AGRA
Growing Africa's Agriculture

KIT Royal Tropical Institute

PIATA 2019 Outcome Monitoring Report
AGRA Tanzania

Consolidated report
KIT Royal Tropical Institute, Amsterdam
30 April 2020

Colophon

Correct citation:
KIT, 2020. *Tanzania Outcome Monitoring Report 2019, AGRA-PIATA Programme*. Alliance for a Green Revolution in Africa, Nairobi; KIT Royal Tropical Institute, Amsterdam.

Contributors:
KIT fieldwork: Verena Bitzer, Geneviève Audet-Bélanger and Rob Kuijpers
KIT team: Geneviève Audet-Bélanger, Verena Bitzer, Coen Buvelot, Peter Gildemacher, Rob Kuijpers, Helena Posthumus, Boudy van Schagen, Elena Serfilippi, Esther Smits, Marcelo Tyszler, Bertus Wennink
ENVICON: Joseph Kangile, Evody Thaddeo, Karoli Njau and a team of 10 enumerators

Photo: Rasheedhrasheed

Language edit: WREN*media*

This report has been commissioned by AGRA to monitor its PIATA programme progress in Tanzania.

KIT Royal Tropical Institute
Amsterdam, the Netherlands
www.kit.nl

AGRA
Nairobi, Kenya
www.agra.org

Contents

Acronyms

AGRA	Alliance for Green Revolution in Africa
ANSAF	Agricultural Non-State Actors Forum
ASDP II	Agriculture Sector Development Programme Two
ASDS II	Agriculture Sector Development Strategy, Phase Two
ATC	Agriculture Council of Tanzania
AU	African Union
BRITEN	Building Rural Incomes Through Enterprise
BTC	Belgian Technical Cooperation
CAADP	Comprehensive Africa Agriculture Development Programme
CGIAR	(formerly) Consultative Group on International Agricultural Research
Danida	Danish International Development Agency
DRC	Democratic Republic of the Congo
EAGC	Eastern African Grain Council
FAO	Food and Agriculture Organization of the United Nations
FIPS	Farm Input Promotions Africa
FYDP II	Five Year Development Plan Phase Two
GDP	Gross Domestic Product
GIZ	German International Cooperation
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	International Institute of Tropical Agriculture
JICA	Japan International Cooperation Agency
JSR	Joint Sector Review
KIT	Royal Tropical Institute
MIICO	ADP Mbozi, Ileje Rural Development Organization and Isangati Agricultural Development Organization Consortium
NAIP	National Agricultural Investment Plan
OPV	Open pollinated variety
PIATA	Partnership for Inclusive Agricultural Transformation in Africa
PMO-RALG	Prime Minister's Office, Regional Administration and Local Government
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SELF	Small Entrepreneurs Loan Facility Project
Sida	Swedish International Development Cooperation Agency
SME	Small and medium-sized enterprise
SUKA consortium	Sumbawanga/Katavi consortium
TAFSIP	Tanzania Agriculture and Food Security Investment Plan
TARI	Tanzania Agricultural Research Institute
TCCIA	Tanzania Chamber of Commerce, Industry and Agriculture
TDV 2025	Tanzania Development Vision
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WRS	Warehouse Receipt System

List of tables

List of figures

1 Summary of results

1.1 Introduction

AGRA aims to catalyse and sustain an inclusive agricultural transformation in Africa to increase incomes and improve food security for 30 million farming households in eleven 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 envisages 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 Tanzania, AGRA aims to increase incomes and improve food security of 1.5 million smallholder farming households through strategic country support and government engagement coupled with a set of targeted catalytic downstream and systemic investments (made through its alliance of partners) in high impact areas such as food processing and market-oriented agricultural production (AGRA, 2017). Therefore, AGRA's intervention in Tanzania focuses on country support and policy engagement, as well as support to value chains and market systems development. This strategy is the continuity of AGRA's past investments (US$51.29 million) and lessons learned over the years. The current investments are dedicated to the following strategic objectives:

- Increased staple crop productivity for smallholder farmers,
- Strengthened and expanded access to output markets,
- Increased capacity of smallholder farming households and agricultural systems to better prepare for and adapt to shocks and stresses, and
- Strengthened continental, regional and government multi-sectoral coordination and mutual accountability in the agriculture sector.

Catalytic investments at systems and household levels are made through four consortia, which were established across the country in Kagera, Kigoma (both Western Highlands), and Sumbawanga/Katavi (SUKA) and Ihemi/Ludewa (both Southern Highlands). AGRA's focus lies on maize, rice and beans (primary crops) and cassava and potato (secondary crops).

For the 2019 outcome monitoring in Tanzania, AGRA decided to focus on two crops – maize and rice. For the qualitative systems review, AGRA selected the market system and the extension system. Note that the seed system and input supply systems were not included in the 2019 monitoring.

1.2 System change

Market system

System change needs

The crop marketing system in Tanzania is weak and disorganised, which impacts smallholder farmers in particular. Post-harvest handling and storage infrastructure are poor and farmers are generally forced to sell quickly after harvest. Most crop trade is done via informal channels, with farm-gate or village-level transactions being most common. While farm-gate prices are low, market prices are relatively high due to poor road networks and administrative constraints, such as the produce cess (tax). Food processing, apart from small-scale milling of staple crops, is still in its infancy. While Tanzania depends on the export of agricultural products for foreign exchange earnings, international trade is frequently impeded by erratic export bans and unclear export regulations.

AGRA objectives and activities

AGRA Tanzania aims to enhance supply chain efficiency and improve market access for smallholder farmers. Therefore, the focus lies on building farmer relationships with buyers, improved quality through better post-harvest practices, and an improved enabling environment. With regard to relationship building, all regional consortia work with business-to-business forums where farmers can meet potential buyers. They also establish direct linkages between identified offtakers and provide farmer training (e.g. on crop standards, gross margin calculation, etc.). Farmer training further deals with improved post-harvest handling to reduce crop losses and improve quality. The consortia also rehabilitate or construct warehouses for farmers to aggregate their produce. Concerning the enabling environment, two of the four consortia work on trade facilitation and promotion. There are also two additional AGRA projects that specifically aim to improve market-related policies through lobby and advocacy.

Early results and analysis

AGRA supports a variety of market-relevant interventions, which address various market constraints for smallholder commercialisation. All consortia provide different elements of smallholder market support, including efforts to promote collective marketing and connecting farmers to (often local) formal buyers. These consortia also heavily engage in improving post-harvest management through farmer training and supporting warehouses for crop storage. However, many market activities implemented by the four consortia seem to be rather fragmented and ad hoc. The heavy focus on farmer training is relevant, but it needs to be monitored in how far training enables farmers to participate more successfully in markets. It is also not clear whether business-to-business forums offer farmers better market access than the predominant farm-gate sales. Finally, the consortia identified early barriers to improved post-harvest management. For storage practices, access to finance remains a challenge for farmers to acquire and use such technologies. With regards to collective storage and marketing, more than just restoring facilities is required; to be successful, governance and accountability around such structures are imperative.

Extension system

System change needs

The extension system in Tanzania is characterised by a pluralistic landscape of service providers. While this is often considered a strength, service delivery to farmers continues to rely on public extension, which struggles with problems of staff shortages and limited operational resources due to structural underfunding. All categories of service providers, including the public system, are characterised by a high degree of donor dependency. Service provision is mostly top-down, executed through demonstration plots and field days, and ends once project funding is finished. Farmers' needs, especially women farmers' needs, are often not sufficiently recognised. Coordination between service providers is supposed to be handled by local government authorities but does not take place on an institutionalised basis and does not lead to complementarity in service delivery. Finally, accountability of service providers, especially to farmers, is limited and data on service provision is often not publicly available, if collected at all.

AGRA objectives and activities

Under AGRA's Partnership for Inclusive Agricultural Transformation in Africa (PIATA) programme, support to the extension system focuses on quickly reducing the extension agent-to-farmer ratio and creating demand for and access to improved seeds, fertiliser and other inputs. The formation of village-based advisors (VBAs) lies at the core of AGRA's approach lies. These VBAs deliver extension messages to farmers, mostly through demonstration plots, and gain extra income through small-scale economic activities (e.g. supplying farmers with inputs). This approach is employed in all four regional APRA-funded consortia. By October 2019, more than 5,000 VBAs had been trained, who can each work with approximately 100-200 farmers. The main extension method is through 'mother-baby' demonstration plots, which allow farmers to experiment with small packages of improved seed and blended fertiliser. A number of private sector companies are integrated into extension activities to show farmers the use of specific products. In two consortia, the national Tanzania Agricultural Research Institute (TARI) is also involved in extension activities.

Early results and analysis

With the training of a large number of VBAs, the four AGRA consortia have established a new actor in Tanzania's extension landscape. This recognises the importance of working with farmers for productivity increases and has the potential to improve the coverage of extension services. Linking extension services to input supply is also promising. However, the reliance on VBAs as service providers to farmers also comes with risks, as it is not clear to what extent they can actually deliver quality extension messages to farmers. It is also likely that only a few VBAs will manage to establish themselves as rural entrepreneurs. This needs to be monitored over time, as well as the effect of successful/non-successful entrepreneurship by VBAs on their training activities for farmers. Currently, engagement with public extension is limited, which means that capacity remains low and is unlikely to change in the future.

1.3 Household survey

A household survey was carried out amongst a group of maize farmers in Iringa region (N=1,164) and a separate group of rice farmers in Katavi region (N=961), of which 581 actually cultivated rice. 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 rice farmers, based on the 2018 crop season. These indicators are used to measure progress at farmer level towards AGRA's overarching goal of catalysing agricultural transformation for increased income and food security.

Table 1: AGRA outcome indicators (2018 cropping season)

Outcome indicator	Maize	Rice
Goal indicator 2: Average number of months of adequate household food provision	11.2	10.3
Goal indicator 6: Wealth assets index score	-0.230	-0.468
1. Average yield (kg/ha) (Indicator 1)	1,286	2,550
3. Rate of application of target improved technologies or management practices (Indicator 14)	82%	2%
4.4 Average distance (minutes) from farmers to agro-dealers (Indicator 15)	37.3	52.2
4. Percent of farmers accessing agricultural advisory extension support services (Indicator 16)	43%	15%
Percent of hectares under improved technologies or management practices (Indicator 20)	72%	1%
Average fertiliser use (Total N + P + K, kg/ha) (Indicator 21)	51.9	0.1
6. Percent of post-harvest losses (at farm level) (Indicator 22)	1%	0%
33. Percent of total household produce sold through structured market facilities/arrangements (Indicator 30)	0%	0%
10. Value of incremental sales as a result of AGRA (crop revenue in US$) (Indicator 36)	77.5	324.6
13. Percent farmers using financial services of formal institutions (Indicator 43)	9%	14%

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

Maize growing households in Iringa have, on average, enough food to meet their family's needs during 11.2 months of the year. Food insecurity is highest in the period between November and April for maize growing farmers. Rice farming households in Katavi are slightly more food insecure. They have enough food for 10 months of the year, on average. The period between December and February is considered most food insecure. As with maize, the months of food insecurity is the period during which most crops are in the field before harvest.

A large proportion of maize households (39%) can be placed in the 3rd wealth quintile (out of 5), whereas rice growing households are markedly poorer. Nearly every fourth household is part of the poorest (1st) wealth quintile.

Maize yields were rather low at 1,286 kg/ha for the 2018 season, which contrasts with a high percentage of farmers who indicated using improved technologies or management practices (82%). Many maize farmers also use improved crop varieties (58%), have access to extension (43%), and apply fertiliser (41.7 kg/ha of nitrogen, on average).

The situation is rather different for rice. While average rice yields amounted to 2,550 kg/ha for the 2018 season, hardly any farmers (2%) adopted agricultural productivity enhancing technologies. Fertiliser is virtually absent from their fields and farmers do not use improved varieties, although many resort to traditional varieties which are endorsed by AGRA (40%). Rice farmers' access to extension is low (15%).

According to farmer estimates, almost no crops are lost after harvesting. The adoption of endorsed post-harvest practices is high, with 72% of maize farmers and even 95% of rice farmers reporting to do so. Only about a quarter of surveyed farmers indicated making use of improved storage; designated storage facilities are hardly used.

None of the surveyed households have access to formal channels of market information. Formal trading arrangements are absent and crops are predominantly sold to traders. The large majority of surveyed households also do not have access to formal financial services. In the case of maize, only 9% have access to such services and, in the case of rice, this is slightly higher with 14% of farming households. 'Access' usually implies having a bank account. Agricultural loans and agricultural insurance are absent.

1.4 SME survey

A performance survey was conducted among 45 small and medium-sized enterprises (SMEs) that benefitted from interventions under the PIATA programme. The survey reports on data for commercial seed producers, nine agro-dealers for input supply, two input supply companies; and 21 agri-value chain companies (e.g. aggregators, traders and processors). All SMEs were rated on their performance on business resilience, financial stability, human capital, and technology/assets.

Results for 10 commercial seed producers show a medium business resilience. While they have only been in business for about three years, on average, and focus on producing and celling improved/certified seed, they deal with a diversity of buyers for market diversification. Their financial performance is relatively good in view of a solid annual turnover of close to US$150,000 and good access to formal credit. However, this is hardly used to make investments in new technology. Seed producers employ a large number of staff (about 19 permanent and 110 casual, on average) – many of whom are female (42%) and skilled (41%).

The nine agro-dealers have a lower business performance compared to seed producers. While they have been in business for less than three years, they do already offer a diversified service portfolio, mainly retail of chemical fertilisers, pesticides and improved or certified seeds, and provision of advisory services. Agro-dealers have good access to formal credit, but a rather low annual turnover of around US$26,000. Investments by agro-dealers in new technology are low. Agro-dealers have few permanent and casual staff, and also few female and skilled employees.

Only two input supply companies were surveyed. The results signal average performance across all areas, except for a low score on technology.

The surveyed agri-value chain companies that engage as aggregators, traders and/or processors achieve a low score on business resilience. This is grounded in their limited number of years of business experience (2.5 on average) and, crucially, in their limited service provision. Most offer only one service, which consists of aggregating and selling farmers' production and does seem to be lucrative, as the companies report an average annual turnover of more than US$520,000. They also have good access to credit, which, however, is not being used to make investments in technology. The low proportion of skilled staff is notable (6%); female staff account for about 20% of the workforce.

2 Objectives and scope of the report

KIT Royal Tropical Institute was contracted by AGRA to conduct the 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 were realised through a combination of quantitative and qualitative methods, implemented by a team of international and local experts. The Tanzania team consisted of:

- two international experts in quantitative data collection in agriculture;
- an international expert in qualitative data collection in agriculture;
- a national coordinator of quantitative field data collection;
- a national expert in qualitative data collection in agriculture;
- a number of desk-based international analysts on quantitative data.

AGRA Tanzania selected maize and rice as priority crops for reporting. AGRA also selected the market system and the extension system as the priority domains.

Primary data was collected over a period of several weeks in mid-2019, focusing on the regions of Iringa and Katavi:

- Household survey data was collected based on AGRA beneficiary lists. The sample was determined using multi-stage random sampling, by first randomly selecting geographically spread locations and, within the location, randomly selecting beneficiaries. A sample of 1,154 maize growing households in Iringa region and 961 rice growing households in Katavi region (of which 581 cultivated rice in 2018) was randomly selected from this population, using two-stage clustered sampling.
- Qualitative information for the systems' analysis was collected by means of key informant interviews with AGRA grantees and non-involved experts in Dar-es-Salam and Iringa region, as well as focus group discussions with farmers in Iringa region.
- The SME survey was administered to 45 randomly selected companies and businesses linked to AGRA interventions.

This report should be read keeping in mind the limitations of the study. The sample size of the household data collection effort had to be capped to manage costs. In addition, 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 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 such that 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

3.1 Agricultural policy context

Agriculture is key in Tanzania: It contributes 30% of national gross domestic product (GDP), accounts for 19% of total export earnings and employs approximately 67% of the country's workforce (Bank of Tanzania, 2018; Thurlow et al., 2018). The sector's contribution to GDP has more than tripled in the last 10 years, supported by rising cash crop production, an emerging agro-processing segment and strong domestic demand for processed food (Oxford Business Group, 2018a). Major agricultural exports include coffee, cotton, tobacco, tea, cashew nuts and sisal, although the main crops grown are maize, rice and pulses. The country also produces significant quantities of fruits, vegetables, livestock products and fish/fish products, which testifies to a highly diverse agricultural sector.

The importance of agriculture is recognised by the Government of Tanzania, which promotes agriculture for its contribution to national economic growth, development of the industrial sector, and food and nutrition security (Ministry of Agriculture, 2016). Support for agriculture is indeed much needed, as the sector faces various challenges, including severe infrastructure deficits, export restrictions, limited access to high-yielding inputs for farmers, low access to credit, limited irrigation, and dependency on rainfall (Oxford Business Group, 2018b). Crop yields are low, as input use is marginal and droughts, floods, diseases and pests have reoccurring devastating impacts (Arce & Caballero, 2015).

In 2018, the President of Tanzania launched the second phase of the Agricultural Sector Development Programme (ASDP II), themed *Agricultural Sector for Industrial Development*. ASDP II, which runs from 2017/18 to 2027/2028, has been developed to propel the country's economic development and guide the implementation of prioritised interventions. These include the Tanzania Development Vision 2025 (TDV 2025), the Long Term Perspective Plan (2012-2021), the current Five Year Development Plan Phase Two (FYDP II 2011-2021), the Tanzania Agriculture and Food Security Investment Plan (TAFSIP), and the Agricultural Sector Development Strategy Phase Two (ASDS II).

ASDP II aims to transform the agricultural sector towards higher productivity, enhanced commercialisation and smallholder farmer income for improved livelihoods, food security, nutrition, and contribution to GDP. It serves as the main vehicle for the implementation of ASDS II, but also for sub-sector policies and development programmes aligned with agricultural line ministries and private sector initiatives.

ASDP II prioritises four main components:

- sustainable water and land use management;
- enhanced agricultural productivity and profitability;
- commercialisation and value addition; and
- strengthening sector enablers, coordination and monitoring and evaluation (M&E)

For each agro-ecological zone, commodity value chains for inclusion were prioritised based on the potential to create the biggest impact in terms of yields, profitability, improved livelihoods, commercialisation and industrialisation. Maize, cassava, rice, potatoes, banana,

coffee, cotton, oil seeds, cashew, tea, sugar and horticulture are among the priority commodity value chains under the first five years of ASDP II.

ASDP II, if implemented in full, is an ambitious and potentially expensive programme: annual investment costs are estimated at US$988-1,400 million (Ministry of Agriculture, 2017). As points of comparison for these costs, Tanzania's GDP in 2016 was estimated at US$47.4 billion and its proposed annual national budget for 2017/18 is US$14 billion (Benson et al., 2017). While this constitutes a significant financial stretch, which could potentially be managed if significant resources were provided by Tanzania's development partners for its implementation (Benson et al., 2017), general public investment in agriculture also needs to be taken into consideration. This has been consistently low in Tanzania and has not yet exceeded 5% of the national budget, thus clearly falling short of the 10% as per the CAADP commitments.

Tanzania was therefore evaluated as 'not on track' (with an overall score of 3.1 out of 10) with regard to the CAADP commitments in the African Union's (AU) 2017 progress report (AU, 2018). Other key elements of meeting the AU's agricultural transformation objectives have also not been met (Table 2).

Table 2: Tanzania'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	100%	Public agriculture expenditure as a share of total public expenditure	5.9%
Prevalence of wasting among children under 5 years old	4.5%	Annual growth of the agriculture value added (agricultural GDP)	-1.0%
Youth engaged in new job opportunities in agriculture value chains	64.3%	Total agricultural research spending as a share of agriculture GDP	0.3%
Trade Facilitation Index	45 out of 100	Increase of the value of intra-African trade of agricultural commodities and services	-24.3%
Inclusive institutionalised mechanisms for mutual accountability and peer review	67%	Evidence-based policies, supportive institutions and corresponding human resources	19%
Country progress score (out of 10): 3.1 – *not on track*			

Source: AU, 2018

3.2 AGRA objectives and activities

AGRA Tanzania, 2007-2015

AGRA has been active in Tanzania since 2006 and has since invested more than US$51.29 million to contribute to agricultural development (Figure 1). AGRA's focus was to strengthen public institutions with human capacities necessary to drive sector technological development, promoting variety development, supporting SMEs, especially seed companies and agro-dealers, training farmers to improve yields and post-harvest activities. AGRA has

also worked on innovative finance to benefit smallholder farmers and small agribusinesses. Finally, AGRA worked on policy notes generating evidence on the performance of fertiliser subsidy voucher scheme for efficiency, impact on fertiliser use, productivity and crop incomes (AGRA, 2017).

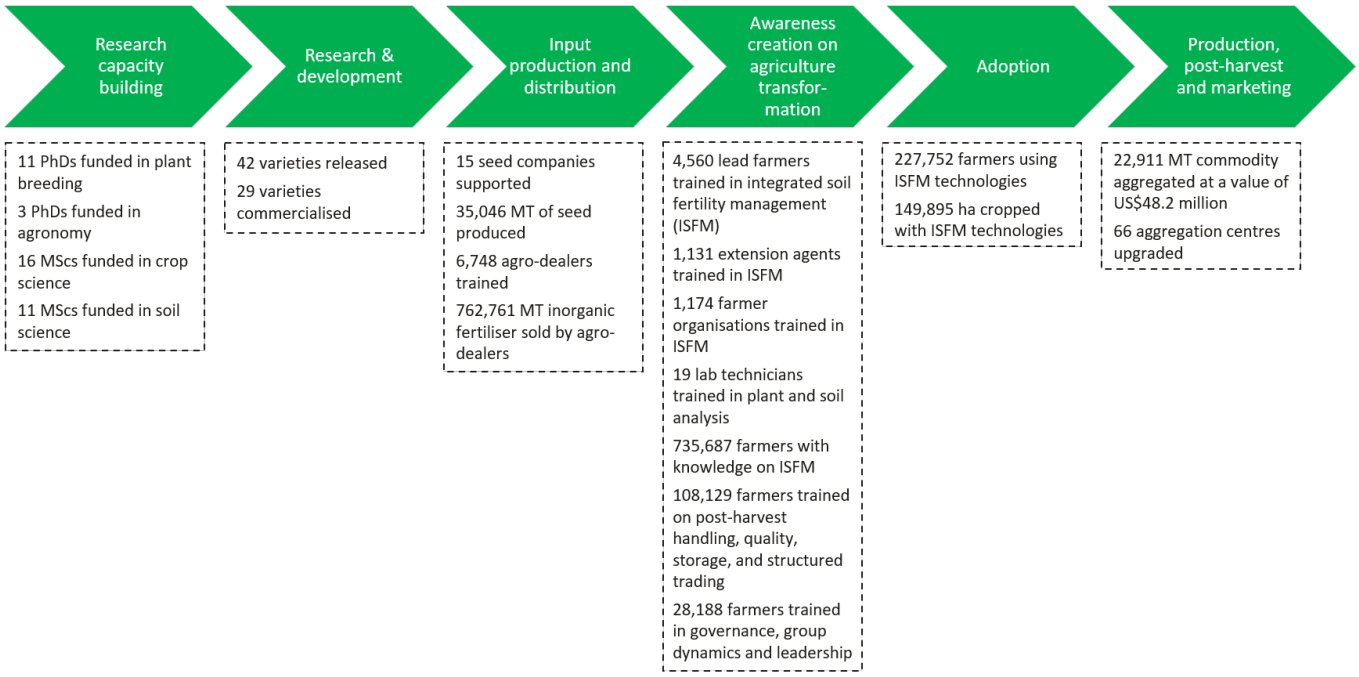


Figure 1: AGRA investments and results in Tanzania over the period 2007-2015

Having worked in Tanzania over the last 10 years, AGRA and partners have built an asset base in technologies, partnerships and models that, if scaled, can lead to competitive and inclusive agriculture in Tanzania (AGRA, 2017).

AGRA Tanzania country strategy, 2017-2021

AGRA is among the organisations supporting agricultural transformation in Tanzania by partnering with the government and key stakeholders to strengthen agricultural input systems, technology development and supply chains to improve staple crop production and commercialisation of farming enterprises. AGRA investment in Tanzania is sizable and close to US$20 million in PIATA initiative; such a programme supports various agricultural systems in the country (AGRA, 2019).

Under PIATA, AGRA's objective in Tanzania is to "catalyse and sustain an Inclusive Agricultural Transformation to increase incomes and improve food security of 1.5 million smallholder farming households" (AGRA, 2017). This is to be achieved by enhancing productivity, strengthening linkages between market and production systems, supporting the Government of Tanzania to deliver on its priorities and promoting an enabling environment for agribusiness development.

AGRA works specifically at the level of the national government – supporting the implementation of ASDP II, strengthening sector coordination and creating an attractive policy environment for private sector investments – and at systems' level and farmer level initiatives in priority agro-economic zones. These systems include the seed systems,

fertiliser and soil systems, extension systems, market systems and finance systems. The objective of AGRA's system level interventions include (AGRA, 2017):

- enhancing supply chain efficiency through effective agribusiness deal-making platforms;
- expanded market access through value addition, structured trade, quality enhancement and aggregation;
- strengthened input supply systems and linkages to output markets to facilitate the uptake of yield-enhancing agricultural technologies.

AGRA Tanzania works predominantly, but not exclusively, through a consortium model, bringing together different partners involved in the value chain. Four consortia are currently implemented in the regions of Kagera, Kigoma, Sumbawanga/Katavi (SUKA) and Ihemi/Ludewa, within the 2017-2020 timeframe (Table 3). These consortia implement their activities under the name of *Kilimo Tija*. In addition, AGRA also funds thematic projects in the areas of financial access and post-harvest management, while looking to support an enabling policy environment (AGRA, 2019).

*Table 3: AGRA consortia (*Kilimo Tija*) in Tanzania, 2017-2020*

Consortium	Partners involved
Kigoma consortium	• Ruvuma Commercialization and Diversification of Agriculture (RUCODIA) • FaidaMaLi • Farm Radio International (FRI) • Nyakitonto Youth for Development Tanzania (NYDT) • Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA) • Meru Agro
Kagera consortium	• FaidaMaLi • FRI • KADERES • TARI Maruku • SUBA Agro
SUKA consortium	• Agricultural Council of Tanzania (ACT) (lead) • ADP Mbozi • Building Rural Incomes Through Enterprise (BRITEN) • MIICO (a membership organisation formed by ADP Mbozi, Ileje Rural Development Organization and Isangati Agricultural Development Organization)
Ihemi Ludewa	• BRITEN • East Africa Grain Council • Tanzania Association of Professionals for Business Development Services TARI Uyole

4 Market system

4.1 System performance

Production

Smallholder farmers dominate over 70% of Tanzanian agriculture, with maize being the most important crop in terms of area under cultivation, followed by beans, rice, cassava and cotton (Arce & Caballero, 2015). The country has a wide range of agricultural potentials, including 44 million ha of arable land and numerous rivers for irrigation. Nevertheless, less than 24% and 4% of the arable land and irrigation potentials have been harnessed, respectively (Mkonda & He, 2018). Low investment in the sector is mirrored in low productivity. For example, while the area under maize production has increased from 1.34 million ha in 1996 to 3.85 million ha in 2015, productivity per ha has actually decreased, due to soil degradation, increased droughts, poor farming methods, eruption of diseases and less investment in the agricultural sector, especially research, among others (Mkonda & He, 2018). However, more encouraging yield increases have been observed for beans and rice, which may reflect increased use of improved varieties and, in the case of rice, inorganic fertiliser and possibly some expansion in irrigated land (Benson et al., 2017).

Agribusiness and agro-processing

Tanzania is ranked 141 out of 190 countries in the World Bank Doing Business 2020 survey (World Bank, 2020). While some improvements were registered in the 2020 report, such as launching online company registrations in 2019 to start a business, continued weaknesses hamper its performance, including poor rural infrastructure, difficulty of accessing land and construction permits, a cumbersome tax regime, barriers to trade across-borders and sporadic bans on export or import of various goods. The SME survey conducted as part of this assignment (Section 9.3) also shows that business performance is not optimal with limited investments in technology, as well as limited business resilience. Local financing for agriculture has been growing in recent years, but is still limited, at high interest rates. VAT duties charged on imported inputs also vary considerably. For instance, while there is no import duty on fertiliser itself, 18% VAT is charged on the bags containing the fertiliser (CEPA, 2016). Adding the costs of services rendered at the port (e.g. bagging) and transport services leads to high costs for farmers despite the initial intention to reduce prices for farmers (CEPA, 2016). As a result, the potential for commercialisation in agriculture is largely unrealised.

