro-dealers: Observations total annual turnover: 66%.
Agri-Value Chain Actors: Observations total annual turnover: 50%.

Table 117: SME employees

Employees	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
Permanent Staff	20.6	4.22	2.22	9
	(13.81)	(3.45)	(0.98)	(9.14)
Casual Staff	51.6	18.11	-	21.66
	(42.30)	(31.06)		(48.23)
% Female(over total)	43%	54%	25%	33%
% Skilled(over total)	6%	0%	5%	0.3%
*Annual Salary Permanent (USD)**	28915	2265	912	4882
	(22071)	(1742)	(528)	(5234)
*Annual Salary Casual (USD)**	20867	1100	-	3573
	(31714)	(620)		(5221)
*Daily Wage Casual (USD)**	8.18	2	1.6	11.73
	(13.36)	(0.60)	(-)	(17.55)

*Standard Deviation in parenthesis. *Incomplete information for Annual Salary and Daily wage. Detailed information reported below.*
Seed Companies: Obs salary permanent workers: 77%; Obs salary casual workers 88%; Obs daily wage 88%
See Producers: Obs salary permanent workers: 100%; Obs salary casual workers 100%; Obs daily wage 100%
Input Supply agro dealers: Obs salary permanent workers: 88%; Obs salary casual workers 0%; Obs daily wage 11%
Agri-Value Chain: Obs salary permanent workers: 87%; Obs salary casual workers 37%; Obs daily wage 37%

Table 118: SME buyers

Buyers	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
Projects, programs and government	100%	100%		25%
Farmer organizations, coops, associations	100%	11%	55%	75%
Individual buyers / producers	100%		100%	75%
Traders, input suppliers, wholesalers	60%		33%	12%
Average number of buyers	3.6	1.11	1.88	2.14
	(0.54)	(0.33)	(0.60)	(0.89)
Observations	**5**	**9**	**9**	**8**

Standard Deviation in parenthesis

Table 119: SME services

SME Services	Seed companies	Seed Producers
Variety development	20%	44%
Breeder seed production	40%	
Production of early generation seed / foundation seed	20%	77%
Production of improved / certified seed	60%	
Production of noncertified seed		11%
Sales of improved / certified seed	100%	
Sales of non certified seeds		
Sales of early generation seed / foundation seed		
Average number of services provided	2.4 (1.51)	1.33 (0.70)
Observations	**5**	**9**

SME Services	Input supply agro dealers
Retail (sales) of improved / certified	66%
Retail (sales) of chemical fertilizers	77%
Advisory services / extension	
Import of inputs	
Wholesale and Manufacturing of inputs	
Average number of services provided	1.44 (0.52)
Observations	**9**

SME Services	Agri Value Chain
Aggregation of farmer production (transport, Agri-food processing (transformation of	100%
Transport	12%
Mechanization	
Average number of services provided	1.12 (0.35)
Observations	**8**

Table 120: SME investments

Investments	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
Expansion of land area	80%	44%	22%	25%
Expansion of buildings and/or storage	40%		33%	37%
Upgrading of equipment	80%	22%	22%	12%
Research & Development	20%			
Training of staff	60%	11%		
Increase / injection for working capital	40%			
No Investment		33%	22%	50%
Average number of investments	3.2 (1.64)	0.77 (0.66)	0.77 (0.44)	0.75 (0.88)
Observations	**5**	**9**	**9**	**8**

Table 121: Percentage of credit from formal sources

Access to formal credit	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
0%				12.50%
<10%				
10-25%				
25-50%			33.33%	
50-75%				37.50%
75%-90%	20%		11.11%	12.50%
>90%	80%	100%	55.56%	37.50%
Observations	**5**	**9**	**9**	**8**

Table 122: AGRA support services

AGRA Services	Seed Companies	Seed Producers	Input Supply Agro-Dealers	Agri Value Chain
Grant	60%			
Loan/Credit			11%	
Training	40%			
Technical Assistance	60%	22%		12%
No Service	20%	77%	11%	87%
Average Number AGRA Services	1.8 (1.3)	0.22 (0.44)	0.22 (0.44)	0.12 (0.35)
Observations	**5**	**9**	**9**	**8**

Standard Deviation in parenthesis

10 Annex 16. SMEs participating in the interviews

Seed companies	Seed Producers	Input supply/Agro dealers	Agri Value Chain
ACOF	Angelo Geronimo	Agro-dealer Alafo	Alfredo Alface
Emilia Comercial Limitada	Antonio Niquira	Banca Chiritse Agro dealer	Armazem do Chines
Emilia Comercial Sementes	Augusto Tepanheque	Banca Do Senhor Lucas	Armazéns Albino Elissa
Sementes Nzara Yapera Lda	Banca Bernardo Arnassa	Banca Elias	Carlos Jeniasse
Oruwera	Cardozo Paulino	Banca Parafino	Chapi Comercial
	Edmond Muchate	Eusebio Moyo	Filimone Estine Chipere
	Empresa Adamo	Magassosso Express Development	Lucas Bernardo
	Orvalho Joao	Semo Manuel Gabriel	Tenta Sorte
	Sabado Amade	Wamwayi ndi Wamwayi A D	