Similarly, industrial food processing is still in its infancy in Tanzania. Only crops for domestic consumption get processed, most of which is handled by small enterprises. For example, with maize, small-scale mills process over 90% of the country's maize, and only a limited number of larger mills target urban consumers with higher quality products (Wilson & Lewis, 2015). Milled maize is the basic ingredient of *ugali*, a common component of a Tanzanian meal.

Other crops hardly undergo any processing in the country. For instance, only 4% of annual production of fruit and vegetables is processed and only 10% of cashew nuts produced in the country are processed in Tanzania (International Trade Administration, 2019). There is also underutilisation of existing processing capacity due to inadequate supply of raw

materials. Some processing factories are idle most of the year because of inadequate raw materials, especially after the harvesting season. As a result, over the past two decades, the contribution of agriculture value addition to the GDP has been decreasing (ESRF, 2015).

Post-harvest handling and quality

Post-harvest handling and storage infrastructure in Tanzania are generally poor, which results in high post-harvest losses and loss of income. For example, Tanzanian farmers lose up to 30-40% of their maize through post-harvest losses (Sulaiman & Rosentrater, 2015).

In addition to high post-harvest losses, crops such as maize often develop high levels of mycotoxin contamination. As quality checks (e.g. for moisture of grain) are largely absent along crop value chains, this is considered an important health risk for consumers. Standards, such as measurement or grades, are equally absent or not enforced in crop value chains aimed at the domestic market or (informal) regional export. Problems of inaccurate scales are widespread and traceability of crop origin is hardly possible (Wilson & Lewis, 2015).

As many of the old government storage units have fallen into disuse or have been informally 'privatised', farmers have little access to adequate storage facilities (Wilson & Lewis, 2015). This, in turn, creates an incentive for farmers to sell soon after harvest, even though the prices are low. To address this issue, Warehouse Receipt Systems (WRS) are currently being developed for a number of different crops, including maize, often around the formation of farmer groups. However, even though the maize in store can be used as collateral, commercial banks often require three years of financial accounts from the WRS group. This makes it difficult to start WRS without some external support (Wilson & Lewis, 2015). Nevertheless, the recent Enabling the Business of Agriculture Report by the World Bank characterises the WRS in Tanzania as one of the most advanced in eastern Africa (World Bank, 2019).

Markets

Prior to agricultural market reforms in the late 1980s and early 1990s, state-controlled markets curtailed the role of private traders through restrictions on quantity handled and procurement rights at the farm-level. Particularly the marketing – and export – of Tanzania's main export crops was strictly controlled by government crop authorities. These have been replaced by crop boards with radically reduced mandates.

Currently, most smallholder farmers sell individually, when needs arise or due to lack of storage facilities (Magesa et al., 2014). The vast majority of crop trade, especially for food crops, therefore passes through informal channels, with farm-gate or village-level transactions being most common. Transactions between producers, traders and processors are characterized by a lack of trust and face several structural, political and administrative constraints, including bad road networks, limited access to credit, poor contract enforcement and erratic policies (e.g. Wilson & Lewis, 2015). This leads to low farm-gate prices on the one hand, and high consumer prices on the other (Magesa et al., 2014). As a result, there is little 'pull' in the value chain to stimulate improvements in production (Wilson & Lewis, 2015). Another negative factor is the so-called 'produce cess', a tax levied by Local Government Authorities since 2003 on the sale of crops (initially at 5% and currently at 3% of the farm-gate price). Nevertheless, commercialisation levels are increasing: 35% of crops produced in 2014/15 were brought to market, which was about 7% higher than was the share marketed in 2008/09 (Benson et al., 2017).

Marketing of AGRA food crops in Tanzania

- *Maize*. The commercial maize market is controlled by a small number of very strong, influential dealers and processors that are well adapted to handle irregular and opportunistic trade. They have the finance and networks to set prices, especially immediately after harvest when many farmers are short of money (Wilson & Lewis, 2015, p. 4).
- *Rice*. Rice trade involves few large trading intermediaries (Arce & Caballero, 2015). Dar-es-Salaam is the principal end-market for rice and accounts for 60% of the domestic market (International Trade Administration, 2019).
- *Beans*. Farmers mostly sell beans at regular open markets. Major markets include Dar-es-Salaam, Dodoma, Mwanza, Arusha and Zanzibar. Institutional buyers (e.g. schools, hospitals, prisons) are also an important marketing channel. About 20% of dry beans are exported. (Birachi, 2012)

It should also be noted that the government intervenes in markets through the National Food Reserve Agency, an executive agency of the Ministry of Agriculture, Food Security and Cooperatives, which purchases food crops from farmers and warehouses in surplus areas at approximately 10% higher than the market price

International trade

Agriculture constitutes approximately 25% of Tanzania's export earnings. The total value of agricultural exports increased between 2007 and 2011 from US$908 million to US$1.18 billion (Arce & Caballero, 2015). Tobacco is the country's largest export crop, followed by coffee, cotton and cashew nuts. Agricultural imports include wheat grain or flour, vegetable oil, sugar and rice (Benson et al., 2017).

Maize is another important export crop, as demand is particularly high in Kenya and other neighbouring countries, including Burundi, Malawi, Rwanda, the DRC and Zambia. However, maize exports are largely opportunistic and range between 23,000 MT and a 156,000 MT (Wilson & Lewis, 2015). Periodic export bans have discouraged traders from seeking large export contracts and encouraged illegal routes: either by bribing at customs posts or through bush '*panya*' routes across Tanzania's highly-permeable borders (Wilson & Lewis, 2015). While Tanzania is a member of both Southern Africa Development Community (SADC) and Common Market for East and Southern Africa, official agricultural trade with neighbouring countries in the East African Community and in SADC is low (Benson et al., 2017).

Policies

There are various policies and laws regulating the agricultural sector, such as the National Irrigation Policy (2010), Seeds Act (2003), Plant Breeders Act (2012) and Fertiliser Act (2009). Furthermore, commodity boards play a significant role for specific commodities (mainly export products but also sugar). The government is currently formulating a new Agriculture Act that will change the mandates of the crops boards and the way that they are managed.

One of the key underlying policy documents is the National Agricultural Policy (revised in 2013), which aims to optimise crop production for food security and economic development. This fits into the dominant agricultural policy narrative since 2001, which emphasises the

importance of agricultural commercialisation and the benefits of stimulating greater investments into the sector (Poulton, 2017). Some of these policies include:

- The Agriculture Sector Development Strategy (ASDS) (2001), which sets out a vision for limited state involvement in agriculture (mostly as a provider of an enabling environment), so as to create space for greater commercial private sector participation. However, the ASDS left existing legislative and institutional frameworks largely intact, which discouraged private investment in agriculture (Poulton, 2017). Similarly, ASDP I – the plan to implement the ASDS – sought to expand the role of central government ministries relative to the private sector (Poulton, 2017).
- *Kilimo Kwanza* (Agriculture First) was developed under the auspices of the public-private Tanzania National Business Council and launched in 2009. The initiative aimed to speed up agricultural development through modernisation and commercialisation.
- The Southern Agricultural Growth Corridor of Tanzania (SAGCOT) was initiated in 2010 to encourage private sector investment and poverty reduction through agribusiness development. By 2030, SAGCOT aims to have mobilised US$2.1 billion of new agribusiness investment, so as to bring a further 350,000 ha of land into profitable production, creating 420,000 jobs, involving 100,000 commercial smallholders and lifting 2 million people out of poverty (SAGCOT website).
- Big Results Now (BRN) (2013) was an initiative adopted to spearhead the development of economic sectors, including agriculture, as a continuation of *Kilimo Kwanza*. BRN was meant to replicate a Malaysian model adopted to facilitate quick development, with highly ambitious targets, such as involving 400,000 smallholder farmers and covering 330,000 ha of land by 2015/16. As targets were not met, Poulton (2017) calls the influence of this initiative on agriculture 'ephemeral'. BRN was discontinued in 2017.
- The ASDP II (launched in 2018) is designed to reinforce the focus on smallholder-led commercialisation with a view to supporting farmers to graduate from subsistence farming to semi-subsistence/semi-commercial status, practising farming as a business.

Altogether, these programmes and initiatives are meant to raise agricultural production, especially for rural households, in order to optimise crop production. However, despite these programmes and initiatives, little has been achieved (Mkonda & He, 2018). Policies do not seem to be very favourable especially for smallholder farmers (Mdee et al., 2020). Erratic export bans and restrictions on internal markets affect marketing systems and are a disincentive for farmers to invest.

It is therefore interesting to note that the World Bank has just commended Tanzania for being the most favourable regulatory environment for farmers among low income countries, due to its high scores on supplying seeds and finance to agriculture (World Bank, 2019).

Table 4: Overview of the agricultural market system in Tanzania

	Strengths	Weaknesses	Opportunities for improvement
Production	• Large availability of arable land, range of farming systems and agro-ecological conditions conducive for large-scale production of cash crops and a wide variety of fruits and vegetables. • Network of Agriculture Research Institutes (ARIs) and availability of appropriate technologies for different systems.	• Reliance on rain-fed agriculture and little land under irrigation • Low productivity	• Modernise farming for higher yields and improved natural resource management • Improve resilience of farming in view of climate change • Improve quality of smallholder produce • Improve access to finance to facilitate smallholder investments
Agribusiness and agro-processing	• Conducive environment for digital agribusiness services, with approximately 27.1 million mobile GSM connections across Tanzania • Improved availability of inputs, with an increase in the number of private firms supplying commercial seeds; agro-dealers; and private firms importing/ distributing tractors • Government support of PPP arrangements to bring more investment in agriculture	• High cost of power • Access to finance • Investor uncertainty due to ad hoc policies such as export bans on crops (maize, rice, beans and arbitrary application of cesses (locally levied tax) of 2-5% on sale of crops; and poor communication/ implementation of policy changes such as 2012 waiver for VAT on irrigation, tractors, farm implements etc. • Food processing is regulated by over 17 bodies resulting in multiple fees, delays, duplicate functions and bureaucracy • Irregular nature of supply and demand prevents business expansion • Small-scale processors are inefficient	• Increase value-added processing and manufacturing to respond to growing domestic demand, e.g. for rice, edible oils and processed foods • Improve schemes and initiatives for smallholder inclusion in agribusiness models (including corporate social responsibility requirements)
Storage	• Established warehouse receipt system (WRS).	• Uncertainty of markets reduces viability of storage and temporal arbitrage • Cost as a disincentive for technology adoption for improved post-harvest handling	• Reduced VAT for improved post-harvest material/equipment • Support (private or collective) investment in warehouses and post-harvest infrastructure
Marketing	• Large domestic market • Significant support from international community and private sector.	• Uncertain policies are disincentive to trade expansion • Unregulated markets increase risks • Cash shortages drive marketing when prices are low (after harvesting) • Limited access to information by farmers • Low farm-gate prices	• Improve commercialisation of agricultural produce based on adequate market information for farmers • Promote price differentiation based on formal standards, grades and measurement • Promote WRS to enable farmers to market at desired moment

		• Transport increases costs • Mistrust between value chain actors	• Reduce communal levies
International trade	• Established export trading channels • Liberalised trading environment • Huge potential for export.	• Erratic export bans • Unclear export regulations	• Reduce bureaucracy and tariffs (and other fees) • Improve trade infrastructure (e.g. cold storage) • Improve stability of export-import through reduction of bans
Policies	• Support policies for agricultural commercialisation.	• Few results from policies so far	• Establish mechanisms for policy implementation and monitoring • Improve evidence base for decision making

Source: CEPA, 2016; Wilson & Lewis, 2015

4.2 AGRA change ambition

Improved market system performance is often equated with enhanced supply chain efficiency in marketing, processing and trade (AGRA, 2017). AGRA staff articulated the following change ambitions with regard to the market system:

- Expand market access by building farmer relationships with buyers, including the sale of products through aggregation centres;
- Improve quality and productivity through good agricultural practices (including the use of improved varieties and application of inorganic fertilisers, timely harvest) as well as better post-harvest practices (including the use of tarpaulins, Agro Z bags or Purdue Improved Crop Storage (PICS) bags);
- Improve the enabling environment for agricultural commercialisation, e.g. by improving SME capacity and reducing barriers to cross-border trade.

Most of these objectives come back in the four consortia funded by AGRA (Table 5).

Table 5: Market change ambitions of AGRA consortia in Tanzania

	Kigoma	**Kagera**	**Ihemi-Ludewa**	**SUKA**
Market change ambitions	• Improved post-harvest management • Improved storage facilities • Improved access to finance to SMEs • Improved crop quality • Increased volume crops aggregated • Increased cross-border trade • Reduced non-tariff barriers	• Improved post-harvest management • Improved storage facilities • Improved access to finance to SMEs • Improved crop quality • Increased volume crops aggregated • Increased cross-border trade • Reduced non-tariff barriers	• Reduced post-harvest loss • Increased agricultural employment and entrepreneurship • Increased use of structured markets	• Improved quality of farm produce • Increased access reliable markets • Reduced post-harvest losses at farm level • Private sector as the driver for market access • Improved and sustainable business relationships between value chain actors • Improved access to cross broader trade

				• Enhanced business environment • Sustained market led approach among working partners		

Source: Communication with AGRA staff

At the same time, AGRA pursues market-relevant objectives in two other projects which take place at national level. The first project ("Advocacy to Strengthen Agriculture System and Accelerate Agricultural Transformation") looks specifically at improving the CAADP bi--annual review process, which creates an enabling business environment by reviewing specific hampering policies, and promoting cross-border trade. Trade promotion is also the objective of the "Strengthening Food Security and Export Trade in Tanzania" project, with the Economic and Social Research Foundation (ESRF).

Table 6: AGRA Tanzania investments in market development[1]

	Region	Description/purpose of grant	Partners	Expected outcome (on markets)	Timeframe	Progress to date
Production	Sumbawanga and Katavi	SUKA consortium: Promoting Market Led Approach to Improve Profitability of Maize, Beans and Rice Value Chains	Katavi region: Agriculture Council of Tanzania (ACT) ADP-MBOZI Sumbawanga region: BRITEN MIICO	Improve crop quality Reduced post-harvest losses	August 2017-July 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium: Linking farmers to input and output markets to spur maize, beans and soybeans productivity in Iringa and Njombe regions of Tanzania	BRITEN, EAGC	Improve crop quality Reduced post-harvest loss	October 2017 to September 2020	Ongoing
	Kigoma	Kigoma consortium: Integrated project for increased income and improve food security for smallholders in Tanzania	NYDT FaidaMali	Improved quality of crops Improved post-harvest management	Sept 2017 to August 2020	Ongoing

[1] Other projects with AGRA funding include YieldWise and CARI II (September 2016-2019), which also have market development ambitions and activities. However, these were not documented in-depth for this report, as they do not fall under the PIATA programme.

	Kagera	Kagera consortium: Agricultural transformation for increased income and improved food security and livelihood among smallholder farmers in Kagera region, Western Tanzania	FaidaMali KADERES	Improved crop quality Improved post-harvest management	Sept 2017 to August 2020	Ongoing
Bulking	Kigoma	Kigoma consortium	FaidaMali	Increased volume crops aggregated Improved storage facilities	Sept 2017 to August 2020	Ongoing
	Kagera	Kagera consortium:	FaidaMali	Increased volume crops aggregated Improved storage facilities	Sept 2017 to August 2020	Ongoing
	Sumbawanga and Katavi	SUKA consortium	ACT, MIICO	Increased volume crops aggregated Improved storage facilities	August 2017-July 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium	Eastern African Grain Council (EAGC)	Increased volume crops aggregated Improved storage facilities	October 2017 to September 2020	Ongoing
Trade and wholesale	Kigoma	Kigoma consortium	FaidaMali	Market access for smallholder farmers Increased cross-border trade	Sept 2017 to August 2020	Ongoing
	Kagera	Kagera consortium	FaidaMali	Market access for smallholder farmers Increased cross-border trade	Sept 2017 to August 2020	Ongoing

	Sumbawanga and Katavi	SUKA consortium	ACT, MIICO	Market access for smallholder farmers	August 2017-July 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium	EAGC	Market access for smallholder farmers	October 2017 to September 2020	Ongoing
	National	Advocacy to Strengthen Agriculture System and Accelerate Agricultural Transformation	Agricultural Non-State Actors Forum (ANSAF)	Ensurimg that cross-border trade for agriculture is increased	December 2018-November 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium	EAGC	Increased use of structured markets	December 2018-November 2020	Ongoing
Processing		None				
Retail		None				
Policies	National	Strengthening Food Security and Export Trade in Tanzania	ESRF	Promote food trade without compromising food security	Sept 2017 to August 2020	Ongoing at time of research
	Kagera	Kagera consortium	FaidaMali	Reduced non-tariff barriers	Sept 2017 to August 2020	Ongoing
	Kigoma	Kigoma consortium	FaidaMali	Reduced non-tariff barriers	Sept 2017 to August 2020	Ongoing
	Kagera	Kagera consortium	FaidaMali	Improved access to finance to SMEs	Sept 2017 to August 2020	Ongoing
	Kigoma	Kigoma consortium	FaidaMali	Improved access to finance to SMEs	October 2017 to September 2020	Ongoing
	National	Advocacy to Strengthen Agriculture System and Accelerate Agricultural Transformation	Agricultural Non-State Actors Forum (ANSAF)	Create enabling environment through advocating for policy review	October 2017 to September 2020	Ongoing
Stakeholder collaboration		None				

4.3 AGRA system change results

Production

All four consortia engage in promoting good agricultural practices through the support of VBAs (see Section 5). It is expected that the adoption of such practices will result in increased productivity and potentially increased volumes directed to marketing.

Kagera and Kigoma consortia

In addition to the extension activities further detailed in Section 3 of this report, facilitating access to finance is part of the activities of these two consortia. According to AGRA grantee FaidaMali, they started the discussions on access to finance in June 2019, when they discussed with the Small Entrepreneurs Loan Facility Project (SELF) – a microfinance facility – to see whether they could provide financial services to farmer groups. The challenge is that microfinance is only given to farmers organised in groups. However, focus group discussions revealed that due to bad experiences in the past, farmers seem very reluctant to associate in groups, especially in Kigoma. Access to finance is particularly important for farmers to enable investments in inputs (quality seed, fertiliser) in a timely manner and to cover labour and production costs.

SUKA consortium

Discussions are ongoing to link farmers with financial institutions, based on the recognition that offtakers are not willing to give advance credit to farmers (finance for harvesting and transporting at most). However, one of the barriers encountered so far in the discussions with financial institutions is their condition that farmer groups need to have an account which has been operating for two to three years. The consortium is therefore working on ensuring that farmers have a live account with in- and outflows to meet general banking conditions.

Bulking and post-harvest handling

Kagera and Kigoma consortia

Post-harvest handling is addressed by working with farmers on primary processing (e.g. threshing techniques) and storage (PICS bags, chemical free preservation, silos) and by rehabilitating warehouses (six in Kagera and seven in Kigoma so far). The latter is done by demonstrating how to engage in collective marketing using warehouses, including harvesting, collecting, bringing produce to the warehouses and registration. According to an AGRA grantee, emphasis is placed on informing farmers not to sell per bag (to avoid overfilling of bags and use of non-standardised measurements) but only to sell per kg. Difficulties have so far been observed by the consortia members with regard to raising fees from farmers for the maintenance of warehouses and payment of warehouse clerks.

SUKA consortium

Similar to the two consortia above, the SUKA consortium is actively rehabilitating warehouses. So far, in Katavi, 15 (out of 18 targeted) warehouses have been renovated – of which eight are owned by private individuals (offtakers, processors) and seven are supposed to be managed by farmer groups. In addition, two warehouses owned by farmer groups were constructed from scratch.

In Sumbawanga, 14 warehouses have been renovated so far (eight are owned by private individuals, while six are owned by farmer organisations) and three new warehouses have

been constructed. In addition, farmers are also trained on post-harvest technologies and management (e.g. proper harvesting time, produce handling, storage management).

Furthermore, the consortium has distributed a variety of quality control tools to support farmers in post-harvest handling and quality control.

Table 7 Quality control and post-harvest handling tools distributed by the SUKA consortium

Control tools	Sumbawanga	Kataivi	Total
Moisture metre	17	10	27
Tarpaulin	16	10	26
Maize sheller machine	12	10	22
Paddy sheller machine	1	0	1
Weight scale	4	20	24
Maize sieve	0	40	40
Pallets	419	19	438
Paddy harvester	0	5	5
Paddy planter	0	1	0
Water pump	0	6	0

Ihemi-Ludewa
Post-harvest losses are addressed by means of training farmers in post-harvest management (e.g. drying, sampling, record keeping, stock management) and sensitising farmers to aggregate their produce at warehouses (only produce meant for selling, not for home consumption). Consortium member EAGC inspects the warehouses first and, if they are not found adequate, they assist in improving the warehouses (handing out quality control tools like pallets, hygrometers, scales, and tarpaulins). Currently, the consortium works with 20 community-owned warehouses.

Stakeholder collaboration

Kagera and Kigoma consortia
The following activities are being conducted to improve marketing of smallholders' produce:

- 'Business-to-business' forums are held once per year between farmer representatives, buyers and other stakeholders (in five districts in Kagera and five districts in Kigoma). Farmers come with samples of produce and buyers check if this corresponds with their quality requirements.
- Consortium member FaidaMali has a list of 40 participating buyers for Kagera and 40 buyers for Kigoma, which is used to facilitate linkages to farmers, depending on which produce they have to sell. Farmers are encouraged to directly negotiate with the buyers (without the intervention of FaidaMali).
- Training of VBAs on gross margin calculation and return on investment (with the general indication of having a ratio of Tsh 1 of investment to translate into Tsh 2.5-3

of return). So far, 400 VBAs have been trained in Kagera and 340 in Kigoma, with the expectation that they train farmers afterwards.

SUKA consortium

The consortium's activities, which are slightly different in each area, include the following:

- [Katavi] Based on the idea of cutting out middlemen from the supply chain, the consortium member ACT establishes direct linkages between offtakers and farmers for maize and paddy rice. ACT indicated that they organise meetings at village level between farmers and buyers to discuss volumes, quality and prices. Buyers are willing to pay a higher price if quality requirements are met, especially with regard to maize. Agreements with farmers are made just before harvest season, as buyers usually want to agree on prices after assessing general availability of produce in the market.
- [Katavi] ACT underlined the importance of farmer groups being able to find buyers themselves, without ACT's intervention. Therefore, ACT provides capacity building to farmers to train them on quality requirements and group strengthening to achieve higher prices. Emphasis is placed on working with formal (registered) groups, so if informal groups are strong enough, ACT helps in formalising them. Furthermore, ACT has formed 'marketing committees' within the farmer groups, composed of 4-6 famers, to search for markets. ACT provides backstopping, but aims to institutionalise these committees to ensure sustainability of their intervention. This also takes place in Sumbawanga, where MIICO supports the formation of marketing committees within farmer groups.
- [Katavi] ATC also trains SMEs (buyers) on value addition and other aspects of improved quality of produce.
- [Sumbawanga] Farmer organisations are trained on quality standards based on the recognition that buyers are increasingly sensitive about quality, especially concerning rice (e.g. aroma, grain size, colour, etc.).
- [Sumbawanga] Business-to-business forums are organised to facilitate contacts between farmers and buyers. The trade office at the district council is included in these meetings to ensure that farmers get price information not only from buyers but also from a neutral person.
- [Sumbawanga] Sensitisation of farmers on the importance of collective marketing for quality control, finding buyers and negotiating prices.
- [Sumbawanga] According to AGRA grantee MIICO, they also promote contract farming whereby farmers are linked to buyers, agro-dealers and financial institutions. Before the production season, MIICO organises meetings with all stakeholders involved, after which contracts are signed to specify quality requirements, delivery, quantity and indicative prices. Based on the contracts, farmers receive access to inputs based on credit, which they repay after harvest season.

Ihemi-Ludewa consortium

The consortium works on smallholder marketing by way of the following activities:

- Business-to-business forums at regular intervals and market expositions. According to EAGC, these forums are very important because they facilitate linkages to important buyers, such as Tandale Market with more than 260 buyers.
- Installation of G-Soko e-trading platform (by consortium member EAGC) in 15 warehouses so that farmers can upload relevant information whenever they aggregate crop at their warehouses (location, volume, quality), which enables buyers to place orders. For farmers, the use of G-Soko is free, but buyers pay 0.1%

of the transaction to EAGC as the platform facilitator. To properly use the G-Soko system, farmer groups were provided with tablets and received training on how to operate the system (22 trainings for farmer leaders held in 2019).

- Trade missions to DRC, Kenya, Malawi and Zambia to link farmers to processors in those countries.
- Training of farmers on crop standards and grading, together with Tanzania Bureau of Standards.
- Training of farmers organisations on gross margin calculation, business plan development and record-keeping to link them to financial institutions

Trade

Cross-border trade is addressed by the Ihemi-Ludewa consortium through EAGC (to a limited degree), by the policy-oriented projects (see below) and by the Kigoma consortium (through the Tanzania Chamber of Commerce, Industry and Agriculture, TCCIA). The latter particularly pursues an ambitious plan to unlock 15 policy constraints with regard to cross-border trade before the end of the project. TCCIA states that they have unlocked four policy constraints so far:

- identification of aggregation centres to be used as warehouses in all four districts of kigoma where the consortium is active;
- new by-law on aggregation centres specifying that farmers may not sell individually from those centres (only collective marketing);
- reduction of cess on produce being traded (no levy for consignments of under 1 MT)
- reduction of road blocks.

Furthermore, TCCIA has had discussions and policy engagement on a number of trade constraints, including export licences, decentralisation of government offices, visa costs, opening up of local branches by banks, staffing of information borders and establishment of joint border committees.

Policies

In the “Advocacy to Strengthen the Agriculture System and Accelerate Agricultural Transformation” project, reviewing agricultural policies to improve the business environment is one of the key objectives. Thus far, this has included a review of policies affecting post-harvest management technologies (e.g. PICS bags, metal silos). According to AGRA grantee ANSAF, one of the challenges hampering adoption of such technologies is the high cost, partially caused by high VAT. As a result, ANSAF has had a meeting with three parliamentary committees to show what can be gained when reducing taxes on these items. However, the concern was raised that manufacturers should also reduce prices on their side before a VAT reduction is considered. Thus, no concrete results on these aspects can be reported at this stage.

Furthermore, ANSAF has been pushing for signing and ratification of the East Africa Sanitary Protocol. ANSAF argues that the absence of this Protocol is one of the reasons that Tanzania imports more agricultural produce than it exports. By signing the Protocol, ANSAF expects that the gap can be reduced and stimulate a 5% increase in cross-border trade. ANSAF therefore aimed to submit their policy paper to parliament in September 2019 to push for the approval of the Protocol.

In the “Strengthening Food Security and Export Trade in Tanzania” project, AGRA grantee ESRF also works on influencing the policy environment for marketing of agricultural crops.

ESRF emphasised that they view the government not only as an information provider and information seeker, but also as a project partner. Firstly, this project involves a review of the government's two main channels of collecting agricultural data, to check whether the export bans have been made based on accurate data. This is closely linked with ESRF's work on developing a new data management system on registering food shortages and surpluses to assist the government to assess the availability of food. Over the past few years, government decisions on imposing export bans seemed to have been rather ad hoc, which is why the AGRA project aims to establish a forecasting system for food insecurity situations. Initially, the project wanted the government to commit to no more export bans, but it quickly emerged that this was not feasible. Instead, the project has shifted to helping the government make evidence-based decision-making on export bans. At this stage, different methodologies to capture food security-related data are being explored, such as the food security index and the food balance sheet.

This goes hand-in-hand with the development of a food safety net strategy for food insecure areas by ESRF. The Ministry of Agriculture conducts a food assessment in May each year, after which they list the food insecure areas. The project's objective component is to develop a strategy for chronic food insecure areas, e.g. food for work, cash transfers, etc. Work was still in progress at the time of this study.

Furthermore, ESRF co-developed an implementation plan for the new post-harvest management strategy in Tanzania, which they pushed for with policymakers, together with other AGRA grantees (especially ANSAF), other initiatives (including AGRA-funded project YieldWise, 2015-2019) and a number of development partners (especially FAO). The National Postharvest Management Strategy (2019-2029) was launched in August 2019, which aims to ensure availability of appropriate postharvest and value-addition practices and technologies, provide incentives for investment in marketing systems, and improve capacities and coordination of strategic interventions.

The Postharvest Management Strategy Implementation Plan (2019-2024), co-developed by ESRF, identified key areas for intervention, including the marketing of hermetic technologies and investment incentives for manufacturers, rehabilitating ward resource centres to train farmers on post-harvest technologies and building grain silos.

Moreover, ESRF is working on developing a Contract Farming Act to regulate all contracting activities and provide for legal coordination between farmers and contractors by a third party, such as an agricultural extension officer. According to ESRF, the act is still in the review process.

4.4 Analysis of AGRA system interventions

AGRA's position in the intervention landscape

There are several other ongoing development projects and interventions in Tanzania which have similar objectives or which connect to AGRA's activities:

- The main initiative in this regard is the SAGCOT programme, which seeks to promote agribusiness partnerships to improve farm productivity and market access in the Southern corridor of Tanzania. Within the greater programme, the SAGCOT Investment Project (SIP) focuses specifically on smallholder farmers. One of the SAGCOT clusters is Ihemi-Ludewa, which overlaps with AGRA consortium Ihemi-

Ludewa. Since AGRA has been one of the supporters of SAGCOT since its launch, it can be expected that coordination is ongoing.

- The Farm to Market Alliance brings together multiple stakeholders, including the World Food Programme, the International Finance Corporation (IFC), Grow Africa, Bayer, Syngenta, Yara, and Rabobank, and aims to connect about 75,000 smallholder maize farmers to domestic buyers and commercial maize markets. AGRA is a member of this Alliance.
- The Rice Postharvest Management and Marketing project (RIPOMA) is an initiative of Helvetas Tanzania and is funded by EuropeAid. It aims to increase income and reduce poverty among smallholder households in SAGCOT by empowering young and women smallholder rice farmers in innovative rice postharvest techniques and marketing.
- Grain Postharvest Loss Prevention (GPLP) project by Helvetas Tanzania conducts policy advocacy on post-harvest management. The project has established the Tanzania Postharvest Management Platform consisting of various stakeholders, including the country's agriculture, industry and trade ministries, civil society organisations and other key actors.

Many of these projects appear to take a similar approach to AGRA, focusing on different support packages to smallholder farmers, including post-harvest management and value chain integration. AGRA is recognised as a key development partner by the Tanzanian government, due to its long-term engagement in the country since 2006 and its alignment with the ASDP II, including a focus on key crops such as maize, paddy and beans.

Relevance of AGRA's interventions

AGRA supports a variety of market-relevant interventions, which – in their entirety – address various market constraints for smallholder commercialisation (Table 8). Farmers need to be able to sell their produce in a profitable and reliable market – the absence thereof discourages investments in agricultural production, including improved seeds, technologies and other inputs. The need for structured market access is reflected in the activities of the four consortia, which all provide different elements of smallholder market support. This includes efforts to promote collective marketing and connecting farmers to (often local) formal buyers, e.g. through deal-making forums or direct linkages. These consortia also heavily engage in improving post-harvest management through farmer training and supporting warehouses for crop storage, which has the potential for reducing post-harvest and handling losses and promoting quality upgrading.

In addition, important market-related activities are conducted by two policy advocacy projects, which, among others, focus on improving cross-border trade and reducing export restrictions. Particularly in the maize value chain, the periodic export bans over the past few years have adversely affected smallholder farmers as access to lucrative markets was restricted and prices dropped, while illegal trade was flourishing. It is therefore commendable that AGRA works on different entry points to improve the policy environment, as was elaborated in the previous section.

It is notable that AGRA's activities tend to be implemented in larger actor constellations, including partnerships with agribusiness, financial institutions, private sector organisations and government agencies.

Table 8: Relevance of AGRA projects for addressing market constraints

Market constraints	Addressed through

High post-harvest losses	• All four consortia: ongoing
	  ○ Training and capacity building
	  ○ Renovation/establishment of warehouses
	  ○ Access to post-harvest technologies
	  ○ Innovative finance products
	• Policy advocacy: ongoing/completed

Lack of access to finance for smallholder farmers	• All four consortia: starting (mostly discussion level)

Lack of stable market access for smallholder farmers	• All four consortia: ongoing
	  ○ Training and capacity building
	  ○ Access to market information
	  ○ Linkages to structural buyers
	  ○ Expanding buyers' storage and processing capacity

Cross-border trade barriers	• Selected consortia: ongoing • Policy advocacy: ongoing

Expected impact

The results from the household survey suggest that the activities of the four consortia have not yet translated into gains for the farmers – at least when looking at the 2018 cropping season. Sales are often conducted at the farm-gate, directly to traders and middlemen; the use of formal marketing systems is basically absent (Sections 7.11 and 8.11).

When the maize or rice are stored, nearly a quarter of farmers use improved storage techniques, which were taught by NGO-led extension services (Sections 7.6 and 8.6). PICS bags are more commonly used for maize, whereas silos are used for rice. Both maize and rice are mostly stored in privately owned or rented warehouses. Only a few farmers store their crops at farmer organisations; WRS is also not widespread. As such, these results show that there is still room for improvement in storage and trade systems at the time of data collection.

The two policy advocacy projects are yet to result in concrete outcomes.

Sustainability of results

AGRA's interventions in the market system have a relevant focus. However, a number of possible limitations were observed during field research for this report, which should be monitored.

First, the market activities which are implemented in the context of the four consortia seem to be rather fragmented. For example, in discussions with actors involved in the consortia, capacity building of farmers was often equated with 'number of [short-term] training events', sometimes not even for farmers themselves but for VBAs who are supposed to pass on the knowledge received to farmers. According to AGRA, the use of VBAs is meant to ensure sustainability of interventions. At the same time, it warrants attention whether these capacity-building efforts enable farmers to participate more successfully in markets – especially over a longer period of time. Furthermore, annual business-to-business forums and giving farmers

lists of buyers were mentioned as market linkage activities by the consortia. Yet, it remained unclear to what extent such short-term activities can sustainably and effectively change existing marketing arrangements for smallholder farmers. The household survey results show that farmers are already connected to middlemen and traders, but do not necessarily have much bargaining power when it comes to prices. Buyers are frequently the main provider of market information; this information asymmetry is likely to lead to low prices for farmers (see Sections 7.10 and 8.10). The consortia should therefore pay attention to how their market linkage activities overcome the current status quo and improve farmers' market access.

Second, in order to improve post-harvest management, all consortia engage in renovating and building warehouses for crop storage. At the time of the survey, farmers largely favoured individual approaches to storage of their products with close to no usage of farmer group owned/managed facilities (see Sections 7.6 and 8.6). Further annual surveys should monitor whether uptake of warehouse storage increases over time. Many of the AGRA-promoted warehouses are owned by farmer groups and may thus also be subject to utilisation and maintenance challenges, especially if member farmers do not pay a fee for use of the warehouse. Some of the warehouses have business plans, have been linked to buyers to encourage utilisation (e.g. forward delivery contracts) and/or have been provided with equipment like moisture metres and weighing scales to facilitate trade. According to AGRA, these are attempts to address the issue of warehouse sustainability. However, collapse of crop warehouses has been a noted challenge in sub-Saharan Africa, linked to lack of warehouse management capacity by farmer groups, mismanagement or malfeasance in handling crop stocks, lack of maintenance and corruption. Governance in and around farmer groups, their activities and infrastructures can impede the sustainability of the interventions. Without appropriate administration, transparency and clear functioning mechanisms, it is likely that interventions around group-based storage and marketing are unsustainable in the long run.

Finally, the issue of market policy engagement warrants both cautionary and optimistic observations. On the one hand, the policy environment in Tanzania seems to be challenging with regard to improving the agricultural market system, as various reports and country indexes suggest. Especially, maize is a key food security crop – and is therefore subject to strong state intervention, of which the aforementioned export bans are just a prominent expression. While two of AGRA's investments in Tanzania specifically aim to improve policies – and the evidence upon which policies are based – it should be noted that agricultural policies have often suffered from a lack of implementation and strategic electoral considerations (Poulton, 2017).

At the same time, AGRA's work around post-harvest policies seems to have gained considerable traction, culminating in the recent adoption of the National Postharvest Management Strategy and an implementation plan. This offers considerable opportunities for targeted future interventions and AGRA is explicitly referred to as a key partner in achieving the strategy's strategic objectives, which suggests that lasting impact on this issue is possible.

5 Extension system

5.1 System performance

Extension providers and funding arrangements

Agricultural extension has been decentralised in Tanzania since 1998 and responsibility for implementing extension services lies with the Local Government Authorities operating at district level. The function of the central government is to provide technical support to local authorities and an enabling environment for extension services to function at the farm level (Rutatora & Mattee, 2001). As services were decentralised, the system also shifted towards a pluralistic one, with an increasing number of non-governmental organisations (NGOs), agribusinesses and farmer organisations also engaging in service delivery to farmers. Nonetheless, the public system is still the largest provider of extension services, which was also confirmed by the household survey (see Section 7.7). It is estimated that around 70% of extension services in Tanzania are delivered through public sector agencies (Ministry of Agriculture, 2013). Most of this happens through ward and village level extension agents, but also TARI and crop boards sometimes provide extension services to farmers, although on a more irregular basis (Bitzer et al., 2016). Figures dating from 2013 from the Ministry of Agriculture show that around 26% of extension services are delivered by NGOs, both international and national, and another 4% are provided by agribusinesses, either input suppliers (seeds or agro-chemicals) and agro-dealers who offer extension services to promote their products or agro-processors who provide services under contract farming arrangements (Ministry of Agriculture, 2013).2 The household survey shows a similar pattern as the findings from Bitzer et al. (2016) for rice, but not for maize. For rice, in the last 12 months, households largely accessed extension services through the government (67%), frequently also through a farmer promoter (public or privately based) (21%), relatively rarely through private companies (14%) and hardly from NGO initiative (9%). For maize, the picture is more nuanced with NGOs leading as providers of extension (50%), followed by the public sector (39%) and farmer promoters (30%).

Service delivery to farmers is highly donor dependent. This holds to similar degrees for all three categories of service providers. Public extension services receive only little direct funding from the government (0.67% of total agricultural budget in 2014/2015 according to Ministry of Agriculture, 2015), of which most is spent on salary costs to sustain the apparatus and maintain staff. Implementation of services and particularly operational resources therefore depend to a large degree on external donor funding.3 This has led to a project-based approach with a multitude of temporal projects or programmes, rather than a strategic approach to extension (Bitzer et al., 2016). Repeated hopes by donors that the central government would be in a position to sustain activities under different projects once donor funding runs out have proven to be too optimistic (Ministry of Agriculture, 2013; Murphy et al., 2013). Similarly, extension by NGOs, and even agribusinesses, has been described as highly dependent on donor resources, with limited sustainability of service provision after the lifespan of a project (Semwanda, 2016).

---

[2] A recent publication even estimates that about 95% of all extension services are provided by public extension agencies (Digital Green, 2019).

[3] Crop boards are an exception in this regard, as they collect levies charged to exporters of traditional crops (e.g. coffee, tea, cashews) and use part of this money to deliver extension services to farmers.

Service effectiveness

Coverage of extension services is difficult to estimate due to a lack of reliable data. In 2013, it was reported that 59% of farmers reported contact with an extension agent, which suggests an increase compared to 25-40% in 2008 (Ministry of Agriculture, 2013). At the same time, reports indicate that extension delivery is not demand-driven and timely delivery of information does not seem to work (Bitzer et al., 2016). The household survey conducted as part of this study shows rates closer to what the Ministry of Agriculture published in 2013, with only 43% of the maize households having received a visit of an extension agent in the past year. Rice households even had a far lower rate with 15% indicating a visit of an extension officer. This may be partly due to the fact that the survey location is not a traditional rice growing area. Therefore, the area may suffer from a lack of rice-related services.

While the government aims to have one extension agent per village (which would require just above 15,000 public extension agents nationwide), the number of village/ward extension officers in June 2013 was 7,974 (Ministry of Agriculture, 2016). This speaks to a reasonable coverage of the public extension system, but due to the top-down provision of extension, positive impact on farm productivity and profitability has yet to be proven (Digital Green, 2019). While farmer field schools have been recommended as the main extension approach by the central government, lack of funding and human resource constraints to deliver this intensive training method manifest in the continued predominance of farmer field days around demonstration plots as the main approach of extension services (Bitzer et al., 2016). The household survey also shows that demonstration plots are the dominant approach to extension.

In view of the questionable effectiveness of extension services, Ragasa et al. (2016) argue that employing more (public) extension agents, as per official policy objectives, may not make services more effective if challenges in funding, infrastructure and facilities are not addressed (Ragasa et al., 2016). ICT applications are also increasing in Tanzania, although none seem yet to have been established with major impact (Digital Green, 2019); none of the responding households to the survey used technologies to access extension services.

Coordination and collaboration

Coordination and collaboration between service providers are supposed to be handled by the Local Government Authorities; currently, however, there is little institutionalised coordination. While many NGOs and agribusinesses make use of government extension staff for some of their field activities, and often voluntarily report their extension activities to Local Government Authorities (District Executive Office), formal linkages between public and private extension are absent (Bitzer et al., 2016). This can result in competition between NGOs over extension officers, non-harmonised messages to farmers, and geographical oversupply and gaps in service provision.

Coordination is also a challenge within the public extension system, including between the Ministry of Agriculture and extension staff under the Local Government Authorities, and between agricultural research and extension (Ministry of Agriculture, 2016). Fragmentation between extension and research for crops, livestock and fisheries – which fall under separate ministries at the national level and different structures at Local Government Authorities – has been noted as another problem (Bitzer et al., 2016).

Accountability

Two main data reporting systems are in place for public extension. First, extension officers are required to submit reports, e.g. on the number of farmers trained on a weekly basis to the district level. Secondly, since the launch of the Agriculture Routine Data System (ARDS), which was introduced and rolled out in all districts in Tanzania between 2009 and 2014, extension officers also have to report on a monthly basis to document changes in village-level agricultural production. However, actual monitoring is constrained by a shortage in resources (e.g. lack of transport to visit all villages and collect relevant data), human capacity (numerous indicators but little clarity on measurement) and institutional capacity (lack of effective oversight by district authorities) (Bitzer et al., 2016; Semwanda, 2016). Specifically, the ARDS system has not been functioning properly, but the Ministry of Agriculture expects this to be improved, as the system was recently consolidated and upgraded with Japanese donor support (Ministry of Agriculture, 2016). It should be noted that accountability to farmers ('downward accountability') is not commonly practised, neither by public or private extension agents (Bitzer et al., 2016; Semwanda, 2016).

Policy framework

The current orientation of agricultural extension services in Tanzania stems from the National Agricultural Policy of 1997, which states the government's objective to broaden the spectrum within which extension is provided, in terms of providers and the range of clientele. The Local Government Act of 1999 transferred the responsibility of providing extension from agricultural lead ministries to Local Government Authorities, which currently fall under the Ministry of Regional Administration and Local Government (Isinika et al., 2008). Consequently, in 1999, technical staff responsible for delivery of agricultural extension services were redeployed to Local Government Authorities to position them closer to farmers (Isinika, 2008).

Since then, various policies have aimed to strengthen the decentralised and pluralistic structure of extension in Tanzania, including the Agricultural Sector Development Strategy of 2001 (ASDS), the Agricultural Sector Development Programme (ASDP I) of 2003 and more recently, the National Agricultural Policy of 2013 and the ASDP II of 2016. For instance, the ASDP II makes several recommendations to transform extension to enhance agricultural production and productivity, including (Ministry of Agriculture, 2016):

- Cater to the diversity of farmers including gender;
- Improve efficiency of service delivery by use of PPPs and promoting private sector participation in extension;
- Strengthen research-extension linkages;
- Increase the number of public extension staff;
- Use participatory approaches to extension;
- Support and equip multi-functional ward agricultural resource centres with ICT;
- increased budgetary allocations (Agriculture Extension Block Grant and Agriculture Capacity Building Grant).

Table 9: Overview of the extension system in Tanzania

	Actors	Strengths	Weaknesses	Improvements and opportunities
Extension providers and funding arrangements	• Local Government Authorities: ward and village extension officers • TARI • Crop boards (e.g. for coffee, tea) • NGOs using lead farmers and VBAs • Agribusinesses: input suppliers, including seed companies, agro-dealers and agro-processors • Farmer-based organisations	• Pluralistic extension system: variety of public, NGO and private service providers with different approaches and methods • Growing involvement of different types of agribusinesses in service provision	• Heavy dependence on donor funds for operational services • Project-based approach: benefits are not scaled up or sustained after donor funding ends • Inadequately staffed and capacitated extension services • Diminishing government expenditure on research and extension • Shortage of operational resources and transport of public extension • Inconsistent public disbursement at district level below requirements	• Increased public resource allocations to extension (both at national and district level) • Increased disbursement of funds • Develop sustainable financing arrangements, including co-investment by farmers • Cost-recovery models based on farmer willingness to pay for services
Extension effectiveness	• Local Government Authorities: ward and village extension officers • TARI • Crop boards (e.g. for coffee, tea) • NGOs using lead farmers and VBAs • Agribusinesses: input suppliers, including seed companies, agro-dealers and agro-processors • Farmer-based organisations	• Emphasis on demand-driven service provision • Farmer field school approach recognised in official policy to move away from training and visit (T&V) approach • Considerable coverage of public extension	• Few incentives for quality extension service delivery and high performance • Lack of professional development of public extension staff • Supply driven extension: reliance on demo plots and farmer field days instead of farmer field schools • No site-specific extension or farming systems approach • Needs of women are not catered for	• Improve agricultural innovation adapted to farmers' needs • Increase extension responsiveness to farmers' constraints and market requirements • Ensure diversity of farmers, especially women farmers, receive services • Capacity development and training of extension staff, especially related to value chains and marketing • Improve extension service equipment including transport • Increase coverage by using ICT
Coordination and collaboration	• Ward and village extension officers	• Official recognition of the importance of private extension	• No direct link from national ministries to extension	• Strengthen agricultural innovation system

	• Local Government Authorities • Prime Minister's Office, Regional Administration and Local Government (PMO-RALG) • Donors	• Establishment of Zonal Information and Extension Liaison Units (ZIELUs) in each agricultural zone, to disseminate research from TARI to extension officers and feed practical knowledge demands back to researchers • Districts required to keep inventories of all active service providers and involve them in annual planning	services at district level • Dysfunctional coordination structures linking extension and TARI (dysfunctional ZIELUs) • Lack of coordination at district level between service providers: no formal role for private service providers; gaps and overlaps in service provision	by linking research, extension and implementers • Encourage coordination in extension system and address gaps of under-served populations, e.g. through coordinating committees at district level • Clearly define public and private roles in extension • Ensure quality control of private sector extension (regulatory oversight)
Accountability	• Ward and village extension officers • Local Government Authorities	• ARDS to collect agricultural performance information and transmit from district to national level • Nationally standardised reporting format and data flows	• Gaps in M&E due to financial and human resource constraints • Results of M&E only for upward accountability; not used for learning purposes	• Institutionalise downward accountability to farmers, including feedback mechanisms to learn from farmers • Promote participatory design of extension
Policy framework	• Ministry of Agriculture	• Decentralised policy setting as part of devolution • Policy environment is quite open to service providers • Few regulatory constraints	• No single line of command from national to district levels • Competition for resources among ministries for agriculture and livestock/fisheries	• Increase public spending on extension • Capitalise on comparative advantages of different types of service providers and different types of information to formulate strategic approach to extension • Redefine the role of public extension officers to serve as facilitators or knowledge brokers in order to bring to bear the different types of information for farmers

Sources: Bitzer et al., 2016; Ministry of Agriculture 2016; Digital Green, 2019

5.2 AGRA change ambition

AGRA's overall change ambition in the extension system is to "*quickly and cost-effectively reduce the extension agent-to-farmer ratio to a more acceptable 1:500 and rapidly create demand for and access to improved seeds, fertiliser and other yield-enhancing inputs*" (AGRA, 2018, p. 3). AGRA promotes a private-sector led approach to extension, which refers to the use of VBAs as a complementary actor in the extension system. Much of AGRA's change ambition focuses on the desired outcomes of extension, which can be visualised as follows.

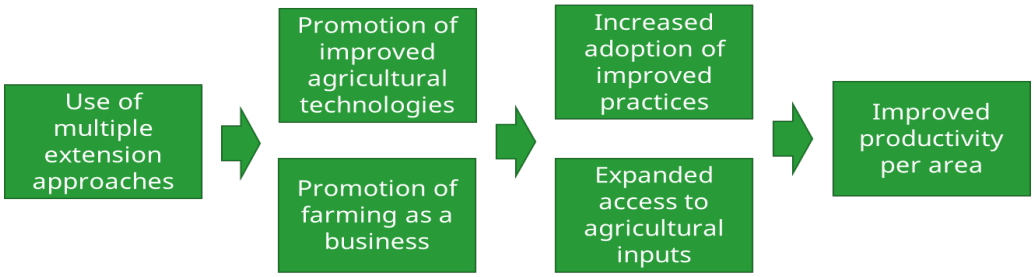


Figure 2: AGRA change ambition for extension

Concretely, this implies that AGRA's change ambitions focus on the system components of 'service providers and funding arrangements' and 'service effectiveness'.

Service providers and funding arrangements

AGRA works through a combination of four main extension service providers: public extension, VBAs, farmer organisations and private sector actors (e.g. seed companies).

At the core lies the promotion of self-employed, village-based 'agri-preneurs' or 'advisors' (VBAs) – individuals selected based on their motivation, capabilities and social recognition – who deliver extension messages to farmers. These VBAs receive agricultural training, which they are supposed to pass on to farmers in the village. One VBA can work with approximately 100-200 farmers, which increases the access of farmers to extension messages. VBAs are supported in this by public extension officers in the areas where AGRA is active.

Moreover, VBAs are linked to input companies to promote seed of improved crop varieties and fertilisers together with good agricultural practices. They are supposed to aggregate farmers' demand and transport inputs to the rural areas, for which they can charge a commission (fee). They thus create demand for agricultural inputs to benefit both farmers and agro-dealers (or other input suppliers). Alternatively, VBAs can be trained to provide spraying services to farmers or establish rural aggregation centres to facilitate access to buyers. The critical point is that VBAs are incentivised to train farmers and manage demonstration plots through connected small-scale agribusiness activities, which rewards them for their training activities. This is supposed to facilitate sustainability and establish VBAs as (financially) independent actors in the extension landscape, with close linkages to public extension and private sector companies.

AGRA provides backstopping support to public extension officers and the VBAs. As the household survey shows, for AGRA-supported farmers, these extension officers and VBAs provide the majority of extension services (with 39% and 30% of extension, respectively, for maize and 67% and 21% of extension, respectively, for rice). AGRA indicates that if they

want extension officers to participate in training farmers (e.g. at a demonstration plot), they facilitate their transport to the plot's location. AGRA staff described the engagement of farmers with public extension officers taking place at a quarterly or periodical basis. Respondents in the household survey reported 2.5 and 2.4 interactions with extension services for maize and rice, respectively, in the past year. This confirms that extension services are not limited to a one off event per year.

The use of VBAs is also supposed to draw the private sector closer to farmers and encourage them to engage in service provision. Not only are companies to provide VBAs with inputs, they are also included, where possible, in conducting demonstration plots to create demand for their products. This is supposed to create an incentive for private companies to engage further. The household survey demonstrates that the private sector only directly caters for a small proportions of service provision for maize (8%) and rice (16%). VBAs clearly have higher interaction rates with producers (30% and 21%, respectively), which may create a bridge between farmers and input providers.

Service effectiveness

AGRA uses multiple approaches to extension, such as training, field visits, demonstration plots, exhibitions, seed small packs and agriculture shows. As the main method, VBAs use 'mother-baby' demonstration plots to showcase improved seed varieties and fertiliser. Farmers are taught about good agricultural practices through a 'mother demo', which is used for repeated farmer field days during a season. After being trained, farmers each receive a small (50 g) pack of seed of a new variety together with a 200 g pack of blended fertiliser to enable them to conduct a 'baby' demo on a small plot on their own farms.

Extension topics promoted by AGRA:

- improved agricultural practices;
- promotion of improved, climate resilient varieties;
- gender and youth empowerment.

In addition, the consortia organise exhibitions at village level by inviting input companies in collaboration with the government so that the farmers can have direct interactions with the companies.

Information and communication technology (ICT) applications (e.g., animated video) are also employed to assist in training VBAs, and help them convey key extension messages that are needed by farmers. In the Kigoma and Kagera consortia, ICT is also used in service delivery to farmers through Farm Radio International (FRI). Radio programmes by guidance of the seasonal crop calendar are organised to communicate extension messages and discuss production challenges with farmers, based on farmers' demands.

Collaboration, accountability and extension policies

AGRA has no change ambition with regard to these system components.

Table 10 AGRA Tanzania investments in extension system development

	Region	Description/purpose of grant	Partners	Expected outcome	Timeframe	Progress to date
Extension providers and funding arrangements	Sumbawanga & Katavi regions	SUKA consortium	ADP-MBOZI BRITEN	Develop VBA model	August 2017 to July 2020	Ongoing
	Kigoma	Kigoma consortium	Nyakitonto Youth for Development Tanzania (NYDT)	Develop VBA model	Sept 2017 to August 2020	Ongoing
	Kagera	Kagera consortium	Karagwe Development and Relief Services (KADERES) FRI TARI Maruku	Develop VBA model	Sept 2017 to August 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium	BRITEN TARI Uyole	Develop VBA model	October 2017 to September 2020	Ongoing
Extension effectiveness	Kigoma	Kigoma consortium	NYDT	Increased adoption of technologies	Sept 2017 to August 2020	Ongoing
	Sumbawanga & Katavi regions	SUKA consortium	ADP-MBOZI BRITEN	Increased adoption of technologies	August 2017 to July 2020	Ongoing
	Kagera	Kagera consortium	KADERES FRI TARI Maruku	Increased adoption of technologies	Sept 2017 to August 2020	Ongoing
	Ihemi Ludewa	Ihemi-Ludewa consortium	BRITEN TARI Uyole	Increased adoption of technologies	October 2017 to September 2020	Ongoing
Coordination and collaboration		None				
Accountability		None				
Policy framework		None				

5.3 AGRA system change results

Service providers and funding arrangements

With regard to service providers of extension, the core of AGRA's activities through the four consortia is the formation of VBAs as a new actor in the extension landscape. So far, more than 5,000 VBAs have been trained on good agricultural practices (four trainings for one day each: on seed, farm preparation, field management, post-harvest handling, etc., and on cross-cutting issues like gender and environment). The VBAs are supposed to pass on this knowledge to farmers, e.g. using demonstration plots. The household survey, which collected data for the 2018 cropping season and thus the first year(s) of the PIATA programme, shows that farmers often learn about farming practices from other community members and that the reported good practices had been adopted three to four years ago (Sections 7 and 8).

Table 11: VBAs trained by AGRA consortia (status: October 2019)

	Kagera consortium	Kigoma consortium	SUKA consortium	Ihemi consortium
VBAs trained	5 districts with 1,679 VBAs trained (out of 2,400 VBAs targeted)	2,170 VBAs trained	592 VBAs trained	582 VBAs trained (out of 500 VBAs targeted)

Furthermore, AGRA integrates private sector companies into extension activities by using specific innovations embedded in purchased inputs in demonstration plots to provide an incentive for private companies to engage. For instance, in the SUKA consortium, 12 companies have been engaged in extension activities. At the same time, AGRA staff recognise that this component is relatively difficult, as many companies lack of capital to hire technical advisors.

Engagement with the public extension system by AGRA consortia is relatively limited. As indicated by a consortium member, "we don't strengthen the public system directly, only indirectly by involving them in our activities" (Interview with ADP Mbozi).

However, it is important to note that the VBAs work is complementary to the work of public extension agents. It helps them to achieve their objective of improved service delivery and reaching farmers with new information and practices. Training sessions offered by the consortia is open to public extension officers (not only VBAs), so it would be interesting to monitor the rate of participation of public officers to capture indirect effects. Finally, stakeholders suggested that the integration of private companies in consortia activities may motivate public extension officers to become more active, as they see overall improved service delivery in their rural areas.

Service effectiveness

Overall, due to the activities of the four consortia, an improved coverage of extension services can be observed. Some of the results can be found in Table 12, which shows that various extension activities have indeed taken place. However, for the year 2018, the survey results also show limited outreach of VBAs to farming households and a discrepancy in interactions with female-headed households, specifically for rice (Table 92). This can possibly be linked to the fact that interventions were still incipient at that stage.

It should be noted that the quality and effectiveness of the various extension activities is difficult to assess without further monitoring data. One of the key elements that AGRA highlights in its communication is the implementation of demand-driven services. Consortium members asserted that they conduct both a needs assessment before training farmers or VBAs and an assessment after training to analyse gaps and areas for future improvement. However, this could not be further verified.

Furthermore, the interviewed consortia emphasised that they use up-to-date content when training farmers. This is an important distinction with government services, which has long been criticised for using old recommendations, e.g. on fertiliser use. To this purpose, most consortia work with newly developed training modules and utilise ICT to deliver content. For instance, in the Ihemi-Ludewa consortium, BRITEN has developed an illustrated best practice manual and video for beans and soybean production. According to the NGO, this is necessary as farmers are willing to new learn practices faster than the government is able to adjust. In the SUKA consortium, ADP Mbozi uses a training manual developed previously, but checked by AGRA to confirm that it corresponded to their requirements. The household survey did not suggest wide use of ICT for the year of 2018 and revealed demonstration plots as a common method for extension delivery. It should be noted that the survey did not focus on beans, but solely on maize and rice (Table 47, Table 92).

Table 12: Selected achievements on service delivery by AGRA consortia (status October 2019)

	Kagera consortium	Kigoma consortium	SUKA consortium	Ihemi consortium
Selected achievements on extension	• 148,613 farmers reached by extension (training received for one agricultural season on all three crops)	• Extension ratio improved from 75 extension agents in 300 target villages to 2,170 VBAs • 600 VBAs linked to agro-dealers	421 demo plots established: • 99 gross margin demo plots (demo established to compare improved and local practices) • 322 mother demo plots (322 demos) • Baby demo plots • 126,980 farmers reached by extension (*status: April 2020)	• 56,842 farmers reached by extension • 956 extension events (demos, field days, etc.) • 51,000 small packs distributed

Coordination and collaboration

According to AGRA staff, extension services are implemented in collaboration with the public extension system and private sector companies (seed companies, agro-dealers, off-takers, etc.). In two consortia, the national research institute TARI is also involved.

Collaboration with other extension projects is more difficult, however. AGRA grantees recognised the need for more coordination, especially at donor level, to ensure that extension is not merely about numbers (of farmers being trained) but rather about lasting benefits to farmers.

Accountability
There are no concrete results on the aspect of accountability of the wider extension system. The consortia rely on internal monitoring (reports by field agents) as part of project reporting.

5.4 Analysis of AGRA system interventions

AGRA's position in the intervention landscape
Tanzania is characterised by a highly diverse landscape for agricultural extension. Providers of extension services include public agencies (who delivery the vast majority of services), development partners, NGOs, agribusinesses (e.g. input suppliers, aggregators, processors), producer organisations, community organisations, and private farm advisors. Thus, extension stretches across public and private, profit and not-for-profit domains, with private sector providers generally being more active in service delivery on traditional export crops, such as cotton, tea and coffee, sometimes as part of outgrower or contract grower schemes. There is a vast number of international NGOs active in service provision, often through (development) project funding. A recent study estimates their number at around 200 nationwide – excluding a high number of local NGOs, which are often small in scale and capacity (Digital Green, 2019). There are also various development partners in the agricultural sector, including the World Bank, Japanese International Cooperation Agency, the European Union, African Development Bank, United Nations Development Project, Irish Aid, Food and Agriculture Organisation, USAID, World Food Programme, Danida, BTC, German International Cooperation Agency and Swedish International Development Cooperation Agency. Basically all of their agricultural projects have an extension component of some kind included, among other activities.

It appears that most agricultural projects rely heavily on traditional methodologies of demonstration plots and farmer training (Digital Green, 2019). This resembles what AGRA is doing. The VBA approach promoted by AGRA is also used in Tanzania by other agencies and programmes, such as USAID, Farm Input Promotions Africa (FIPS) and Gatsby Foundation. Therefore, AGRA's profile in the extension landscape is similar to others, which is recognised by AGRA. In many of the geographical areas where it is active, development partners are present and pursue an approach that is in alignment with AGRA (AGRA, 2017). This could potentially lead to complementarity for improved extension service coverage. However, this study did not find strategic linkages to other partners to create synergies across projects and interventions. More attention should be paid to this aspect in the future to ensure complementarity of activities.

Relevance of AGRA's interventions
AGRA's work through the consortia recognises the importance of extension for reaching smallholder farmers and achieving higher productivity through the use of modern farm inputs. As smallholder farmers in Tanzania are generally underserved, AGRA's activities help to close (some) gaps in the extension landscape. This speaks to a high degree of relevance of investing in service delivery for smallholder farmers.

The relevance of AGRA's extension activities should also be seen in connection to AGRA's efforts to improve farmers' access to inputs. A recent large-scale study in Malawi, Uganda and Nigeria showed that receiving agricultural advice is associated with significantly larger farm output and productivity, as well as with higher use of modern agricultural input technologies (Naeher & Schuendeln, 2018). In this context, the linkage of AGRA's extension

activities with input supply of farmers is commendable. By integrating input dealers in extension activities and by training VBAs to serve as rural agro-dealers, it is realistic to expect that farmers' access to modern inputs will be improved and relationships and goodwill between farmers and specific suppliers can be established.

Furthermore, AGRA involves different actors in its activities within a defined geographical area to collaborate on service provision, which has the potential to build on different skills sets and resources, and to avoid duplication. More focus should be placed on building a clear collaboration strategy and also involving other development partners in a systemic manner in each consortium.

Finally, by focusing on service delivery to farmers, the consortia contribute to official policy objectives and strategies, specifically ASDP, phase two.

Expected impact

At this stage, impact of AGRA's extension activities is yet to manifest. The household survey showed little impact for the 2018 cropping season, but the consortia activities had only commenced at that time and therefore few effects were to be expected. The systems analysis further brought to light a number of critical considerations, which should be taken into account to increase future impact.

First, all four consortia feature a pronounced emphasis on the number of farmers reached with extension services. However, 'farmer reach' is insufficient to indicate the quality of farmer contacts with extension staff.

Second, the planning of extension appears to be done by AGRA grantees rather than farmers. While grantees indicated conducting a 'quick needs assessment' in select villages, the common approach across consortia indicates a top-down approach, rather than demand-driven extension.

The focus on technology transfer also has implications for the extension methods used. All consortia indicated using training, field demonstrations, field days, exhibitions and shows. At the same time, it remains unclear how diverse and flexible these methods are. Local context matters for the success of extension approaches, including social structures, farming systems, gender relations and the degree of crop commercialisation (Digital Green, 2019).

AGRA grantees recognised that gender, in particular, does not yet have a prominent role in extension activities. As one interviewee highlighted, working with maize and other cash crops is inherently challenging, as these are considered 'male crops' and male and female farmers have different access – to knowledge, inputs, decision-making and benefits of crop production. This calls for a more pronounced focus on the household as a production unit to ensure that AGRA's services are indeed inclusive. The survey results in Sections 7 and 8 demonstrate that female-headed households are significantly poorer on various dimensions, which calls for more attention on this aspect.

Third, AGRA's extension activities rely heavily on VBA recruitment and training, who should be trusted community members with an entrepreneurial spirit and willing to train other farmers (e.g. at demonstration plots). While VBAs may facilitate access to inputs for farmers, it is not clear to what extent they can actually deliver quality extension messages to farmers, as the quality of subsequent levels of training may be questionable. Results from the

household survey suggest that, in 2018, public extension remained the most common source of information on agricultural practices for households (Sections 7.7 and 8.7) A recent review of USAID projects in sub-Saharan Africa found that training of farmers by 'lead farmers' or similar agents was often "unsound or non-existent" (Digital Green, 2019). This warrants close attention.

Finally, while the VBA model appears to be a low-cost option to improve extension outreach and strengthen the rural agro-dealer network, it is actually rather cost-intensive. This is because the agro-dealer function of VBAs requires formalisation in Tanzania, including an official permit to sell seeds, a separate permit to sell fertiliser, and yet another permit to sell agro-chemicals. An expert interviewed estimated minimum costs at US$400 per VBA. VBAs also require mandatory training (syllabus) before getting a permit. Seed and fertiliser permits can be applied for at the district level but, for agro-chemicals, VBAs need to apply at a central agency based in Arusha (no online application possible). VBAs further need to apply for a business license. This cumbersome process calls for significant support of VBAs by AGRA's projects – they are unlikely to manage this process by themselves. At the same time, it suggests that expectations that VBAs can easily be turned into rural agro-dealers may need to be lowered. The household survey did not establish any clear linkages between VBAs and the use of fertiliser by farmers (Sections 7.6 and 8.6).

Sustainability of results

Three aspects should be monitored that could risk the sustainability of AGRA's interventions in extension.

First, the public sector extension system does not have a prominent role in AGRA's activities. Government participation appears necessary and is used by AGRA consortia to gain access to communities, but there is no significant strengthening of public services. As a result, AGRA's extension activities are limited to specific geographical areas (project locations) and bound by project funding.

Secondly, the consortia all use free input packs to encourage adoption of recommended innovations. This may indeed lead to adoption during the project but there is a high risk of discontinuation once project support is withdrawn. Subsidies during projects may even undermine the idea of farming-as-a-business and disrupt the development of competitive market channels for inputs (Digital Green, 2019).

Finally, the success of the VBA model in the long run depends on the ability of VBAs to find monetary value in their activities. Without any payment or incentives, a recent review shows that the likelihood of VBAs continuing their services and training other farmers is limited (Digital Green, 2019). Thus, VBAs need to make (some) profit from selling inputs to farmers, or even negotiate compensation for training activities. This requires targeted support to VBAs to develop (small-scale) business models and entrepreneurial capacity, including flexibility in responding to dynamic contexts. This is challenging, as AGRA grantees also recognised, hampering the quick adoption of the VBA model.

Part II: Household survey

6 Methodology of the household surveys

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 locally available. 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 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 have agreed not to make use of counterfactuals.

The target population for this study are all AGRA beneficiaries in the regions of Iringa and Katavi in Tanzania. The sampling was done based on beneficiaries lists provided by AGRA. As the lists were considered representative of the AGRA beneficiary population, they were used for the sample selection.

The sample is determined using multi-stage random sampling, by first randomly selecting geographically spread locations and, within location, randomly selecting beneficiaries. A sample of 2,000 households was randomly selected from this population, using two-stage clustered sampling. The sampling procedure was done twice: two different samples were selected for maize and rice; though the sampling procedure was identical.

Firstly, wards were randomly selected to cover 60% of the population of the targeted area. Concentrating the sample in a subset of wards with more than 100 AGRA beneficiaries made data collection logistically feasible and, at the same time, ensured sufficient spread of the data. The number of interviews to be conducted per wards was then determined proportionally to the beneficiary population in each ward. Thereafter, villages were randomly selected in the wards. The number of interviews per villages was again determined based on the relative population size, under the condition of selecting villages with at least 20 beneficiaries. Within each village, the number of male and female farmers to be interviewed was determined proportionally to the number of male and female beneficiaries in the village. Respondents were selected randomly. A buffer was added in each village in case the selected sample could not be found. For maize, the buffer was about 20%. For rice, the buffer was larger due to the suspected difficulties in locating rice farmers.

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).

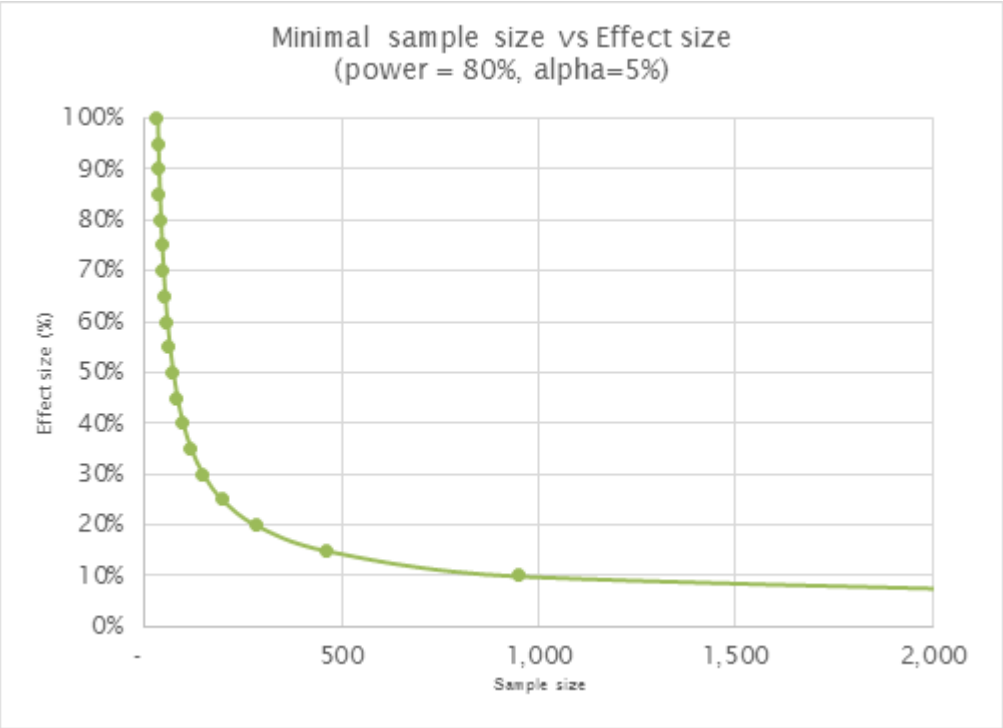


Figure 3: Power calculation

6.3 Survey structure and respondents

The main unit of analysis is the household. Therefore, it is possible that multiple household members are 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 track enumerators in the field and ensure that the sampling strategy was correctly implemented by the team. As such, data collection could be closely monitored from the Netherlands.

6.4 Limitations of the household survey

When interpreting this data, a number of aspects should be kept in mind. Firstly, the purpose of the assignment is 'internal' monitoring of change. As such, the assignment does not require impact measurement of AGRA's and partners' interventions and therefore does not require change to be measured against counterfactuals and attribution of results.

Secondly, the survey relies on recall data for the year 2018, while data collection occurred in 2019. Although 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.

Thirdly, since the sampling was done based on AGRA beneficiary lists, the sample is only representative of AGRA's beneficiary population and its representativeness cannot be extended to the wider regions or Katavi and Iringa.

Finally, the lists of beneficiaries provided by AGRA were often incomplete and local consultants faced challenges in finding the sampled households due to incorrect information on beneficiaries or double registration of the same beneficiaries under different names. This was especially prevalent for households in the rice sample. In addition, it turned out that, at the time of the survey, a large part of the sampled population had not yet started cultivating rice, despite lists reporting a certain acreage under production. Hence, not the entire target population was reached by AGRA interventions or support at the time of the data collection. Consequently, it was not possible to include the planned number of 1,000 rice farming households in the sample. However, AGRA staff emphasised that these farmers would be involved in activities planned at a later stage. It was therefore decided to administer the general parts of the survey to the selected households.

7 Household-level results: maize in Iringa region (2018 season)

7.1 Sample description

Survey area

A total sample of 1,154 maize-cultivating households were interviewed in Iringa region in three districts: Iringa District Council (43% of the sample), Kilolo District (40% of the sample), and Mufindi District (17% of the sample). Within these districts, 42 communities were visited. The division of the sample over the three districts is proportional to the number of farming households in each district. Figure 4 shows the geographical spread of surveyed households.

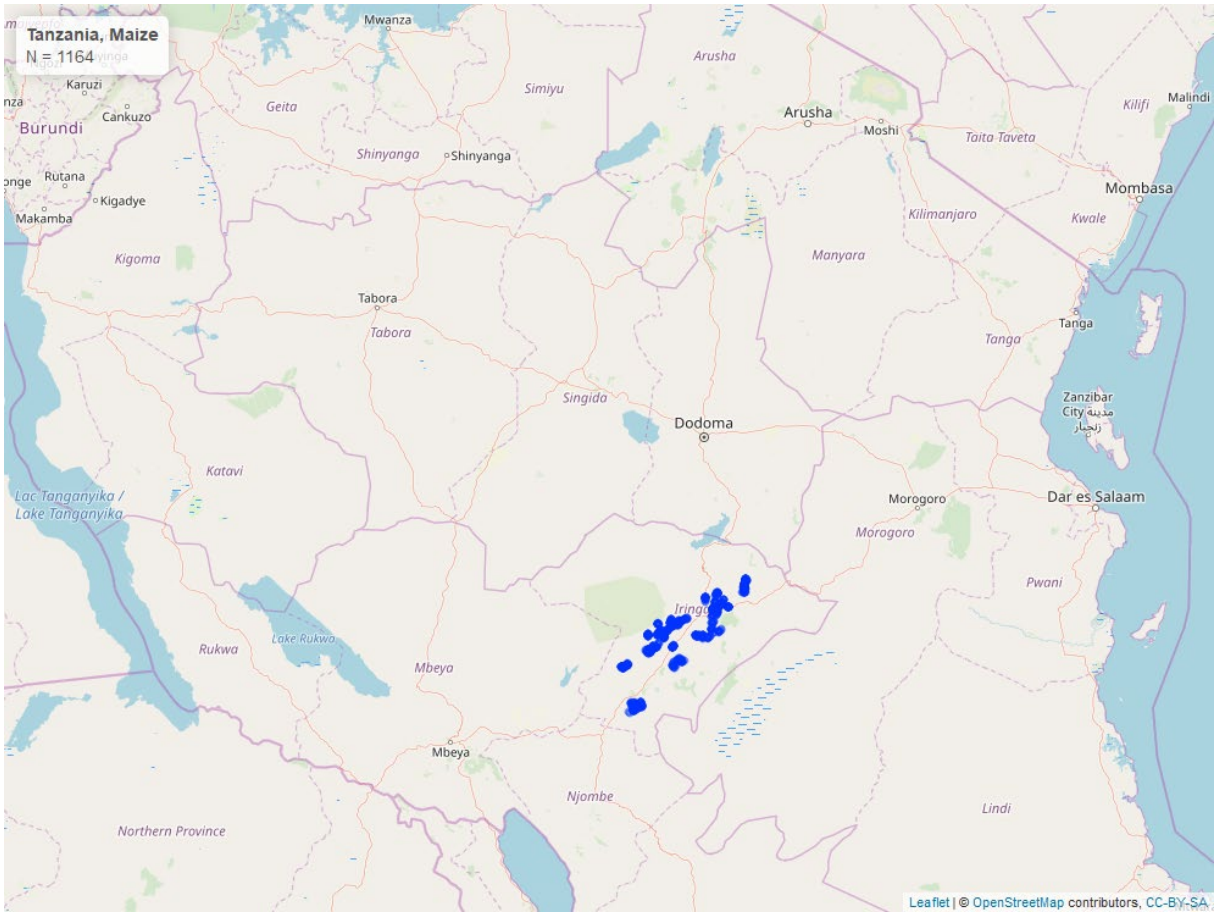


Figure 4: Distribution of survey locations for maize

Farm household characteristics (maize)

All respondents were beneficiaries of interventions supported by AGRA. The distribution between men and women in the sample is 73% male-headed households and 27% female. In 75% of cases, the beneficiary is also the head of the household. Respondents were, on average, 44 years old (see Figure 5).

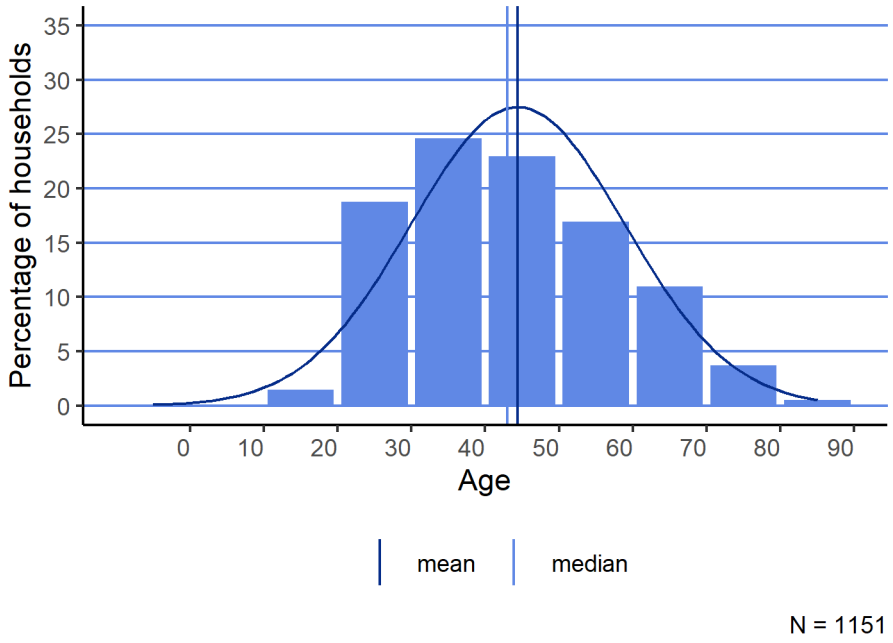


Figure 5: Distribution of respondents' age

Households consisted of 4.7 members (2.3 adults and 2.4 children), on average, with female-headed households being significantly smaller in size (see Table 13).

Table 13: Household composition

Household size	All	Male-headed	Female-headed	sig
Number of children in the household	2.4	2.6	2.0	***
Number of adults in the household	2.3	2.4	2.0	***
N	1154	844	309	

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

Almost all households surveyed (98%) own agricultural land. The average amount of land owned is 1.44 ha of which 1.1 ha is, on average, cultivated. Figure 6 shows the land allocated to maize cultivation. Most of the cultivated land (0.9 ha) is allocated to maize.

Half of the households interviewed intercrop maize with other crops, most commonly beans (41%) and soybeans (19%).

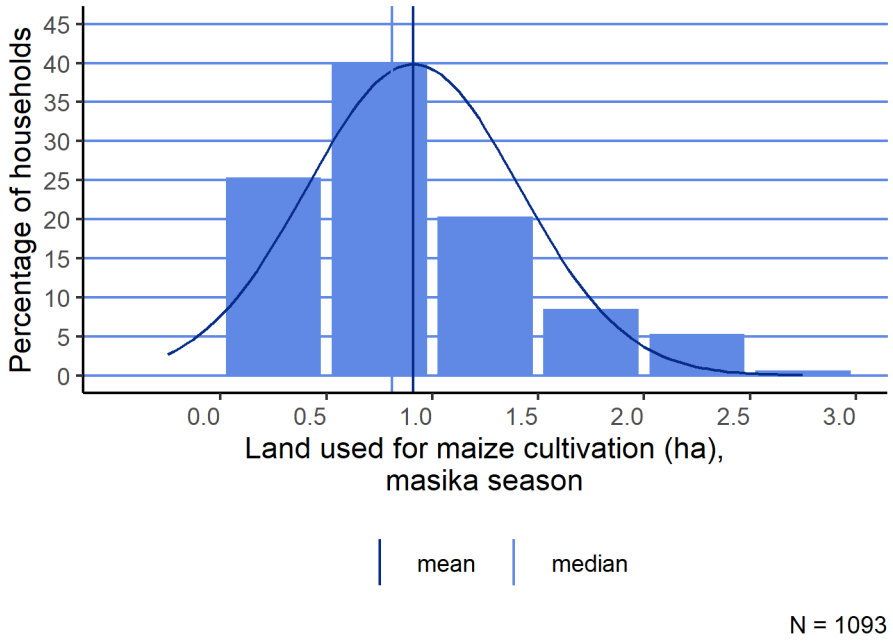


Figure 6: Distribution of land allocated to maize (ha), masika season

In Iringa region, maize is grown in two farming seasons: the *masika* season, which falls in the main rainy season, and the *vuli* season, which coincides with the second (small) rainy season. Table 14 shows that 97% of households interviewed cultivated maize in the *masika* season of 2018 and that none of the households cultivated maize in the *vuli* season of the same year. The remaining 3% of the farmers did not cultivate maize in any of the seasons in 2018. Consequently, the following section only presents data for the *masika* season.

Table 14: Percentage of households producing maize, per season

	All	Male-headed	Female-headed	sig
Masika season	97%	97%	97%	
Vuli season	0%	0%	0%	
N	1,154	844	309	

*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 15 gives an overview of the primary indicators collected (see Annex 2. Data dictionary main indicators for definitions for each indicator). The indicators and the underlying behavioural patterns are discussed in further details in the following sections.

Table 15: Overview of main indicators maize-farming households

	All	Male-headed	Female-headed
Goal indicator 2: Average number of months of adequate household food provision	**11.2**	**11.3**	**10.9**

Goal indicator 6: Wealth assets index score	**-0.230**	**-0.189**	**-0.338**
G6.1 Share of households in first wealth quintile (%)	10%	8%	15%
G6.2 Share of households in second wealth quintile (%)	29%	27%	32%
G6.3 Share of households in third wealth quintile (%)	39%	39%	38%
G6.4 Share of households in fourth wealth quintile (%)	21%	23%	15%
G6.5 Share of households in fifth wealth quintile (%)	1%	2%	0%
IWI International Wealth Index	37.5	38.9	33.8
1. Average yield (kg/ha)	**1286**	**1309**	**1222**
3. Rate of application of target improved technologies or management practices	82%	85%	76%
3.1 Adoption of improved varieties (%)	58%	61%	50%
3.2 Adoption of endorsed varieties (%)	8%	9%	5%
3.3 Number of seasons variety is recycled	5.7	5.4	6.5
3.4 Adoption of endorsed planting practice (%)	49%	52%	41%
3.5 Adoption of inorganic fertiliser (%)	74%	77%	68%
3.6 Adoption of endorsed fertiliser (%)	NA	NA	NA
3.7 Adoption of organic fertiliser (%)	21%	21%	20%
3.8 Adoption of inoculants (%)	NA	NA	NA
3.9 Adoption of pest-management practices (%)	41%	42%	35%
3.10 Adoption of endorsed post-harvest practices (%)	72%	72%	72%
3.11 Adoption of improved storage (%)	23%	24%	21%
3.12 Use of designated storage facilities (%)	0%	0%	0%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	73%	74%	71%
Ha under improved technologies or management practices (%)	72%	72%	72%
3.14 Area under improved varieties (%)	57%	57%	57%
3.15 Area under inorganic fertiliser (%)	72%	72%	72%
3.16 Area under pesticides (%)	41%	41%	41%
4. Access to agricultural advisory extension support services	**43%**	**44%**	**41%**
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.5	2.6	2.5
4.2 Received small seed pack (%) (additional indicator 4)	25%	24%	28%
4.3 Used small seed pack (%) (additional indicator 4)	94%	94%	95%
4.4 Distance to nearest agro-dealer (minutes)	37.3	37.3	37.4
5. Nitrogen application (kg/ha)	**41.7**	**43.2**	**37.9**

5.1 Phosphorus application (kg/ha)	11.2	11.8	9.8
5.2 Potassium application (kg/ha)	0.4	0.3	0.6
Average fertiliser use (Total N + P + K, kg/ha)	**51.9**	**53.8**	**46.7**
6. Percent of post-harvest losses (%)	**1%**	**1%**	**1%**
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**77.5**	**85.8**	**55.7**
13. Access to formal financial services (%)	**9%**	**11%**	**7%**
13.1 Bank account (%)	8%	9%	6%
13.2 Agricultural loan (%)	1%	1%	1%
13.3 Agricultural insurance (%)	1%	1%	1%
17. Average age of varieties used (years)	**19.7**	**19.7**	**20.0**
33. Sale through structured trading facilities/arrangements (%)	**0%**	**0%**	**1%**
33.1 Selling to traders/middlemen (%)	90%	90%	91%
33.2 Selling to consumers (%)	1%	1%	3%
33.3 Selling to friends/neighbours (%)	5%	5%	6%
33.4 Selling to aggregation centre (%)	0%	0%	0%
33.5 Selling to farmer organisation (%)	0%	0%	0%
33.6 Selling to wholesalers (%)	2%	3%	1%
33.7 Selling to processors (%)	1%	1%	0%
33.8 Selling to retailers (%)	3%	3%	3%
33.9 Selling to company (undefined) (%)	0%	1%	0%
33.10 Selling to institutional buyers (%)	0%	0%	0%
37. Access to market information through formal channel (%)	**0%**	**0%**	**0%**

The composition of variables can be found in the data dictionary in Annex 2; 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 4 reports the average number of months of adequate household food provision as per the index of the same name (MAHFP). It shows that AGRA beneficiaries have, on average, enough food to meet their family's needs during 11.2 months of the year. Female-headed households are less food secure than male-headed households; this difference is statistically significant but small.

Table 16: 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	11.2	11.3	10.9

Figure 7 shows the MAHFP distribution, it shows that 76% of AGRA-supported farmers reported having had enough food to meet their family's needs during the entire year. Only 3% of the farmers did not have enough food during six months or more. Only 0.1% reported being chronically food insecure (reported having adequate food provision in none of the months).

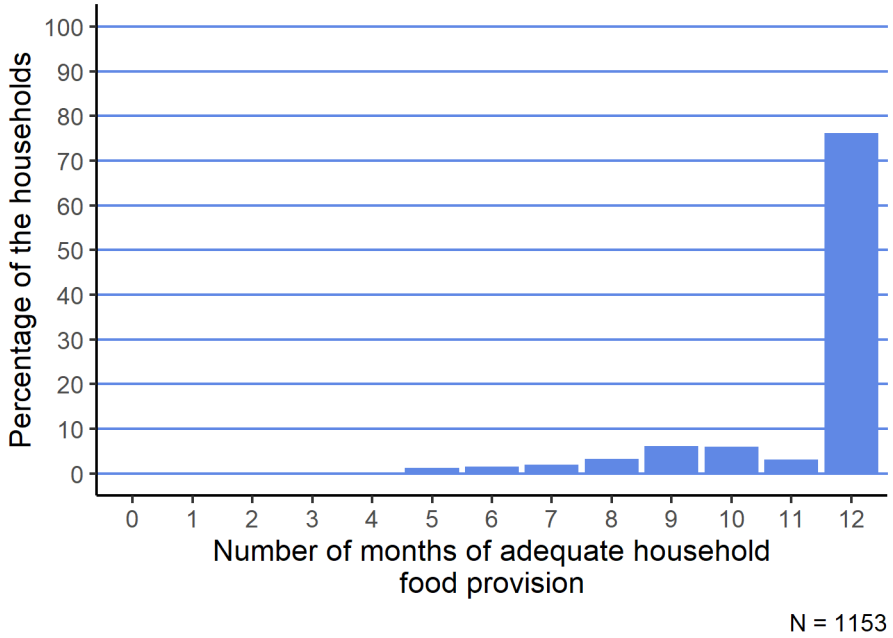


Figure 7: Distribution of number of months of adequate household food provision (G2)

Figure 8 shows the distribution of months with adequate household food provision over the year. The figure shows that food insecurity was highest in the period between November 2018 and April 2019.

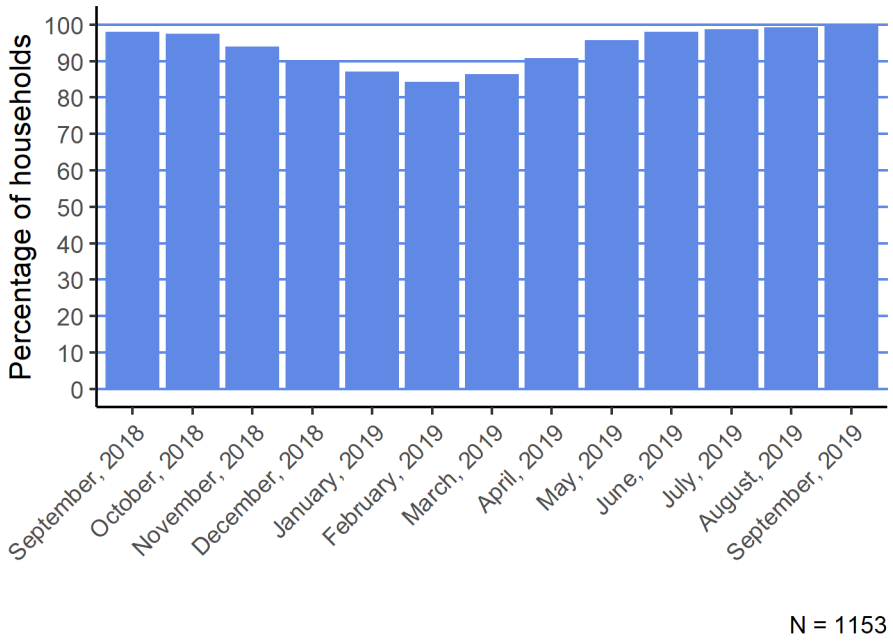


Figure 8: Distribution of months with adequate household food provision

7.4 Wealth asset index score (indicator G6)

Table 17 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, material used for housing construction, and types of water access and sanitation facilities.[4] Wealth index scores were compared with the national Tanzanian DHS distribution for rural areas to determine the household's relative wealth compared to the country average. As can be seen from Table 17, most households are in the 3rd quintile (39%) and 2nd quintile (29%), whilst 10% are in the 1st (poorest) quintile of the country and only 1% are in the 5th (wealthiest) quintile. Male-headed households are, on average, wealthier than female-headed households. This difference is statistically significant.

Table 17: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	-0.230	-0.189	-0.338
G6.1 Share of households in first wealth quintile (%)	10%	8%	15%
G6.2 Share of households in second wealth quintile (%)	29%	27%	32%
G6.3 Share of households in third wealth quintile (%)	39%	39%	38%
G6.4 Share of households in fourth wealth quintile (%)	21%	23%	15%

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

G6.5 Share of households in fifth wealth quintile (%)	1%	2%	0%
IWI International Wealth Index	37.5	38.9	33.8

7.5 Yield (indicator 1)

Crop yields are estimated by dividing the total crop production by the area of land under maize cultivation at household level. 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 tins, while the preferred unit of land size was acres for all respondents. Production and land data units were then converted to kilogrammes and hectares. Out of 1,123 interviewed households, seven respondents did not know their maize production, while five respondents did not know the amount of land used to cultivate maize in the *masika* season of 2018.

AGRA beneficiaries reported an average maize production of a total of 1,115 kg. Figure 9 shows the distribution of the quantity of maize harvested. Total production is significantly higher among male-headed households (see Table 18), as they usually cultivate maize on a larger area of land.

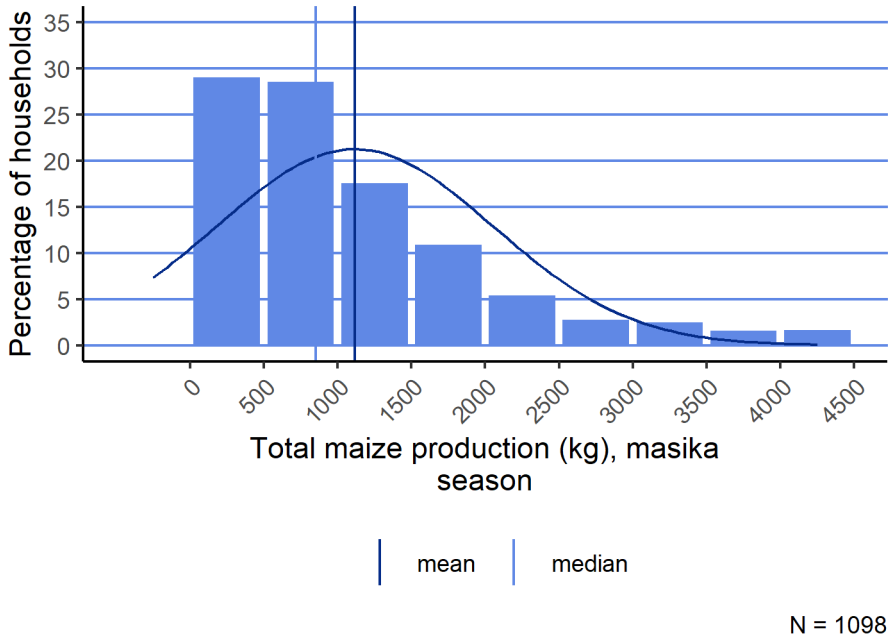


Figure 9: Total production of maize (kg), masika *season*

Table 18: Total production of maize (kg), masika *season*

Total maize production (kg), *masika* season	**All**	**Male-headed**	**Female-headed**	**sig**
mean	1115.6	1182.8	932.5	***
median	851.2	901.6	709.6	
n	1098	805	292	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Total production includes dry maize and green maize. A 20% difference in mass was assumed in the conversion from green to dry maize.

Maize yields are, on average, 1,286 kg/ha (see Table 19 and Figure 10). Although male-headed households report slightly higher yields on average, this difference is not statistically significant.

Table 19: Average maize yield (kg/ha)

	All	Male-headed	Female-headed
1. Average yield (kg/ha)	1,286	1,309	1,222

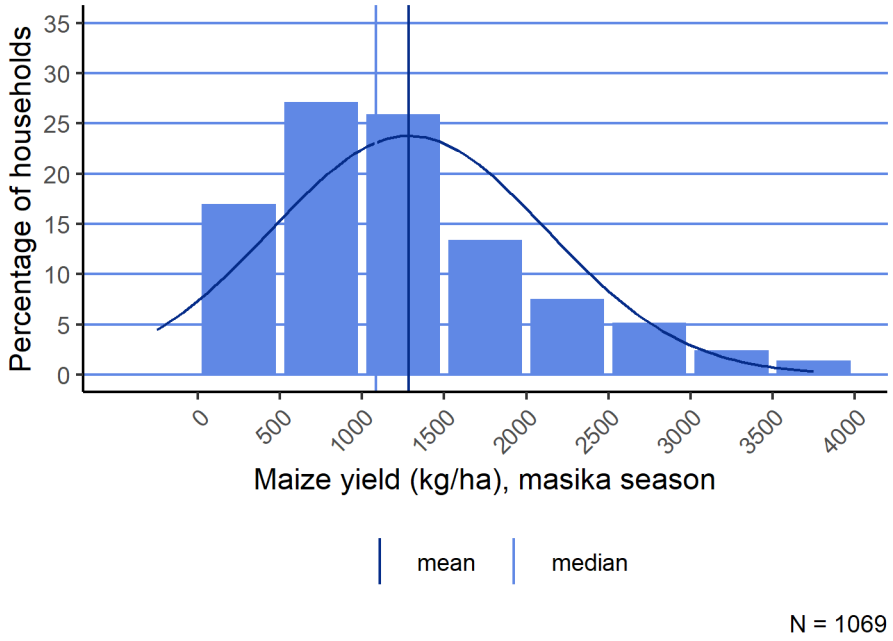


Figure 10: Distribution of maize yield (kg/ha), masika *season*

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

Improved varieties, recycling and planting practices

Improved varieties

Table 20 shows that 58% of farm households make use of improved maize varieties for the *masika* season. These improved varieties are either hybrids or improved open-pollinated varieties (OPVs). In Tanzania, the maize varieties promoted by AGRA are UH6303, UH615, SC627, H625, H628, H614, PAN719, Mery HB513, HB515 and UHS 5350. In 2018, only 8% of the farm households used these endorsed varieties (see Table 20).

Table 20: Main indicators for the use of improved varieties, recycling, and planting practices.

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	58%	61%	50%
3.2 Adoption of endorsed varieties (%)	8%	9%	5%
3.3 Number of seasons variety is recycled	5.7	5.4	6.5
3.4 Adoption of endorsed planting practice (%)	49%	52%	41%

17 Average age of varieties used (years)	19.7	19.7	20.0
Ha under improved technologies or management practices (%)	72%	72%	72%

Table 21 lists the varieties in use by farm households. About 40% of farm households indicated that they grow a local variety, without specifying a name. Local varieties were used significantly more by female-headed households. Many other varieties were mentioned; in particular, 7% of farm households use the promoted variety H625, and another 7% mentioned H628.

Table 21: Maize varieties used (percentage of households per variety), masika *season*

Varieties	All	Male-headed	Female-headed	sig
Local variety, unspecified	40%	37%	47%	***
H625 (promoted)	7%	8%	4%	**
H628	7%	8%	5%	*
Hybrid, unspecified	6%	6%	7%	
Hybrid Seed Co.	6%	6%	7%	
Other	6%	7%	4%	*
PAN691	5%	5%	5%	
SC or Seed Co, unspecified	4%	4%	5%	
Pannar unspecified	4%	4%	2%	
H614	4%	5%	3%	*
DK8031	3%	3%	1%	*
DK8051	2%	2%	1%	
Pioneer Seed Co., unspecified	2%	2%	2%	
DKC 8053	2%	2%	2%	
DK83-50	1%	1%	1%	
DKC90-89	1%	1%	1%	
SC627 (promoted)	1%	1%	0%	
Situka2	1%	1%	0%	
Situka-M1	1%	1%	2%	**
Don't know	1%	1%	2%	
n	1121	821	299	

*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 22 groups the varieties that are cultivated in the hybrid, local variety, or open-pollinated variety (OPV) categories. It shows that 58% of farm households have cultivated a hybrid variety, which means that hybrid varieties are more common than local varieties; only 1% of the varieties in use are OPVs.

Male-headed households use hybrid varieties more than female-headed households (60% versus 47%), whereas the latter use more local varieties (35% versus 46%). This difference is significant.

Table 22: Type of main maize variety (percentage of households per variety type), masika *season*

Type of main variety, *masika* season	All	Male-headed	Female-headed	sig
Hybrid	57%	60%	47%	
Local variety	38%	35%	46%	***
Not able to classify	4%	4%	4%	
OPV	1%	1%	2%	
n	1118	818	299	

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

According to the national seed catalogue, the average number of years since hybrid and OPV varieties were released is 19.7 years (see Table 23). Seeds are, on average, recycled for six seasons before they are renewed. Thus, even when farmers grow improved varieties, which should ideally be renewed every season, they often recycle seeds despite degeneration of varietal traits.

The source from which farmers acquire their seed differs per type of variety (see Table 24). Local varieties are largely recycled (i.e. farm saved seed) or received from a community member (86%). Hybrids are most often obtained from agro-dealers (43%) and NGOs (42%).

Table 23: Age of main maize variety (years), masika *season*

Age of main variety (years), *masika* season	All	Male-headed	Female-headed	sig
mean	19.7	19.7	20.0	
median	18.0	18.0	18.0	
n	393	313	80	

*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 52% of Hybrid and OPV varieties.

Table 24: Source of seed of main maize variety (percentage of households per source), by type of variety, masika season

Source of the seed, *masika* season	All	Local variety	OPV	Hybrid	sig
Recycled from the field of friend/family/neighbour… etc.	15%	86%	40%	0%	
Seed company	3%	0%	0%	4%	
Agro-dealer	38%	3%	40%	43%	
Market stall (not specifically for inputs)	3%	0%	0%	2%	
Farmer organisation	2%	0%	20%	1%	
NGO distribution	38%	11%	0%	42%	
Other	1%	0%	0%	8%	
n	389	37	5	319	

*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 25 shows the calculated yields per type of variety. In line with expectations, yields are significantly higher among farm households cultivating hybrid varieties. However, when interpreting this data it is important to keep in mind that there are few farm households cultivating OPVs (15 observations).

Table 25: Average maize yield (kg/ha), by type of variety, masika *season*

Maize yield (kg/ha), *masika* season	All	Local variety	OPV	Hybrid	sig
mean	1285.5	995.8	742.5	1474.5	***
median	1085.4	889.6	750.8	1310.5	
n	1069	417	15	591	

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

Planting practices

Table 20 shows the percentage of farmers adopting endorsed planting practices. AGRA promotes three planting methods for maize in Tanzania: (i) one seed per hole with spacing of 75 cm between the ridges and 30 cm between the holes; (ii) one seed per hole with spacing of 90 cm between the ridges and 30 cm between the holes; and (iii) two seeds per hole with spacing of 75 cm between the ridges and 60 cm between the holes. In total, 49% of farm households used one of these planting practices (Table 20). Other farm households planted without measuring distances (scattering) (14%), used broadcasting (3%) or other spacing between the seeds (3%). The latter is discouraged from a good agricultural practices point of view.

Table 26 shows that 30-75 cm is the most common spacing practice in use. The majority of the farm households planted one maize seed per hole, but a significantly higher number of female-headed households used more than one seed per hole (see Table 27); this difference is statistically significant. Such a practice is only advised when the spacing distance is 75 by 60 cm and therefore appears not to be applied optimally.

Table 26: Spacing between maize seeds (percentage of households per method), masika *season*

Planting method, spacing, *masika* season	All	Male-headed	Female-headed	sig
30-90 cm	10%	10%	9%	
75-60 cm	3%	3%	4%	
30-75 cm	84%	84%	86%	
Other	3%	3%	1%	
n	930	690	239	

*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 27: Amount of maize seeds per hole (percentage of households per answer), masika *season*

Planting method, amount of seeds per hole, *masika* season	All	Male-headed	Female-headed	sig
1 seed per hole	61%	64%	51%	***
More than 1 seed per hole	39%	36%	49%	
n	929	689	239	

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

Fertiliser use

Table 28 presents the main indicators on fertiliser use. A large majority of farm households (74%) apply inorganic fertiliser. In general, 72% of all maize land is treated with inorganic fertiliser.

Table 28: Main indicators for the adoption and use of fertilisers

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	74%	77%	68%
3.6 Adoption of endorsed fertiliser (%)	NA	NA	NA
3.7 Adoption of organic fertiliser (%)	21%	21%	20%
3.15 Area under inorganic fertiliser (%)	72%	72%	72%
5. Nitrogen application (kg/ha)	41.7	43.2	37.9
5.1 Phosphorus application (kg/ha)	11.2	11.8	9.8
5.2 Potassium application (kg/ha)	0.4	0.3	0.6
Average fertiliser use (Total N + P + K, kg/ha)	51.9	53.8	46.7

AGRA does not promote a specific type of fertiliser, but does recommend the use of fertiliser. This explain the NA value for indicator 3.6. The most common fertilisers were diammonium phosphate among fertiliser useres (DAP) (77%), urea (62%) and calcium ammonium nitrate (CAN) (60%). Other fertilisers used by farmers are NPK, triple superphosphate (TSP), potassium chloride (KCl), and ammonium sulphate. However, these fertilisers are only applied by a very small number of farmers. On average, DAP application among DAP users was 92 kg/ha, urea application was 97 kg/ha among urea users, and CAN application was 89 kg/ha among CAN users.

Over the entire sample, nitrogen is the nutrient applied in the largest quantity (41.7 kg/ha), followed by phosphorous (11.2 kg/ha) and potassium (0.4 kg/ha). Other nutrients are used in low amounts in Tanzania (see Table 29). Male-headed household tend to add more nutrients per hectare, a statistically significant difference with female-headed households.

Table 29: Nutrients applied for maize (kg/ha), masika *season*

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), *masika* season	41.7	43.2	37.9	*
Phosphorus application (kg/ha), *masika* season	11.2	11.8	9.8	**
Potassium application (kg/ha), *masika* season	0.4	0.3	0.6	
Sulphur application (kg/ha), *masika* season	0.1	0.1	0.2	
Calcium application (kg/ha), *masika* season	3.3	3.4	2.9	*
Magnesia application (kg/ha), *masika* season	0.0	0.0	0.0	NA
Boron application (kg/ha), *masika* season	0.0	0.0	0.0	NA
Zinc application (kg/ha, *masika* season	0.0	0.0	0.0	NA
n	1,122	822	299	

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

Common sources of information on fertiliser types include observation within the community (48%) and NGO extension (29%). The majority of farm households has been using fertilisers for three to four years and therefore started prior to the PIATA programme. The most

common fertiliser application method is broadcasting, again a practice which is not optimal for productivity. Top dressing, typically within a month after planting, is a popular method as well and better suited to good agricultural practices.

Around 21% of farm households use organic fertiliser. In almost all cases, organic fertiliser consists of manure, sometimes supplemented by crop residues (see Table 30). Information on organic fertilisers mainly comes from traditional knowledge, but is also valued in agricultural practices extension curriculum. Almost all farm households (96%) obtain information on organic fertiliser from other people in their household or community members. The large majority of farmers have used organic fertiliser for longer than five years.

Table 30: Types of organic fertiliser used for maize (percentage of households per type)

Types of organic fertiliser	All	Male-headed	Female-headed	sig
Granular	0%	0%	0%	NA
Compost	1%	2%	0%	
Manure	100%	99%	100%	
Crop residues	8%	9%	3%	
n	230	169	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%
n = households that apply fertiliser

Differences in productivity between farm households that apply fertiliser and those that did not are considerable. In line with expectations, yields are significantly higher amongst farm households that apply fertiliser.

Table 31: Average maize yield (kg/ha), by fertiliser use (yes/no), masika *season*

Maize yield (kg/ha), *masika* season	All	No fertiliser used	Fertiliser used	sig
mean	1,285.5	750.8	1,419.4	***
median	1,085.4	641.7	1,236.9	
n	1,069	214	855	

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

Pest management practices

Table 32 shows the percentage of farm households that have adopted pest management practices. Adoption of pest management practices is defined as the percentage of farm households applying pesticides, herbicides and/or fungicides

Table 32: Adoption of pest management practices

	All	Male-headed	Female-headed
3.9 Adoption of pest-management practices (%)	41%	42%	35%

Out of the three types of agro-chemicals, pesticides are most widely used (37%), followed by herbicides (12%) (see Table 33); only 2% of farm households use fungicides. A significantly

higher number of male-headed households apply pesticides compared to female-headed households.

Table 33: Percentage of households applying agro-chemical inputs, masika *season*

	All	Male-headed	Female-headed	sig
Pesticide application, *masika* season	35%	37%	29%	**
Herbicide application, *masika* season	12%	12%	12%	
Fungicide application, *masika* season	2%	1%	3%	**
n	1.122	822	299	

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

Around 32% of total land area is treated with pesticides and 10% is treated with herbicides (see Table 34). Fungicides are applied on 1% of cultivated land.

Table 34: Percentage of total land area used for maize cultivation under agro-chemical inputs, masika *season*

	All	Male-headed	Female-headed	sig
Percentage of total land area under pesticides, *masika* season	0.32	0.3	0.3	**
Percentage of total land area under herbicides, *masika* season	0.10	0.1	0.1	
Percentage of total land area under fungicides, *masika* season	0.01	0.0	0.0	**
n	1,164	844	309	

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

Out of the different types of pesticides, Quickphos is most popular (53% uptake). Farm households also often use Karatep (16%). Male-headed households use Karatep significantly more often than female-headed households (see Table 35).

Table 35: Type of pesticides applied (percentage of households per type), masika season for maize (percentage of households per type)

Types of pesticides	All	Male-headed	Female-headed	sig
Durs	53%	53%	53%	
Karatep	16%	19%	9%	**
Quickphos	5%	5%	2%	
Mo	2%	3%	1%	
Kumulus	1%	1%	2%	
Movor	1%	1%	1%	
Other	26%	24%	32%	
n	395	307	88	

*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

The majority of farm households (89%) apply herbicides after weeds have emerged. The remaining households (32%) apply herbicides pre-emergence (see Table 36). Some of these farm households (21 observations) apply herbicides both pre-emergence and post-

emergence. In addition to herbicide use, 99% of farm households engage in weeding. On average, farm households weed two times per season.

Table 36: Timing of herbicide application for maize (percentage of households per answer), masika *season*

	All	Male-headed	Female-headed	sig
Pre-emergence	32%	30%	38%	
Post-emergence	89%	90%	86%	
n	137	100	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%
n = households that apply herbicides

Post-harvest practices

Table 37 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 maize processing (drying and threshing). The adoption of improved storage facilities (indicator 3.11) measures the percentage of farmers storing maize in silos or in double liner hermetic storage bags (such as PICS bags). Farm households store their maize using designated storage facilities (indicator 3.12) when they store maize at farmer's organisations, private storage facilities or warehouse receipt systems.

Table 37: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	72%	72%	72%
3.11 Adoption of improved storage (%)	23%	24%	21%
3.12 Use of designated storage facilities (%)	0%	0%	0%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	73%	74%	71%

A large share of farming households (72%) used a tarpaulin at least once during processing. Table 38 shows that 54% of farming households used a tarpaulin when drying maize. In most cases (62%), farm households learned about tarpaulin use from observation within the community. In general, 90% of farm households that used a tarpaulin have been doing so for more than four years; hence, this practice cannot be linked to the VBAs' efforts.

Table 38: Use of sheeting when drying maize (percentage of households), masika *season*

Usage of sheet/tarpaulin when drying maize, *masika* season	All	Male-headed	Female-headed	sig
mean	54%	55%	53%	
n	1122	822	299	

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

Tarpaulin use is higher for threshing maize. Among the farm households that manually thresh maize, 76% used tarpaulin during threshing. Again, the main source of information on tarpaulin use is observation within the community (63%), although 33% indicated this practice to be self-initiated. Almost all farm households (91%) that use tarpaulins for threshing have been doing so for over four years.

Table 39: Use of sheets for manual threshing of maize (percentage of households), masika *season*

Usage of sheet/tarpaulin when threshing maize, *masika* season	**All**	**Male-headed**	**Female-headed**	**sig**
mean	76%	78%	72%	*
n	700	502	198	

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

Around 23% of farming households make use of improved storage facilities such as silos or double liner hermetic storage bags (such as PICS bags). Table 40 shows that 18% of farm households use PICS bags to store their maize harvest.

Table 40: Percentage of households using PICS bags for maize storage, masika season

Usage of PICS bags, *masika* season	**All**	**Male-headed**	**Female-headed**	**sig**
mean	18%	18%	16%	
n	1122	822	299	

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

A large share of farm households (70%) indicated that they were informed about PICS bags by NGOs; 10% learned about the bags from their community members and 7% learned about it from their VBA. The remainder (13%) received the information from other sources (see Table 41).

Table 41: Source of information on using PICS bags for storage (percentage of households per source), masika season

Where the household learnt about PICS bags, *masika* season	**All**	**Male-headed**	**Female-headed**	**sig**
Myself	1%	0%	4%	
Observation in community/farmer to farmer	10%	11%	10%	
Village-based advisor (VBA)	7%	9%	2%	
Farmer organisation	1%	1%	0%	*
NGO extension	70%	68%	78%	
Public extension/ Government	4%	5%	2%	
Private extension	4%	5%	0%	
Other	3%	2%	4%	
n	200	151	49	

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

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

Storage of maize in silos is low. Only 6% of the households use silos to store their maize (Table 42). A large percentage of farm households (72%) that use silos learned about this practice from their community members.

Table 42: Use of silo's for maize storage, masika *season*

Usage of silos to store maize, ***masika*** season	All	Male-headed	Female-headed	sig
mean	6%	7%	5%	
n	1,122	822	299	

*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 of maize stock is much higher. Table 43 shows that 73% of households recycling seed use tablets to prevent quality loss in seed stock, when recycling seed.

Table 43: Use of preservative tablets for maize seeds, masika *season*

Usage of preservative tablets for maize seeds, ***masika*** season	All	Male-headed	Female-headed	sig
mean	73%	74%	71%	
n	781	567	214	

*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 household consumption, maize can also be stocked for the purpose of selling it later when prices are higher. Around 7% of farm households stock maize for this purpose. On average, farm households stocked 406 kg of their total harvest. None of the farm households used designated storage facilities. Instead, all farm households that stock maize use their own storage facilities (Table 44).

Table 44: Type of storage used for maize (percentage of households per type), masika *season*

	All	Male-headed	Female-headed	sig
Own storage	100%	100%	100%	NA
Farmer organisation storage	0%	0%	0%	NA
Warehouse receipt system	0%	0%	0%	NA
Private storage rental	0%	0%	0%	NA
n	82	61	21	

*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%

7.7 Access to agricultural advisory support services (indicator 4)

Access to agricultural advisory extension support services is defined as the percentage of farm households that interacted with an agricultural extension officer during the last 12 months. During these months, 43% of farm households were visited by an agricultural extension officer (see Table 45), on average, between two and three times.

Table 45: Main indicators for access to agricultural advisory support services

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	**43%**	**44%**	**41%**
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.5	2.6	2.5
4.2 Received small seed pack (%) (additional indicator 4)	25%	24%	28%
4.3 Used small seed pack (%) (additional indicator 4)	94%	94%	95%
4.4 Distance to nearest agro-dealer (minutes)	37.3	37.3	37.4

Table 46 highlights that extension officers were most often affiliated with NGOs (50%), and the Tanzanian government (39%); 30% extension agents were VBAs, representing one of the channels used by AGRA's partners to support farm households. Only a limited number of households benefited from extension services offered by a company (8%).

Table 46: Affiliation of extension service provider (percentage of households per provider)

Type	All	Male-headed	Female-headed	sig
Government	39%	38%	41%	
Company	8%	9%	7%	
NGO	50%	49%	52%	
Farmer promoter/VBA	30%	29%	31%	
Other	0%	1%	0%	
n	500	372	127	

*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'

Demonstration plots are the most common extension method (see Table 47): Around 26% of AGRA beneficiaries indicated having engaged in demonstrations. Demonstrations plots are more commonly used than farmer field schools as they are less resource intensive. Technology packages, farmer field schools, and support by VBAs were mentioned by 16%, 12% and 11% of the farm households, respectively. It should be noted that 56% of households did not experience an extension activity first-hand. This echoes findings of the system analysis (Section 5) that interactions between extension services and the farming population are limited due to resource and personnel scarcity.

Table 47: Type of extension method used (percentage of households per method)

Method	All	Male-headed	Female-headed	sig
None	56%	54%	59%	
Farmer Field Schools	12%	12%	13%	
Demonstration plot	26%	27%	24%	
Technology packages	16%	17%	16%	
Mentoring by lead farmers	1%	1%	2%	

Method	All	Male-headed	Female-headed	sig
Transfer of knowledge within farmer organisation/Training of trainers	5%	6%	2%	***
Support by farmer promoter	11%	12%	9%	
Other	1%	1%	0%	
n	1153	843	309	

*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 promoted by AGRA's partners is the distribution and use of promotional seed packs. Table 45 shows that 25% of farm households received a small seed pack. The uptake of the promotional seed packs is high: 94% of farmers planted the seeds from the received seed pack. Such seed packs are used to promote hybrid varieties.

Generally, appreciation of the seed packs is high: 93% of farm households that planted the seeds are appreciative of them. Table 48 shows that respondents mainly appreciated the varieties for their yields and the (short) maturing time. Other aspects mentioned include taste (23%) and tolerance to droughts (21%). No statistical differences were found in the spread of answers between male and female-headed households.

Table 48: 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
Yields	86%	86%	87%	
Maturing time	63%	61%	69%	
Taste	23%	22%	25%	
Tolerance to droughts	21%	23%	15%	
It was free	10%	10%	11%	
Tolerance to pests	9%	8%	13%	
Tolerance to diseases	8%	8%	7%	
Tolerance to floods	3%	3%	4%	
Colour	3%	3%	1%	
Appreciated by buyers (market)	2%	3%	0%	
Processing	1%	2%	0%	
Other	1%	1%	1%	
N	246	175	71	

*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

When discussing access to agricultural extension services it is also important to assess the distance to the nearest agro-dealer. Distance to agro-dealers is based on travel time. As Table 49 presents, average reported travel time is 52 minutes to reach an agro-dealer. When visiting the agro-dealer, farm households most often go by foot (44%), followed by motorbikes (21%) and bicycles (19%).

AGRA aims to reduce travel time to agro-dealers through the use of VBAs to act as rural service providers. The results of the survey suggest that VBAs have not (yet) fulfilled this function and the distance to agro-dealers continues to be high for farmers. It is possible that some VBAs already fulfil their function but are not yet perceived as agro-dealers by farmers. Note, however, that farmers' access to extension lies at 43% (Table 45) and that only 30% of extension visits were associated with VBAs (Table 46). Hybrid seeds were mostly acquired from agro-dealers and NGOs (Table 24). This makes it likely that, at the time of the survey, VBAs were not acting as rural service providers for inputs.

Table 49: Average travel time to agro-dealer (minutes)

Distance to agro-dealer in minutes	All	Male-headed	Female-headed	sig
Mean	52.2	52.6	49.7	
Median	40.0	40.0	30.0	
N	874	749	125	

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

7.8 Access to formal financial services (indicator 13)

Table 50 reveals that only 9% of surveyed households have access to formal financial services. This means that 9% of farm households have access to either a bank account (8%), a formal agricultural loan (1%) or agricultural insurance (1%). This indicator thus only includes access to formal financial services and it excludes access to informal financial services such as from village money lenders, relatives or saving groups.

Table 50: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13 Access to formal financial services (%)	**9%**	**11%**	**7%**
13.1 Bank account (%)	8%	9%	6%
13.2 Agricultural loan (%)	1%	1%	1%
13.3 Agricultural insurance (%)	1%	1%	1%

While only 1% of the farm households took a loan through a formal arrangement (banks, microfinance institutions, savings and credit cooperatives or mobile money), in total, 16% of farm households took a loan in 2018. Informal arrangements thus play an important role.

Table 51 shows the different loan providers. It shows that that only 5% of loans were provided by formal financial institutions (bank or MFI). Financial loans via NGOs and 'other' types of loan providers not listed here were mentioned by 70% and 72% of the farm households, respectively.

Table 51: Types of loan providers (percentage of households per provider)

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	4%	5%	0%	
VSLA/ISLC/VICOBA (Informal savings and loans group)	6%	6%	5%	
Microfinance institution (MFI)	1%	1%	0%	
Bank	4%	4%	5%	
Company	11%	12%	10%	
NGO	70 %	70 %	80 %	
Don't know	1%	1%	2%	
Other	72%	70%	77%	
n	180	139	41	

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

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 52: Main indicator for post-harvest losses

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

Table 52 shows that post-harvest losses are, on average, 1% of total harvest. The majority of the sample (77%) did not report losing any maize post-harvest. Those households that did lose part of their harvest lost, on average, 40 kg of maize. While interpreting this data, it should be kept in mind that post-harvest losses are typically difficult to estimate for farmers, as losses are not measured.

7.10 Access to market information (indicator 37)

None of the farm households has access to formal channels of market information, as SMS, radio, television, internet or farmer's organisations (see Table 53).

Table 53: Main indicator for access to market information

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

Farm households do, however, use informal channels to collect market information. Table 54 shows that respondents mainly receive market information from buyers (97%) and to a lesser extent from other farmers (16%) and the market (3%). NGOs were not mentioned as information providers.

While respondents may consider buyers as a suitable source of information on market prices, it does not represent an independent source of information, which can enable farmers to better negotiate for their harvest. Information asymmetry is likely to negatively influence prices received by farmers. The system analysis on markets also highlights this as a pervasive problem among smallholder marketing (Section 4).

No difference was found on sources of market information between male and female-headed households.

Table 54: Sources of market information used by farmers (percentage of households per source)

Source of market information	All	Male-headed	Female-headed	sig
Buyer	97%	97%	97%	
Farmer-to-farmer	16%	16%	15%	
Market	3%	3%	4%	
Other	0%	0%	1%	
n	695	534	160	

*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 55 shows the main indicators for farm households' sales channels. It includes information on sale through structured trading facilities or arrangements, as well as information on clients.

Table 55: Main indicators on farmers' sales channels

	All	Male-headed	Female-headed
33. Sale through structured trading facilities/arrangements (%)	0%	0%	1%
33.1 Selling to traders/middlemen (%)	90%	90%	91%
33.2 Selling to consumers (%)	1%	1%	3%
33.3 Selling to friends/neighbours (%)	5%	5%	6%
33.4 Selling to aggregation centre (%)	0%	0%	0%
33.5 Selling to farmer organisation (%)	0%	0%	0%
33.6 Selling to wholesalers (%)	2%	3%	1%
33.7 Selling to processors (%)	1%	1%	0%
33.8 Selling to retailers (%)	3%	3%	3%
33.9 Selling to company (undefined) (%)	0%	1%	0%
33.10 Selling to institutional buyers (%)	0%	0%	0%

Farm household are considered selling through a structured trading facility when they sell at least part of their harvest through a formal contract.

Table 55 shows that the large majority of farm households (90%) sold maize to traders or middlemen. Some (5%) sold to their friends or neighbours. A small number of farm households sold their harvest to retailers (3%), wholesalers (2%), processors and consumers (1%).

Almost no farmer sold their harvest under a formal contract in 2018. As AGRA consortia indicated establishing market linkages with concrete buyers (see Sections 4.2 and 4.3), it is possible that some farmers sold maize under these arrangements, possibly through a farmer organisation. However, in this case, farmers were clearly not aware of this marking channel. Overall, the survey results suggest that formal marketing channels were negligible for the 2018 season.

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 kg. Values were converted to kilogrammes in case quantities were reported in different units.

Table 56: 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$)	77.5	85.8	55.7

On average, the revenue from selling maize is US$77.51 per farm household. Total revenues from maize sales in Tanzanian shillings (TSh) are shown in Table 57. It stands out that revenues are significantly higher for male-headed households (nearly US$86) than for female-headed households (close to US$58). Both values, however, are extremely low.

Table 57: Sales value (total revenue) of maize sold, masika *season – calculated variable (IO5.3 – 36) – KIT indicator 10*

Revenue from sales of maize, *masika* season (TSh)	All	Male-headed	Female-headed	sig
mean	175,924.1	194,701.0	126,463.3	***
Median	80,000.0	100,000.0	32,500.0	
n	1,046	759	286	

*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

This difference in revenues is not caused by the price farm households receive for their maize. Farm households on average receive TSh356. This price is almost identical between male-headed and female-headed households (see Table 58).

Table 58: Price received for maize (TSh)

Common price received for maize (TSh/kg), *masika* season	All	Male-headed	Female-headed	sig
mean	356.6	356.8	355.2	
median	333.3	333.3	341.7	
n	663	508	154	

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

Instead, the difference arises from quantities sold, as male-headed households sell larger quantities on average. They sell 30% of their harvest compared to 24% in the case of female-headed households (Table 59); this difference is highly significant. Since male-headed households produce more maize (as was shown earlier), they also sell larger quantities in absolute terms.

Table 59: Allocation of maize harvest to different household uses (percentage of total harvest)

	All	Male-headed	Female-headed	sig
Maize used for consumption (% of harvest), *masika* season	56%	55%	61%	***
Maize kept for seed (% of harvest), *masika* season	4%	3%	5%	***
Maize given away (% of harvest), *masika* season	7%	7%	6%	
Maize used as payment for inputs (% of harvest), *masika* season	1%	1%	1%	
Maize bartered or exchanged for goods (% of harvest), *masika* season	1%	1%	1%	
Maize sold (% of harvest), *masika* season	29%	30%	24%	***
Post-harvest losses of maize (% of total harvest), *masika* season	1%	1%	1%	**
n	1098	805	292	

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

Furthermore, the crop value of the harvest of farming households can be calculated, by multiplying the total production by the price per kilogramme. Table 60 shows that the mean crop value among farmers who sold part of their harvest amounts to more than TSh522,000 (or US$230, see Table 61). The standard deviation is high, indicating that individual crop values vary greatly.

Table 60: Crop value (TSh) of maize produced, masika *season*

	All	Male-headed	Female-headed
Average value of production in Tanzanian Shilling	522,538	356,890	468,267
Note: n = households that sold maize			

Table 61: Crop value (US$) of maize produced, masika *season*

	All	Male-headed	Female-headed
Average value of production in US$	230	237	206
Note: n = households that sold maize			

8 Household-level results: rice in Katavi region (2018 season)

8.1 Sample description

Survey area

A total sample of 961, of which 581 were rice-cultivating households were interviewed in the Katavi region in four districts: Mlele district (25%), Mpanda district (56%), Tanganyika district (19%) and Mufindi district (0.1%). Within these districts, respondents were living in 27 communities.

The division of the sample over the three districts is proportional to the number of farm households in each district. Figure 11 shows the geographical spread of surveyed households.

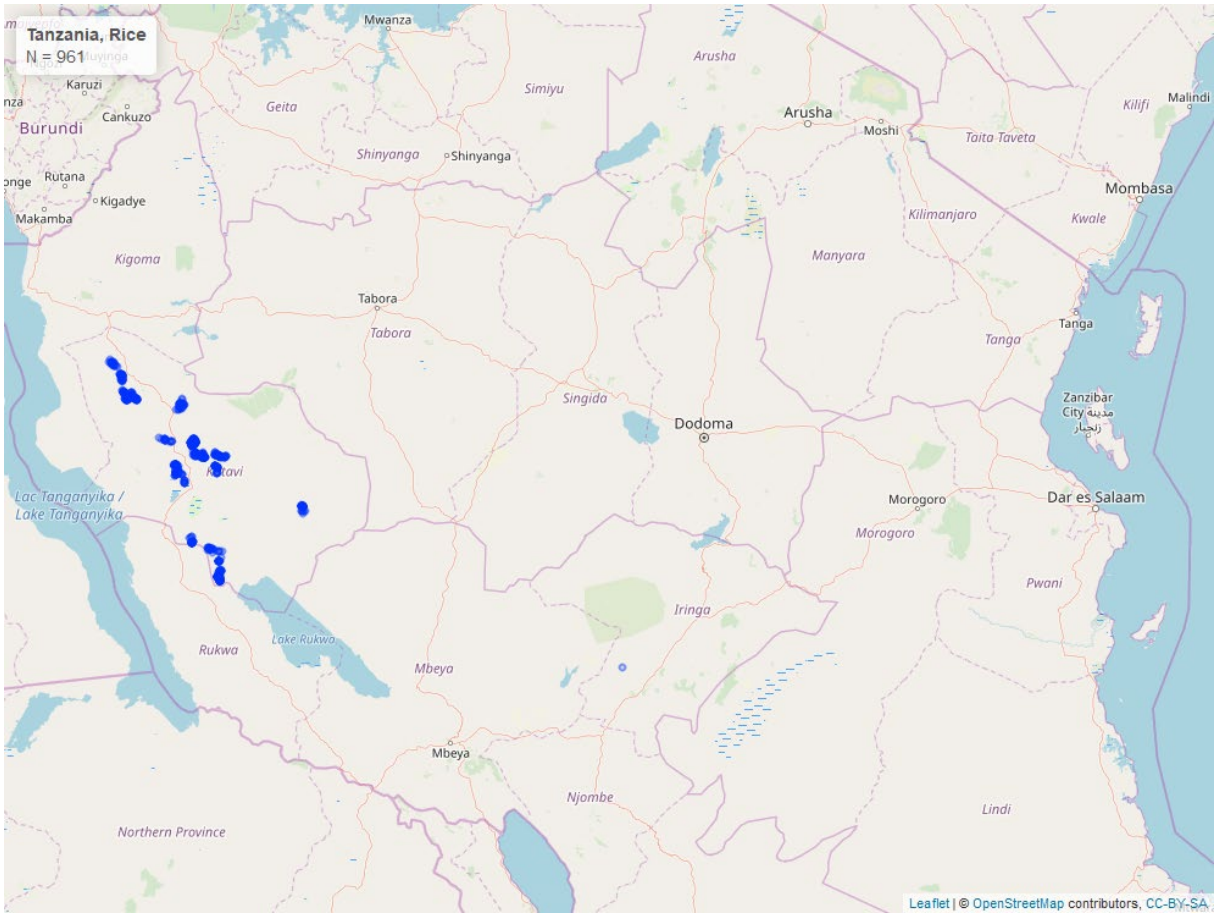


Figure 11: Distribution of survey locations for rice

Farm household characteristics

Respondents were all beneficiaries of interventions supported by AGRA. Most of them were male-headed households (86%). In 90% of cases, the beneficiary is also head of the household. Respondents are, on average, 45 years old (Figure 12).

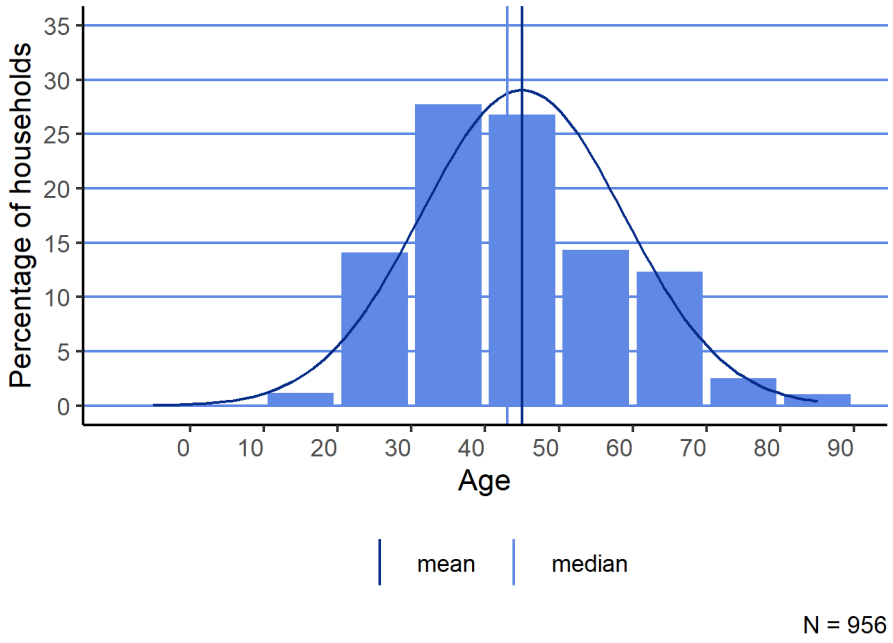


Figure 12: Distribution of respondent age

Farm households consist of 7.1 members on average (see Table 62).

Table 62: Household composition

Household size	All	Male-headed	Female-headed	sig
Number of children in the household	3.9	4.0	3.3	***
Number of adults in the household	3.1	3.2	2.8	**
n	957	824	133	

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

Almost all households (97%) own agricultural land. The average amount of land owned is 2.2 ha. The average amount of cultivated land is 1.5 ha, which means that 0.7 ha are either uncultivated or used for other purposes. Figure 13 shows that 0.7 ha is, on average, used for rice cultivation. The other part of the land is thus used for other crops cultivation.

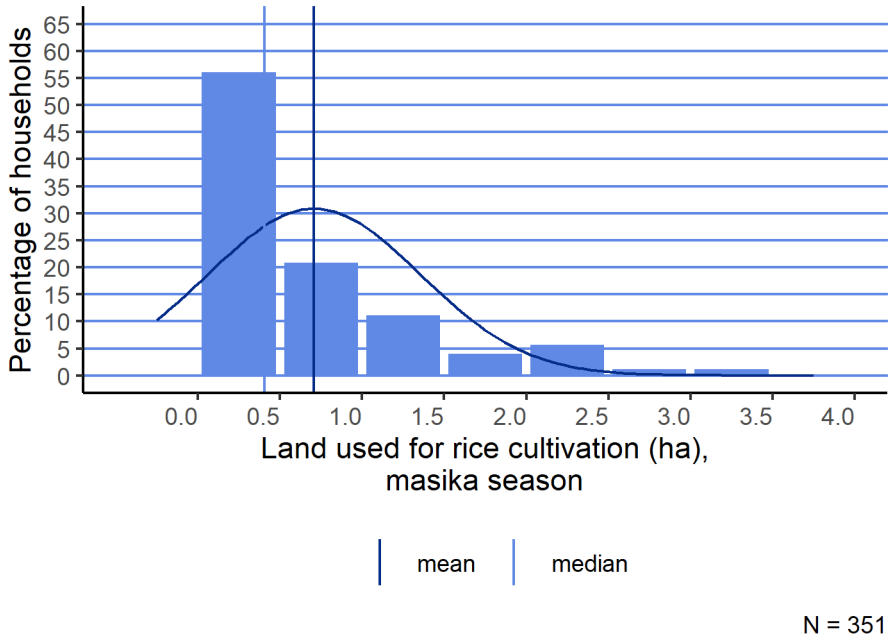


Figure 13: Land allocated to rice (ha), masika *season*

Table 63 shows the percentage of farm households cultivating rice. The Table shows that only 39% of farm households that were interviewed actually cultivated rice in 2018. This issue emerged since many farm households registered as rice beneficiaries by AGRA, turned out not to cultivate rice.

Since all households cultivated rice during in the *masika* season, this report only presents data for this season.

Table 63: Percentage of households producing rice, per season

	All	Male-headed	Female-headed	sig
Masika season	39%	40%	34%	
Vuli season	0%	0%	0%	NA
n	957	824	133	

*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 64 gives an overview of the primary indicators collected. The indicators and the underlying behavioural patterns are discussed in further details in the following sections.

Table 64: Overview of main indicators rice-farming households

	All	Male-headed	Female-headed
G2: Average number of months of adequate household food provision	**10.3**	**10.5**	**9.7**
G6: Wealth assets index score	**-0.468**	**-0.458**	**-0.533**
G6.1 Share of households in first wealth quintile (%)	23%	23%	26%

G6.2 Share of households in second wealth quintile (%)	36%	35%	37%
G6.3 Share of households in third wealth quintile (%)	30%	30%	28%
G6.4 Share of households in fourth wealth quintile (%)	10%	11%	8%
G6.5 Share of households in fifth wealth quintile (%)	1%	1%	1%
IWI International Wealth Index	31.3	31.5	29.6
1. Average yield (kg/ha)	**2550**	**2589**	**2218***
3. Rate of application of target improved technologies or management practices	2%	2%	4%*
3.1 Adoption of improved varieties (%)	1%	1%	2%*
3.2 Adoption of endorsed varieties (%)	40%	41%	36%*
3.3 Number of seasons variety is recycled	4.1	4.1	4.1*
3.4 Adoption of endorsed planting practice (%)	NA	NA	NA
3.5 Adoption of inorganic fertiliser (%)	1%	1%	2%*
3.6 Adoption of endorsed fertiliser (%)	NA	NA	NA
3.7 Adoption of organic fertiliser (%)	0%	0%	0%*
3.8 Adoption of inoculants (%)	NA	NA	NA
3.9 Adoption of pest-management practices (%)	16%	16%	13%*
3.10 Adoption of endorsed post-harvest practices (%)	95%	95%	98%*
3.11 Adoption of improved storage (%)	24%	24%	24%*
3.12 Use of designated storage facilities (%)	4%	4%	7%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	3%	3%	0%*
Ha under improved technologies or management practices (%)	1%	1%	1%
3.14 Area under improved varieties (%)	0%	0%	0%
3.15 Area under inorganic fertiliser (%)	1%	1%	1%
3.16 Area under pesticides (%)	22%	22%	22%
4. Access to agricultural advisory extension support services	**15%**	**15%**	**10%**
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.4	2.2	3.5*
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)	52.2	52.6	49.7
5. Nitrogen application (kg/ha)	**0.1**	**0.1**	**0.3***
5.1 Phosphorus application (kg/ha)	0.0	0.0	0.1*
5.2 Potassium application (kg/ha)	0.0	0.0	0.1*

Average fertiliser use (Total N + P + K, kg/ha)	**0.1**	**0.03**	**0.1**
6. Percent of post-harvest losses (%)	**0%**	**0%**	**0%***
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**324.6**	**349.6**	**135.2***
13. Access to formal financial services (%)	**14%**	**15%**	**6%**
13.1 Bank account (%)	14%	15%	6%
13.2 Agricultural loan (%)	2%	2%	0%
13.3 Agricultural insurance (%)	0%	0%	0%
17. Average age of varieties used (years)	**67.9**	**67.7**	**69.0***
33. Sale through structured trading facilities/arrangements (%)	**0%**	**0%**	**0%***
33.1 Selling to traders/middlemen (%)	84%	85%	75%*
33.2 Selling to consumers (%)	4%	3%	11%*
33.3 Selling to friends/neighbours (%)	2%	2%	4%*
33.4 Selling to aggregation centre (%)	0%	0%	0%*
33.5 Selling to farmer organisation (%)	0%	0%	0%*
33.6 Selling to wholesalers (%)	4%	5%	0%*
33.7 Selling to processors (%)	2%	2%	4%*
33.8 Selling to retailers (%)	12%	12%	14%*
33.9 Selling to company (undefined) (%)	0%	0%	0%*
33.10 Selling to institutional buyers (%)	0%	0%	0%*
37. Access to market information through formal channel (%)	**0%**	**0%**	**0%**

The composition of variables can be found in the data dictionary in Annex 2; 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 65 reports the average of months of adequate household food provision (MAHFP). It shows that AGRA beneficiaries have, on average, enough food to meet their family's needs during 10 months of the year. Female-headed households are less food secure than male-headed households; this difference is statistically significant but small.

Table 65: 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	10.3	10.5	9.7

Figure 14 shows the MAHFP distribution. Around half (52%) of AGRA beneficiaries report having had enough food to meet their family's needs during the entire year. Another 6% of the farm households did not have enough food during six months or more. Only 1% reported to be chronically food insecure (reported having adequate food provision in none of the months).

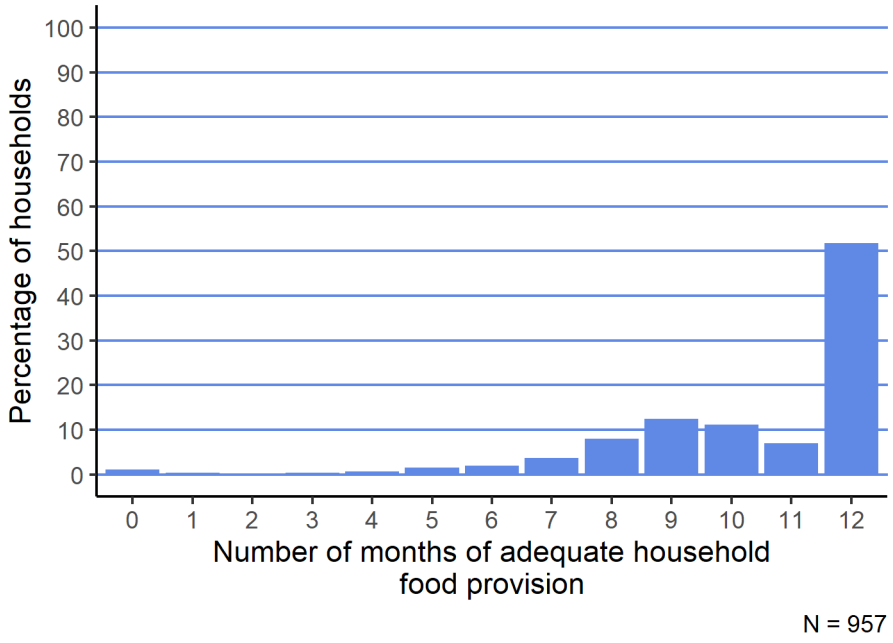


Figure 14: Distribution of months of adequate household food provision (G2)

Figure 15 shows the distribution of months with adequate household food provision over the year. Food insecurity was highest in the period between December 2018 and February 2019.

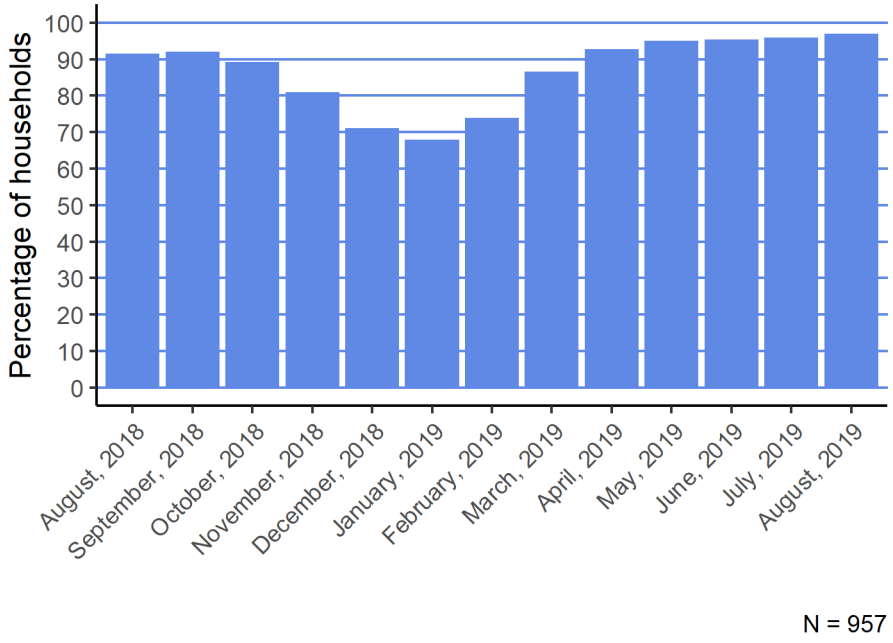


Figure 15: Distribution of months with adequate household food provision

8.4 Wealth asset index score (indicator G6)

Table 66 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, material[5] used for housing construction, and types of water access and sanitation facilities. Wealth index scores were compared with the national Tanzanian DHS distribution for rural areas to determine the household's relative wealth compared to the country average. As can be seen from Table 66, most households are in the 2nd and 3rd wealth quintiles. Around 23% are in the 1st (poorest) quintile of the country and 1% are in the 5th (wealthiest) quintile.

Table 66: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	**-0.468**	**-0.458**	**-0.533**
G6.1 Share of households in first wealth quintile (%)	23%	23%	26%
G6.2 Share of households in second wealth quintile (%)	36%	35%	37%
G6.3 Share of households in third wealth quintile (%)	30%	30%	28%
G6.4 Share of households in fourth wealth quintile (%)	10%	11%	8%
G6.5 Share of households in fifth wealth quintile (%)	1%	1%	1%
IWI International Wealth Index	31.3	31.5	29.6

8.5 Yield (indicator 1)

Crop yields are estimated by dividing the total crop production by the area of land under rice 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, while the preferred unit of land size was most often hectares or acres. Respondents were asked to clarify on bag volume to get a good estimation of the amount of rice per bag. Production and land data units were then converted to kilogrammes and hectares. Out of all farmers cultivating rice in 2018, nine respondents did not know their rice production, while fifteen respondents did not know the amount of rice land cultivated.

Respondents reported an average rice production of 1,787 kg in total. Figure 16 shows the distribution of quantity of rice harvested. A skewed distribution is apparent due to a number of high production value. Thus, the median is slightly lower (1,060 kg) than the mean.

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

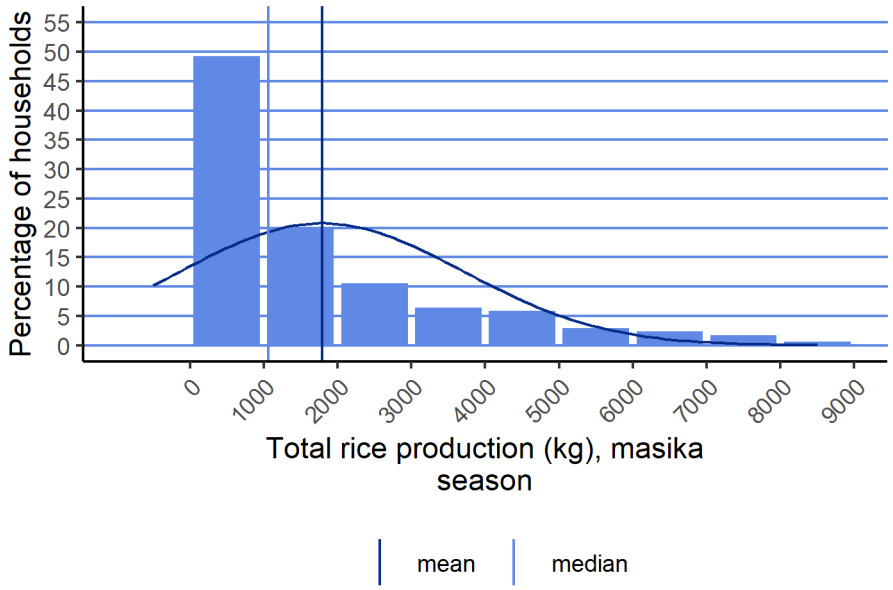


Figure 16: Total production of rice (kg), masika *season*

Rice yields are on average 2,550 kg/ha (Table 67 and Figure 16). Male-headed households report higher yields on average. However, this difference is not statistically significant.

Table 67: Average rice yield (kg/ha)

	All	Male-headed	Female-headed
1. Average yield (kg/ha)	2,550	2,589	2,218

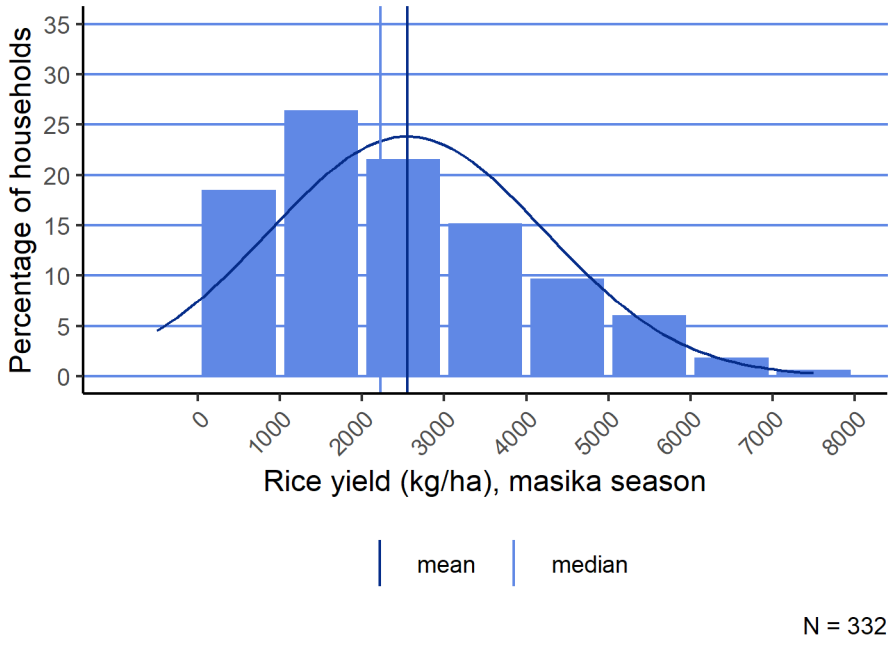


Figure 16: Distribution of average rice yield (kg/ha), masika *season*

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

Improved varieties, recycling and planting practices

Improved varieties

Table 68 shows that only 1% of households make use of improved rice varieties. In Tanzania, the varieties promoted by AGRA are TXD 306 (Saro 5), Kyela, Supa, Gena, WaiWai and Kipato seed. In 2018, 40% of farmers use these endorsed varieties (Table 68). The reason why the adoption of endorsed varieties is so much higher than the uptake of improved varieties is that many farmers cultivate the endorsed Kyela variety, which is classified as a local variety.

Table 68: Main indicators for the use of improved varieties, recycling, and planting practices

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	1%	1%	2%*
3.2 Adoption of endorsed varieties (%)	40%	41%	36%*
3.3 Number of seasons variety is recycled	4.1	4.1	4.1*
3.4 Adoption of endorsed planting practice (%)	NA	NA	NA
17 Average age of varieties used (years)	67.9	67.7	69.0*
Ha under improved technologies or management practices (%)	1%	1%	1%

Table 69 lists the rice varieties grown, displaying that there is large variation in the varieties cultivated. The most popular variety is Malamata, followed by the promoted Supa and Kyela.

Table 69: Varieties used (percentage of households per variety), masika *season*

Varieties	All	Male-headed	Female-headed	sig
Malamata	43%	43%	42%	
Supa (promoted)	23%	22%	27%	
Kyela (promoted)	17%	18%	7%	**
Don't know	8%	7%	18%	**
Other	6%	7%	0%	*
Super Tembo	2%	2%	2%	
Uhuru	2%	2%	2%	
Local variety, unspecified	1%	1%	0%	
Wai Wai (promoted)	1%	0%	2%	*
Nganyalo	1%	2%	0%	
Kihogo red	1%	1%	2%	
Super Kyela	1%	1%	0%	
n	376	331	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 0.5% are combined in 'Other'

Table 70 groups the varieties that are cultivated in the hybrid, pure line, local variety or OPV categories; the majority of farm households used local varieties. None of the farm households cultivated a hybrid variety and 1% cultivated a pure line variety. However, it should be noticed that 42% of varieties used could not be classified; this is partly due to unavailability of information and partly due to farmers not knowing exactly which variety they use.

Table 70: Type of main rice variety (percentage of households per type), masika *season*

Type of main variety, *masika* season	All	Male-headed	Female-headed	sig
Local variety	57%	59%	47%	
Not able to classify	42%	41%	51%	
Pure Line	1%	1%	2%	
OPV	0%	0%	0%	
Hybrid	0%	0%	0%	
n	376	331	45	

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

The age of varieties used by farmers is high; on average, it has been 70 years since the date of release in Tanzania (Table 71). Seeds are recycled for four seasons before they are renewed; this may be an acceptable recycling rate for rice. The majority of farm households (78%) originally acquired the seeds from own recycling or a community member, 12% bought it from an agro-dealer and 8% bought it at a market stall. Thus, informal access system to seed is prevalent.

Table 71: Age of main rice variety (years), masika *season*

Age of main variety (years), *masika* season	All	Male-headed	Female-headed	sig
mean	67.9	67.7	69.0	
median	69.0	69.0	69.0	
n	87	75	12	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
n = number of varieties of which the age could be classified (local varieties excluded). Age could not be classified for % of varieties.

The most important motivation for farm households to choose a certain type of variety is yields. Taste and appreciation of buyers are also important drivers in decision-making (Table 72). The possibility of receiving a price premium from buyers is more important for male-headed households, while female-headed households are more often motivated by characteristics that influence conservation and storage time.

Table 72: Appreciated traits of the main rice variety used (percentage of households per source), masika *season*

Rice variety traits	All	Male-headed	Female-headed	sig
Yields	76%	78%	67%	
Taste	54%	53%	58%	
Appreciated by buyers (market)	41%	42%	36%	
Price and/or premium from buyers	24%	25%	13%	*
Maturing time	18%	18%	20%	
Tolerance to droughts	16%	17%	9%	
Colour	12%	13%	9%	
Tolerance to floods	11%	11%	7%	
Only variety available	7%	8%	4%	
Tolerance to pests	5%	5%	2%	
Tolerance to diseases	5%	5%	2%	
Processing	3%	2%	7%	
Don't know	2%	2%	2%	
Conservation (storage time)	1%	1%	4%	*
It's the only variety that I know	1%	1%	2%	
It was free	1%	1%	0%	
Other	0%	0%	0%	
n	376	331	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'

Planting practices

At the time of the survey, AGRA did not promote any spacing practices for rice in Tanzania. Consequently, no indicator (3.4) for uptake of endorsed planting practices could be calculated.

Table 73 shows the spacing used by farm households while planting and transplanting rice. It shows that the majority of farm households broadcast their rice seeds, therefore, they do not use fixed spacing and therefore do not stick to extension recommendations when it comes to planting. Among the farm households that do plant using fixed spacing, a spacing of 15 by 15 cm is most common.

Table 73: Spacing used for planting and transplanting of rice, masika season

Spacing used for planting and transplanting, *masika* season	All	Male-headed	Female-headed	sig
10 by 10	9%	10%	5%	
15 by 15	18%	18%	21%	
20 by 20	3%	3%	7%	
25 by 25	1%	1%	0%	***
30 by 30	1%	0%	7%	
Random spacing due to broadcasting	62%	63%	58%	
Other	0%	0%	0%	
Don't know	5%	5%	2%	
n	345	302	43	

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

Table 74 shows the sowing methods that farmers use. Broadcasting by hand is the most popular practice and is applied by 81% of farm households. Dibbling (dropping seed in small holes) and drilling (releasing seeds continuously in a row while moving forward at a uniform speed) are both applied by 9% of farmers. Only 1% of farm households broadcast using a funnel.

Table 74: Sowing method for rice, masika *season*

Sowing method, *masika* season	All	Male-headed	Female-headed	sig
Broadcasting by hand	81%	81%	82%	
Broadcasting with funnel	1%	1%	2%	
Drilling	9%	9%	9%	
Dibbling	9%	9%	7%	
Other	0%	0%	0%	
n	376	331	45	

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

Almost all farm households (92%) transplant their rice (Table 75). Of these farmers, 71% initially planted rice in a nursery (a practice promoted by AGRA), 18% planted it in-field and transplanted it to another field later, and the remaining households planted in basins before proceeding to transplanting. Findings are similar for male and female-headed households.

Table 75: Transplanting of rice, masika *season*

Household transplanted the rice, *masika* season	All	Male-headed	Female-headed	sig
mean	92%	91%	96%	
n	376	331	45	

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

Fertiliser use

Table 76 presents the main indicators on fertiliser use. It shows that fertiliser use for rice in Tanzania is very low. Only 1% of farm households apply inorganic fertiliser. In addition, only 1% of the cultivated land is applied with inorganic fertilisers.

Table 76: Main indicators for the adoption and use of fertilisers

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	1%	1%	2%
3.6 Adoption of endorsed fertiliser (%)	NA	NA	NA
3.7 Adoption of organic fertiliser (%)	0%	0%	0%
3.15 Area under inorganic fertiliser (%)	1%	1%	1%
5. Nitrogen application (kg/ha)	0.1	0.1	0.3*
5.1 Phosphorus application (kg/ha)	0.0	0.0	0.1*
5.2 Potassium application (kg/ha)	0.0	0.0	0.1*
Average fertiliser use (Total N + P + K, kg/ha)	0.1	0.03	0.1

AGRA does not promote specific fertiliser for rice in Tanzania. Consequently, it was not possible to calculate an indicator for the adoption of endorsed fertilisers.

The 1% of households using fertiliser apply NPK (75%) and/or urea (50%). On average, NPK users apply 91kg of NPK per ha.

When looking at the entire sample, the nutrient application rate is very low. Nitrogen is the macronutrient most commonly applied nutrient, but usage is still only 0.1 kg/ha. All the other nutrients are applied in extremely low quantities; although female-headed households apply higher quantities of almost every nutrient (Table 77).

Table 77: Nutrients applied for rice (kg/ha), masika *season*

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), *masika* season	0.1	0.1	0.3	
Phosphorus application (kg/ha), *masika* season	0.0	0.0	0.1	***
Potassium application (kg/ha), *masika* season	0.0	0.0	0.1	***
Sulphur application (kg/ha), *masika* season	0.0	0.0	0.0	***
Calcium application (kg/ha), *masika* season	0.0	0.0	0.0	NA
Magnesium application (kg/ha, *masika* season	0.0	0.0	0.0	***
Zinc application (kg/ha, *masika* season	0.0	0.0	0.0	***
n	376	331	45	

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

n = households that cultivated rice

Table 78 shows that half of farm households that apply fertiliser learned about fertiliser practices from their VBA. The other half learned either from observation within the community (25%) or by themselves (25%).

Table 78: Source of information on fertiliser types for rice (percentage of households per type), masika *season*

Where the household learnt which fertiliser to apply, *masika* season	All	Male-headed	Female-headed	sig
Myself	25%	33%	0%	
Observation in community/farmer to farmer	25%	33%	0%	
Village-based advisor (VBA)	50%	33%	100%	
Other	0%	1%	0%	
n	4	3	1	

*Note: significance from a Chi-squared statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Categories smaller than 0.1% are combined in 'Other'
n = households that applied fertiliser

In addition to the extremely low application rate of inorganic fertilisers, farm households also do not use organic fertiliser.

Pest management practices

Table 79 shows the percentage of farm households that have adopted pest management practices. Adoption of pest management practices is defined as the percentage of farm households applying pesticides, herbicides and/or fungicides. In general, 16% of farm households adopted pest management practices.

Table 79: Adoption of pest-management practices

	All	Male-headed	Female-headed
3.9 Adoption of pest-management practices (%)	16%	16%	13%*

Out of all agro-chemicals, herbicides were mentioned by 15% of farm households, followed by pesticides (1%) and fungicide (1%) (Table 80).

Table 80: Percentage of households applying agro-chemical inputs for rice, masika *season*

	All	Male-headed	Female-headed	sig
Pesticide application, *masika* season	1%	1%	0%	
Herbicide application, *masika* season	15%	16%	13%	
Fungicide application, *masika* season	1%	1%	0%	
n	376	331	45	

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

Farming households that do use agro-chemicals apply them on a small share of their land. Consequently, over the entire sample, 0% of the cultivated land is applied with herbicides, fungicides and/or pesticides (Table 81).

Table 81: Percentage of total land used for rice cultivation under agro-chemical inputs, masika *season*

	All	Male-headed	Female-headed	sig
Percentage of total land area under pesticides, *masika* season	0.0	0.0	0.0	
Percentage of total land area under herbicides, *masika* season	0.0	0.0	0.0	
Percentage of total land area under fungicides, *masika* season	0.0	0.0	0.0	
n	961	824	133	

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

In almost all cases (90%), farm households apply herbicides before weeds emerge. Only 21% of farm households apply herbicides pre-emergence (see Table 82). A small percentage (11%) of farm households applied herbicides in both moments. Another practice widely used is weeding, mentioned by 96% of farm households. On average, people weed once per season.

Table 82: Timing of herbicide application for rice, masika *season*

	All	Male-headed	Female-headed	sig
Pre-emergence	21%	21%	17%	
Post-emergence	90%	90%	83%	
n	58	52	6	

*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 applied herbicides

Post-harvest practices

Table 83 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 rice processing (drying and threshing). The adoption of improved storage facilities (indicator 3.11) measures the percentage of farmers storing rice in silos. Farm households store their rice using designated storage facilities (indicator 3.12) when they store rice at farmer's organisations, otherwise they use private storage facilities, or warehouse receipt systems.

Table 83: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	95%	95%	98%
3.11 Adoption of improved storage (%)	24%	24%	24%
3.12 Use of designated storage facilities (%)	4%	4%	7%
3.13 Adoption of tablets to preserve quality of recycled seed (%)	3%	3%	0%*

The vast majority of farm households (95%) use a tarpaulin at least once during processing. Table 84 shows that 89% of farm households use a tarpaulin when drying rice. In most cases (63%), farm households learned about tarpaulin use from observation within the community. A large share of farm households (71%) have been using a tarpaulin for more than four years.

Table 84: Use of sheeting for drying rice, masika *season*

Used a sheet/tarpaulin for drying rice, *masika* season	All	Male-headed	Female-headed	sig
mean	89%	88%	96%	
n	376	331	45	

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

AGRA promotes the use of mechanised threshing. However, only 1% of farm households engage in this practice and almost all farmers thresh their rice manually. However, tarpaulin use is common for threshing rice. Among the farm households that manually thresh rice, tarpaulin use during threshing was mentioned by 94% of farm households (see Table 84). Again, the main source of information on tarpaulin use is observation within the community (76%). Three-quarters (76%) of farm households that use tarpaulins for threshing have been doing so for over four years. Female-headed households adopted tarpaulins later than male-headed households.

Table 85: Use of sheeting when threshing rice, masika *season*

Used a sheet/tarpaullin for threshing rice, *masika* season	All	Male-headed	Female-headed	sig
mean	94%	93%	98%	
n	354	313	41	

*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 not very high. Only 24% of farm households use improved storage facilities such as silos. Silos are used by 23% of farm households (see Table 86).

Table 86: Use of silo's for storage of rice, masika *season*

Usage of (metal or plastic) silos for storing rice, *masika* season	All	Male-headed	Female-headed	sig
mean	23%	23%	24%	
n	376	331	45	

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

Despite being designed for storage of beans, farm households also use PICS bags for storage of rice. Table 87 shows PICS bags are used by 4% of farm households.

Table 87: Percentage of households using PICS bags for storage of rice, masika *season*

Used PICS bags for storing rice, *masika* season	All	Male-headed	Female-headed	sig
mean	4%	4%	4%	
n	376	331	45	

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

A small percentage of farm households recycling seeds (3%) also use preservative tablets to prevent quality loss in their seed stock when recycling seed (see Table 88).

Table 88: Use of preservative tablets for rice seeds, masika *season*

Usage of preservative tablets for rice seeds, *masika* season	**All**	**Male-headed**	**Female-headed**	**sig**
mean	3%	3%	0%	
n	294	264	30	

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

Around 20% of farm households stock their rice in order to sell it later when prices are higher. On average, farm households stocked 426 kg. The percentage of farm households using designated storage facilities is 4%. Among the farm households that stock their rice, the majority (86%) stock it at their own storage facilities. Only 4% stock rice at the farmers' organisation, and 3% make use of WRD. The remaining 13% rents private storage space (Table 89).

Table 89: Type of storage used for rice, masika *season*

	All	**Male-headed**	**Female-headed**	**sig**
Own storage	86%	87%	80%	
Farmer organisation storage	4%	4%	0%	
WRS	3%	3%	0%	
Private storage rental	13%	10%	30%	*
n	77	67	10	

*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%

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

Access to agricultural advisory extension support services is defined as the percentage of farm households that interacted with an agricultural extension officer during the last 12 months. During these months, 15% of farm households were visited by an agricultural extension officer (see Table 90) – a percentage which mirrors the finding of the extension system analysis that only limited number of farmers get access to information and knowledge. On average, farm households that met with an extension officer were visited between two and three times.

Table 90: Main indicators for access to agricultural advisory support services

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	15%	15%	10%
4.1 Avg. no. of visits per year by agri. advisory extension support services	2.4	2.2	3.5*
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)	52.2	52.6	49.7

Extension officers were either affiliated with the Tanzanian government (67%) or were farmer promoter/VBAs (21%) (Table 91).

Table 91: Affiliation of extension service provider (percentage of households per provider)

Type	All	Male-headed	Female-headed	sig
Government	67%	65%	85%	
Company	14%	14%	8%	
NGO	9%	9%	15%	
Farmer promoter/VBA	21%	21%	15%	
Other	0%	0%	0%	NA
n	140	127	13	

*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'

Since only 15% of surveyed households were visited by an extension agent, most respondents also said that there was no extension method used. For those with access to extension, the most common extension was the use of a demonstration plot (Table 92): 7% of farmers indicated having engaged in demonstrations. Support by farmer promoters and distribution of technology packages were both received by 5% of farm households, although it can also be observed that female-headed households basically receive no support from farmer promoters (Table 92). The system analysis outline the fact that there is no clear gendered strategy when it comes to extension services.

Table 92: Type of extension method used (percentage of households per method)

Method	All	Male-headed	Female-headed	sig
None	82%	81%	86%	
Demonstration plot	7%	7%	5%	
Technology packages	5%	5%	5%	
Support by farmer promoter	5%	6%	1%	**
Farmer Field Schools	4%	4%	6%	
Transfer of knowledge within farmer organisation/Training of trainers	3%	4%	2%	
Other	1%	1%	0%	

Method	All	Male-headed	Female-headed	sig
n	957	824	133	

*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 rice in Tanzania, since rice seed packs were not distributed.

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 93, average travel time is 52 minutes, an average time similar to the experience of maize farmers (Section 7.7). When visiting an agro-dealer, farm households most often take a bicycle (52%), go by foot (25%) and use/rent a motorbike (13%).

Table 93: Average travel time to agro-dealer (minutes)

Distance to agro-dealer in minutes	All	Male-headed	Female-headed	sig
mean	52.2	52.6	49.7	
median	40.0	40.0	30.0	
n	874	749	125	

*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 94 shows that 14% of farm households have access to formal financial services. This means that 14% of the households has access to at least one bank account, formal agricultural loan or agricultural insurance. This indicator only includes access to formal financial services and excludes access to informal financial services, such as services provided by village money lenders, relatives, or saving groups. Formal access to financial services is therefore greater among rice farmers than it is for maize farmers (9%) (Section 7.8).

Table 94: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13. Access to formal financial services (%)	14%	15%	6%
13.1 Bank account (%)	14%	15%	6%
13.2 Agricultural loan (%)	2%	2%	0%
13.3 Agricultural insurance (%)	0%	0%	0%

The financial service that is used most is a bank account: 14% of farm households have one – noting that the differences between male-headed and female-headed households are considerable. Only 2% of farmers took a loan through a formal arrangement (banks, microfinance institutions, savings and credit cooperatives or mobile money). However, in total 4% of the farmers took a loan in 2018; none of the farmer had agricultural insurance in 2018.

Table 95 shows that almost half of loans (45%) were provided by formal financial institutions (SACCO, bank or MFI) and another 36% by family or friends. Female-headed households more often took up loans from informal savings and loans group (33%). This difference is highly statistically significant, but it is not representative since only three female-headed households took a loan.

Table 95: Types of loan providers (percentage of households per provider)

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	36%	36%	33%	
Village money lender	3%	3%	0%	
VSLA/ISLC/VICOBA (Informal savings and loans group)	3%	0%	33%	***
Savings and Credit Cooperative (SACCO)/Credit Union	22%	24%	0%	
Microfinance institution (MFI)	6%	6%	0%	
Bank	17%	18%	0%	
Trader	3%	3%	0%	
Company	14%	12%	33%	
Other	0%	0%	0%	NA
n	36	33	3	

*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 rice that was lost after harvesting as a share of total production.

Table 96: Main indicator for post-harvest losses

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

Table 96 shows that post-harvest losses are, on average, 0% of the total harvest. This number is so low because the majority of the sample (92%) did not report losing any rice post-harvest. However, those households that did loose part of their harvest lost, on average, 223 kg of rice, which is quite significant. Yet, 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)

None of the farm households had access to formal channels of market information as SMS, radio, television, internet or farmer organisations (Table 97).

Table 97: Main indicator for access to market information

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

Farm households do, however, often use informal channels to get market information. They mainly receive market information from the buyer (86%) and, to a lesser extent, from other farmers (26%) or on the market (15%) (Table 98). NGOs were not mentioned as information providers.

Table 98: Sources of market information used by farmers (percentage of households per source)

Source of market information	All	Male-headed	Female-headed	sig
Buyer	86%	87%	82%	
Farmer to farmer	26%	25%	32%	
Market	15%	16%	4%	*
Other	0%	0%	0%	
n	282	254	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'

8.11 Sales channels (indicator 33)

Table 99 lists the main indicators for farmers' sales channels. It includes information on sale through structured trading facilities/arrangements, as well as information on farmers' clients.

Table 99: Main indicators on farmers' sales channels

	All	Male-headed	Female-headed
33. Sale through structured trading facilities/arrangements (%)	0%	0%	0%
33.1 Selling to traders/middlemen (%)	84%	85%	75%
33.2 Selling to consumers (%)	4%	3%	11%
33.3 Selling to friends/neighbours (%)	2%	2%	4%
33.4 Selling to aggregation centre (%)	0%	0%	0%
33.5 Selling to farmer organisation (%)	0%	0%	0%
33.6 Selling to wholesalers (%)	4%	5%	0%
33.7 Selling to processors (%)	2%	2%	4%
33.8 Selling to retailers (%)	12%	12%	14%
33.9 Selling to company (undefined) (%)	0%	0%	0%
33.10 Selling to institutional buyers (%)	0%	0%	0%

Farm households are considered selling through a structured trading facility when they sell at least part of their harvest through a formal contract. However, none of the rice farming households indicated to sell under a formal contract. Thus, for the 2018 season, formal arrangements, as promoted by AGRA, were absent (or farmers were at least unaware of them, in case they sold through a farmer organisation). Farmers sold to typical buyers as identified in the system analysis on markets (Section 4), i.e. traders and retailers (12%) (Table 99).

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 sales are reported as a baseline value. Revenues were calculated by multiplying the quantity sold (in kg) by the common price received per kg. Values were converted to kilogrammes in case quantities were reported in different units. On average, the revenue from selling rice is US$325 per farm household. It stands out that revenues are significantly higher for male-headed households than for female-headed households, who earn only about 40% of what their male counterparts earn (see Table 100).

Table 100: 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$)	324.6	349.6	135.2

On average, farmers sell 41% of their total harvest. The remainder is used for other purposes, such as consumption (41%), farm-saved seed (5%) or used as payment for inputs (3%) (Table 101). Farm households, on average, receive TSh666.7 for one kg of rice (see Table 102). Prices received by male-headed households were significantly higher than prices received by female-headed households, with a difference close to TSh100 per kg.

Table 101: Allocation of rice harvest (%)

	All	Male-headed	Female-headed	sig
Rice used for consumption (% of harvest), *masika* season	41%	41%	47%	
Rice kept for seed (% of harvest), *masika* season	5%	5%	7%	
Rice given away (% of harvest), *masika* season	2%	2%	1%	
Rice used as payment for inputs (% of harvest), *masika* season	3%	3%	5%	
Rice bartered or exchanged for goods (% of harvest), *masika* season	2%	2%	2%	
Rice sold (% of harvest), *masika* season	41%	42%	32%	*
Post-harvest losses of rice (% of total harvest), *masika* season	0%	0%	0%	
n	342	305	37	

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

Table 102: Price received for rice (TSh)

Common price received for rice (TSh/kg), *masika* season	All	Male-headed	Female-headed	sig
mean	666.7	675.2	582.7	**

Common price received for rice (TSh/kg), *masika* season	All	Male-headed	Female-headed	sig
median	625.0	625.0	555.6	
n	261	237	24	

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

Total revenues from rice sales in Tanzanian Shillings are shown in Table 103. The large difference between the mean and median sales value is striking: the mean revenues are subject to a number of high (yet not unlikely) values. Therefore, the median sales value is only TSh275,000 (US$121).

Table 103: Sales value (total revenue) of rice sold, masika *season – calculated variable (IO5.3 – 36) – KIT indicator 10*

Revenue from sales of rice, *masika* season (TSh)	All	Male-headed	Female-headed	sig
mean	736,551.0	793,283.8	306,800.0	***
median	275,000.0	320,000.0	110,000.0	
n	343	303	40	

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

The crop value of the rice harvest of farming households is calculated by multiplying the total production by the price per kg. Table 104 shows that the mean crop value lies at just above TSh1.5 million (which equates to US$675, see Table 105). The standard deviation is high, indicating that individual crop values vary greatly.

Table 104: Crop value (TSh) of rice produced, masika *season*

	All	Male-headed	Female-headed
Average value of rice production in Tanzanian Shilling	1,533,606	1,591,250	929,714
Note: n = households that sold rice			

Table 105: Crop value (US$) of rice produced, masika *season*

	All	Male-headed	Female-headed
Average value of rice production in US$	675	701	409
Note: n = households that sold rice			

Part III: Small & medium enterprise survey

9 SME performance survey

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

Dimensions of performance

This scorecard for SME performance is based on monitoring four dimensions:

- Business resilience indicates the SME's ability to adapt to disruptions while maintaining business operations, employment and assets. Variables used to determine business resilience are:
    - Years in business
    - Number of services provided
    - 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 annual turnover
    - 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 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 3. An overview of all SME indicators and associated descriptive statistics is presented in Annex 4.

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 Tanzania, 45 SMEs participated in the survey:

- 10 commercial seed producers;

- 2 seed companies;
- 9 input supply/agro-dealers;
- 2 input companies;
- 21 aggregators/traders/processors.

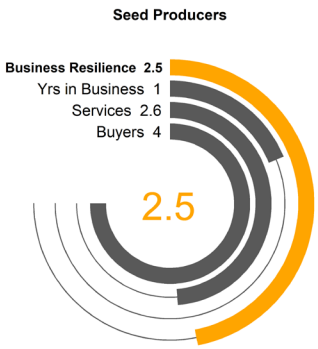
However, performance of the two seed companies is not reported upon since they provided very incomplete information during the interviews. More information on the SMEs participating in the interviews can be found in Annex 5.

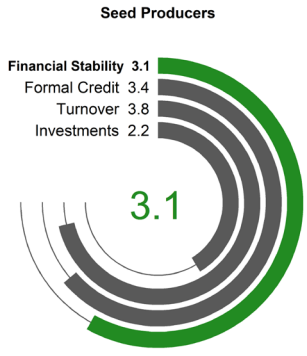
9.3 Performance dashboards

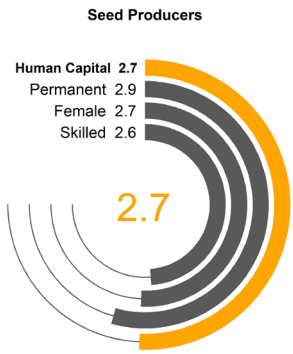
This section summarises the performance of the different types of SMEs on each of the four dimensions: business resilience, financial stability, human capital and technology. A red bar indicates poor performance (score 1-2); an orange bar indicates that there is room for improvement (score 2-3); and green indicates good performance (score 3-4).

Commercial seed producers

Ten commercial seed producers were interviewed. The results on business resilience show medium performance by the seed producers (Figure 17). This is linked to the fact that these SMEs are quite young, having been in business for three years on average (Table 112 in Annex 4). The companies mostly produce and sell improved varieties or certified seeds (Table 115 in Annex 4). They show a high diversification of market risk since they deal with four types of buyers on average (Table 114 in Annex 4). Seed producers' financial performance is relatively good, with a yearly turnover of close to US$150,000 and good access to formal credit (Table 117 in Annex 4). However, it is noticeable that the SMEs do not make many investments. In fact, 50% had not invested at all over the past three years. The other 50% invested mainly in expanding their area of land to increase production. This leads to an overall low score on technology. Seed producers have a rather high number of permanent employees and a high percentage of female (42%) and skilled staff (41%) (Table 113 in Annex 4).







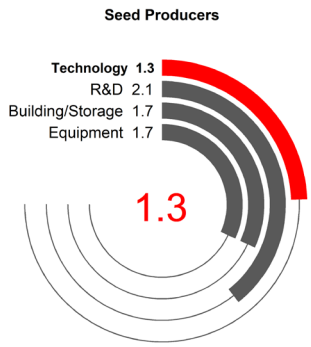
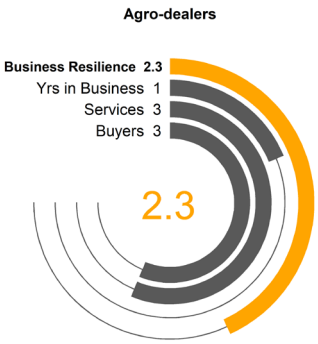
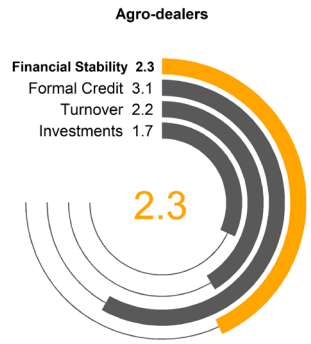


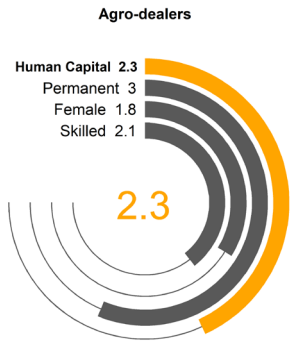
Figure 17: Commercial seed producers' performance scorecard

Agro-dealers

The survey comprises data on nine agro-dealers (Figure 18). These are all hub agro-dealers based in town, who supply small village-based agro-dealers. The results show a medium level of performance across all dimensions, except for technology. Business resilience is limited by the few number of years in business (2.7 years, Table 112 in Annex 4) but, on the upside, agro-dealers deal with three types of buyers and offer a relatively diverse set of services, selling seeds and agro-chemicals and offering agricultural advisory services to clients (Table 115 in Annex 4). There is room for improvement when it comes to financial stability as annual turnover is quite low (around US$26,400) and the number of investments is very low. A number of agro-dealers even declared not having made any investments in the last three years (Table 116 in the annex). If investments were made, it was usually for improving storage facilities. Agro-dealers employ only a small workforce and have a low percentage of female and skilled staff.







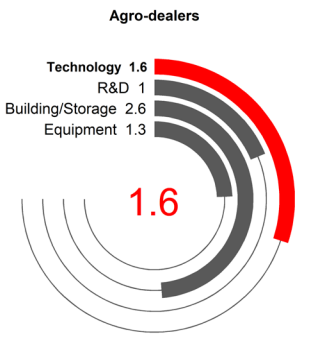


Figure 18: Input supply agro-dealers' performance scorecard

Input supply companies

Only two input supply companies were interviewed. From the limited observations available, it can be stated that the performance of the two companies is average. They are relatively new in business (but longer than the SMEs of the other three categories) and offer few services. They have good access to formal credit, but seem to make few investments (Figure 19).

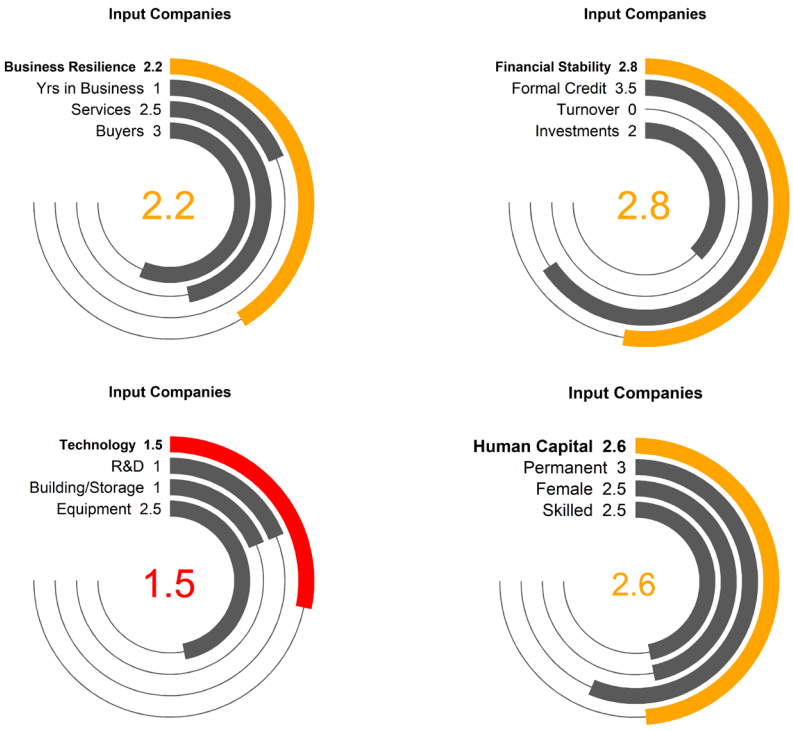


Figure 19: Input companies' performance scorecard

Agri-value chain actors

Twenty-one SMEs in the category of agri-value chain actors (aggregators, processors and transporters) were interviewed. These SMEs are new enterprises, they have been in business for 2.5 years on average. They mainly aggregate farmers' production (Table 115 in Annex 4). They deal with more than three buyers, on average, showing a good level of market risk diversification (Table 114 in Annex 4). Their financial stability is good, with good access to formal credit and the highest average turnover of all types of SMEs interviewed (more than US$520,000 per annum) (Figure 20). Yet, they have not made many investments in the last three years. If they made any investments, it was in upgrading equipment (Table 116 in Annex 4); nearly half of them had not made any investment. The SMEs could expand the proportion of female and skilled employees, both of which are currently low with 20% female staff and only 6% skilled staff.

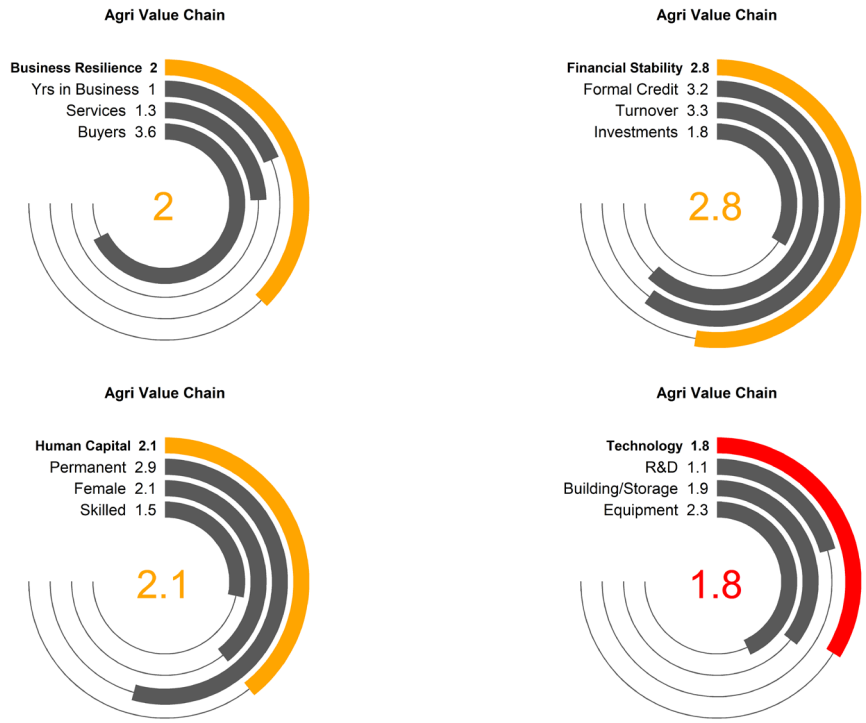


Figure 20: Agri-value chain actors' performance scorecard

References

African Union. 2018. *Inaugural Biennial Review Report of the African Union Commission on the Implementation of the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared prosperity and Improved Livelihoods*. African Union Commission, Addis Ababa.

AGRA (Alliance for a Green Revolution in Africa). 2017. *Tanzania Operational Plan*. Draft. AGRA, Nairobi.

AGRA (Alliance for a Green Revolution in Africa). 2018. *Extension Strategy: AGRA's Private Sector-Led Approach to Extension*. AGRA, Nairobi.

AGRA (Alliance for a Green Revolution in Africa). 2019. *2018 Annual Report. Impact, progress, partnerships*. AGRA, Nairobi.

Arce, C.E. and Caballero, J. 2015. *Tanzania Agricultural Sector Risk Assessment*. Agriculture Global Practice Technical Assistance Paper. 94883, June 2015. The World Bank, Washington DC.

Bank of Tanzania. 2018. *Bank of Tanzania Annual Report*. Bank of Tanzania, Dar es Salaam.

Benson, T., Randiamamonjy, J., Fang, P., Nyange, D., Thurlow, J. and Diao, X. 2017. *Prospects for the sectoral transformation of the rural economy in Tanzania: a review of the evidence*. Michigan State University, East Lansing, Michigan; International Food Policy Research Institute (IFPRI), Washington DC; and University of Pretoria, South Africa. Available through: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/132245/filename/132456.pdf (Accessed 4 November 2019).

Birachi, E. 2012. *Value chain analysis of beans in eastern and southern Africa: Building partnerships for impact through research on sustainable intensification of farming systems*., International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.

Bitzer, V., Tyszler, M. and Wennink, B. 2016. *The Pluralistic Extension System in Tanzania: Actors, Approaches and Challenges*. Royal Tropical Institute (KIT), Amsterdam.

CEPA (Cambridge Economic Policy Associates Ltd). 2016. *Global Agriculture and Food Security Program (GAFSP), Private Sector Window*. Agribusiness Country Diagnostic – Tanzania. CEPA, London, UK. Available through: http://documents.worldbank.org/curated/en/291131490093290550/pdf/113628-WP-GAFSP-IFC-Agribusiness-Tanzania-PUBLIC.pdf (Accessed 4 November 2019).

Charles, G. and Martin, G. 2018. *Addressing challenges of cross-border trade (CBT) in Kigoma Region*. Draft report. Tanzania Chamber of Commerce, Industry and Agriculture, Kigoma.

Digital Green. 2019. *Strengthening Private Sector Extension and Advisory Services Portfolio Review*. Developing Local Extension Capacity (DLEC) project, August 2019. Available through: https://www.agrilinks.org/sites/default/files/dlec_strengthening_private_sector_extension_and_advisory_services_full_report.pdf (Accessed 4 November 2019).

ESRF (Economic and Social Research Foundation). 2015. *Agro-processing trade. The private sector's experience of climate change along the value chain in Tanzania*. ESRF, Dar Es Salaam. Available through: http://www.cuts-geneva.org/pacteac/images/Documents/EAC%20Forum/Forum22/EAC%20Geneva%20Forum-%20Tanzania%20Note%2022.pdf (Accessed 4 November 2019).

International Trade Ministration. 2019. *Tanzania – Agro-Processing*. Web-based information of export.gov, hosted by US Department of Commerce. Available through: https://www.export.gov/article?id=Tanzania-Agro-Processing (Accessed 4 November 2019).

Isinika, A.C., Ngetti, M., and Rwambali, E.G. 2008. Contemporary challenges of agricultural extension service delivery in Tanzania. *ICE Journal*, 3(1), pp.15-28.

Magesa, M., Michael, K., and Ko, J. 2014. Access to agricultural market information by rural farmers in Tanzania. *International Journal of Information and Communication Technology Research*, 4(7).

Mdee, A., Ofori, A., Chasuka, M. and Manda, S. 2020. Neither sustainable nor inclusive: a political economy of agricultural policy and livelihoods in Malawi, Tanzania and Zambia. *The Journal of Peasant Studies*, published online.

Ministry of Agriculture. 2013. *An Assessment of the Performance of Extension Services under the Agriculture Sector Development Programme (ASDP) in Tanzania. Final Report*. Unpublished manuscript.

Ministry of Agriculture. 2016. *Agricultural Sector Development Programme Phase Two (ASDP II)*. Government Programme Document, May 2016. Available through: http://www.tzdpg.or.tz/fileadmin/documents/external/national_development_frameworks/ASDP2_Final_Document_20_May._2016__after_edit__1_.pdf (Accessed 4 November 2019).

Mkonda, M.Y. and He, X. 2018. Agricultural history nexus food security and policy framework in Tanzania. *Agriculture & Food Security*, 7(75).

Murphy, P., Crosse, S. and Schulte, R. 2013. *Report on the Teagasc Review Group on Agricultural Support Services in Tanzania*. Available through: http://www.tzdpg.or.tz/fileadmin/documents/dpg_internal/dpg_working_groups_clusters/cluster_1/psdtrade/Documents/Agriculture/13-02-11_Final_Report_Teagasc_Review_Group.pdf (Accessed 13 October 2015).

Naeher, D. and Schuendeln, M. 2018. *The demand for advice: Theory and empirical evidence from farmers in Sub-Saharan Africa*. Available through: https://www.wiwi.uni-frankfurt.de/fileadmin/user_upload/dateien_abteilungen/abt_ewf/International_Economic_Policy/admin/Demand_for_agricultural_advice.pdf (Accessed 18 November 2019).

Oxford Business Group. 2018a. Already Tanzania's largest sector, agriculture continues to post positive trends. In: Oxford Business Group ed. *Tanzania 2018*. Oxford Business Group, London.

Oxford Business Group. 2018a. Tanzania launches initiatives to modernise and expand smallholder agricultural production. In: Oxford Business Group ed. *Tanzania 2018*. Oxford Business Group, London.

Poulton, C. 2017. *APRA policy processes and political economy: Tanzania country review*. APRA Working Paper 05. Future Agricultures Consortium, Brighton.

Resnick, D., Haggblade, S., Benson, T. and Crawford, E. 2019. *Synthesis Report I Advancing Research, Policy, and Capacity for Food System Transformation Synthesis of Achievements from the Feed the Future Innovation Lab for Food Security Policy*. Available through: https://www.canr.msu.edu/fsp/publications/Report_2018_FSP%20Synthesis%20to%20USAID.pdf (Accessed 4 November 2019).

Rutatora, D.F. and Mattee, A.Z. 2001. Major agricultural extension providers in Tanzania. *African Study Monographs*, 22(4), pp.155-173.

Semwenda, A.J. 2016. *Challenges facing agricultural extension in the current institutional context: the case of Hai District, Kilimanjaro Region*. Sokoine University of Agriculture, Morogoro, Tanzania. Available through: https://pdfs.semanticscholar.org/939d/fd54b86b00504021a40cacd809a71f7601db.pdf (Accessed 4 November 2019).

Sulaiman, R.A. and Rosentrater, K.A. 2015. *Current Maize Production, Postharvest Losses and the Risk of Mycotoxins Contamination in Tanzania*. Proceedings from 2015 ASABE Annual International Meeting, Paper No. 152189434. Available through: https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1450&context=abe_eng_conf#:~:targetText=Tanzania%20is%20a%20major%20maize%20producer%20in%20Sub%2DSaharan%20Africa.&targetText=Despite%20the%20steady%20production%20of,40%20%25%20in%20some%20rural%20areas (Accessed 19 November 2019).

Thurlow, J., Randriamamonjy, J. and Benson, T. 2018. *Identifying Priority Value Chains in Tanzania*. Michigan State University (MSU), East Lansing, Michigan, and International Food Policy Research Institute (IFPRI), Washington DC.

Wilson, T.R. and Lewis, J. 2015. *The maize value chain in Tanzania. A report from the Southern Highlands Food Systems Programme*. Food and Agriculture Organization of the United Nations (FAO), Rome. Available through: http://www.fao.org/fileadmin/user_upload/ivc/PDF/SFVC/Tanzania_maize.pdf (Accessed 10 October 2019).

World Bank. 2020. *Doing Business*. World Bank, Washington, DC. Available through: https://www.doingbusiness.org/content/dam/doingBusiness/country/t/tanzania/TZA.pdf (Accessed 4 April 2020).

World Bank. 2019. *Enabling the Business of Agriculture* 2019. Country Profile Tanzania. The World Bank, Washington DC.

Annex 1. List of interviews for qualitative systems monitoring

Table 106: Interview respondents for systems analysis

Organisation	Respondent	Department/function	Date	Topic discussed	Relation to AGRA
Action for Development Program (ADP)-Mbozi	Ismail Shimwela	Project Manager	09-07-2019	Extension system	Grantee
Agricultural Council of Tanzania (ACT)	Alinanuswe Ambalile	Program Manager	09-07-2019	Market system	Grantee
Agriculture Non-state Actors Forum (ANSAF)	Joseph Nyamboha	Policy and Budget Analysis Coordinator	11-07-2019	Market system	Grantee
Alpha Agrovets Suppliers Limited	Alpha P. Mgimba	Managing Director	15-07-2019	Input/VBA system	Partner/beneficiary
Building Rural Incomes Through Enterprise (BRITEN)	Fauzia Ali Matano	Project Manager-TIJA	11-07-209	Extension system	Grantee
Centre for Sustainable Development Initiatives (CSDI)	Dr. Isack Michael Nguliki	Monitoring and Evaluation Manager	09-07-2019	Market system	Grantee
Cereals and Other Produce Board-Iringa	Aganyila Kamihanda	Acting Branch Manager	18-07-2019	Market system	Expert
Dickens Investment	Dickens Lulandala	Managing Director	18-07-2019	Market system	Partner
Eastern Africa Grain Council (EAGC)	Ledis Kigala	Programme Officer	09-07-2019	Market system	Grantee
Economic and Social Research Foundation (ESRF)	Vivian Kazi	Researcher	10-07-2019	Market system	Grantee
Faida Mali	Jackson Lyimo	Project Manager	10-07-2019	Market system	Grantee
Farm Radio International	Frank Ademba	Project Officer	11-07-2019	Extension & markets	Grantee
Iringa District Council	Daniel Mlay	Crop Officer	15-07-2019	Extension	Expert
Iringa Region-Regional Agricultural Advisor Office	Revocatus Lwegoshora	Regional Agricultural Officer	15-07-2019	Extension & markets	Expert
Karagwe Development and Relief Services (KADERES)	Kokutona Innocent	Monitoring and Evaluation Officer	10-07-2019	Extension	Grantee

Kilimo Trust (KT) Tanzania	Owen Nelson Mghweno	Programme Officer	12-07-2019	Markets	Grantee
Mbozi, Ileje, Isagati Consortium (MIICO)	Catherine Mulaga	Project Officer	10-07-2019	Markets	Grantee
NAFAKA-Cereal market system development	Silvanus Mruma	Director of input systems and productivity	18-07-2019	Various	Expert
Nyakitonto Youth for Development (NYDT)	Ramadhan Joel Nkembanyi	Executive Officer	10-07-2019	Extension	Grantee
Rural Urban Development Initiatives (RUDI)	Allan Ngakonda	Project Manager	12-07-2019	Markets	Grantee
Ruvuma Commercialization and Diversification of Agriculture (RUCODIA)	Jackson Jasson Mwambungu	Project Manager	09-07-2019	Markets	Grantee
Silverlands	Lydia Mziray	Legal compliance Officer	18-07-2019	Markets	Partner
Super Seki Investment	Ritha Bathlomeo	Managing Director	18-07-2019	Markets	Partner
Tanzania Agricultural Research Institute (TARI) Uyole	Dr. Tulole Bucheyeki	Director			
Tanzania Agricultural Research Institute (TARI) Maruku	Dr. Magdalena William	Researcher	11-07-2019	Extension	Grantee
Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA)-Kigoma	Prosper Guga	Executive Officer	11-07-2019	Markets	Grantee
Tanzania Association of Professionals for Business Development Services (TAP BDS)	Deodati Bernadi	Project Manager	12-07-2019	Markets	Grantee
Vwawa Agrovets Suppliers Limited	Magreth N. Sanga	Managing Director			

Annex 2. Data dictionary 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.
Additional indicator 2: 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 the terms of reference. In parenthesis numbering of AGRA's Theory of Change

Annex 3. SME performance scorecards

Table 107: 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 108: 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 109: 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 110: 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 4. SME descriptive statistics

Table 111: General SME characteristics

General SME Characteristics	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
Years of business	3.1 (1.10)	5 (0)	2.7 (1.30)	5 (0)	2.5 (1.16)
Average number of commodities					
Commericalized/traded	4 (1.73)	2.5 (0.70)			0.76 (0.99)
Processed					0.85 (0.65)
Transported					0.19 (0.87)
Commodities commercialized/traded					
Maize	100%	100%			38%
Rice					57%
Soybean					48%
Permanent staff	19.3 (19.37)	NA	2.22 (1.98)	14.5 (14.84)	8.63 (9.55)
Casual staff	110.83 (118.88)	NA	2.66 (1.80)	9 (-)	33.52 (65.48)
Total annual turnover (USD)*	149303 (138844)	NA	26452 (32846)	NA	521262.3 (768783)
Observations	**10**	**2**	**9**	**2**	**21**

Standard Deviation in parenthesis
**Incomplete information for annual turnover. Detailed information reported below.*
Agri-Value Chain: Obs annual turnover 90%
Commerical Seed Producers: Obs annual turnover 50%
Input Supply agro dealers: Obs annual turnover 100%

Table 112: SME employees

Employees	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
Permanent Staff	19.3 (19.37)	NA	2.22 (1.98)	14.5 (14.84)	8.63 (9.55)
Casual Staff	110.83 (118.88)	NA	2.66 (1.80)	9 (-)	33.52 (65.48)
% Female (over total)	42%	NA	18%	31%	20%
% Skilled (over totoal)	41%	NA	25%	39%	6%
*Annual Salary Permanent (USD)**	32448 (24360)	NA	1885 (1395)	6266 (-)	6034 (5768)
*Annual Labor Cost Casual (USD)**	27195 (31478)	NA	1028 (560)	435 (-)	26730 (46581)
*Daily Wage Casual (USD)**	2.87 (1.55)	NA	1.00 (0.50)	3.26 (1.53)	7.09 (6.42)

*Standard Deviation in parenthesis. *Incomplete information for Annual Salary and Daily wage. Detailed information reported below.*
Agri-Value Chain: Obs salary permanent workers: 90%; Obs salary casual workers 61%; Obs daily wage 61%.
Commerical Seed Producers: Obs salary permanent workers: 60%; Obs salary casual workers 40%; Obs daily wage 80%.
Input Supply agro dealers: Obs salary permanent workers: 88%; Obs salary casual workers 88%; Obs daily wage 88%.
Input Supply companies:Obs salary permanent workers: 50%; Obs salary casual workers 50%; Obs daily wage 100%.

Table 113: SME buyers

Buyers	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
Projects, programs and government	90%	100%			95%
Farmer organizations, coops, associations	90%	100%	100%	100%	95%
Individual buyers / producers	90%	100%	100%	100%	85%
Traders, input suppliers, wholesalers	90%	100%	100%	100%	85%
Average number of buyers	4 (0)	4 (0)	3 (0)	3 (0)	3.61 (0.97)
Observations	**10**	**2**	**9**	**2**	**21**

Standard Deviation in parenthesis

Table 114: SMEs services

SME Services	Commercial Seed Producers	Seed companies
Variety development	27%	50%
Breeder seed production	45%	50%
Production early generation / foundation seed	36%	50%
Production improved / certified seed	81%	100%
Production of noncertified seed	9%	
Sales improved / certified seed	81%	100%
Average number of services provided	2.7 (1.15)	3.5 (2.12)
Observations	**10**	**2**

SMEs Services	Input supply agro dealers	Input companies
Retail (sales) of improved / certified seed	100%	50%
Retail (sales) of chemical fertilizers and pesticides	100%	100%
Advisory services / extension	100%	
Import of inputs		50%
Wholesale and country-wide distribution		50%
Manufacturing of inputs		
Average number of services provided	3 (0)	2.5 (2.12)
Observations	**9**	**2**

Table 115: SME investments

Investments	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
Expansion of land area	40%				4%
Expansion of buildings and/or storage	20%		55%		28%
Upgrading of equipment	30%		11%	50%	42%
Research & Development	30%				
Training of staff	30%			50%	4%
Increase / injection for working capital					
No Investment	50%	100%	33%	50%	42%
Average number of investments	1.5 (1.9)	0%	0.66 (0.5)	1 (1.41)	0.80 (0.81)
Observations	**10**	**2**	**9**	**2**	**21**

Table 116: Percentage of credit from formal sources

% Credit from formal sources	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
0%	10%	50%			
<10%			22%		
10-25%					23.81%
25-50%	10%		11%	50%	9.52%
50-75%	20%		33%		19.05%
75%-90%	10%		11%		9.52%
>90%	50%	50%	22%	50%	28.10%
Observations	**10**	**2**	**9**	**2**	**21**

Table 117: AGRA support services

AGRA Services	Commercial Seed Producers	Seed Companies	Input Supply Agro-Dealers	Input Supply Companies	Agri Value Chain
Grant	40%			50%	14%
Loan/Credit					4%
Training	9%		77%		42%
Technical Assistance	20%				
Platform to showcase products	10%	50%	11%		
No Service	30%	50%	22%	50%	47%
Average Number AGRA Services	0.7 (0.48)	0.50 (0.70)	0.88 (0.60)	0.50 (0.70)	0.61 (0.66)
Observations	**10**	**2**	**9**	**2**	**21**

Annex 5. SMEs participating in the interviews

Table 118: Sampled SMEs for performance survey

Commercial seed producers	Seed companies	Input supply/agro-dealers	Input companies	Agri-value Chain
Agriseed Technologies Ltd	Kibo Seed Company Ltd	Alpha Agrovet	Bajuta International (T) Ltd	Aniseth Commision Cargo
Aminata quality seed and consultancy	Monsanto Tanzania Ltd	Haruna Omary agrovet	Imuka Agricultural Enterprises	Dickens Investment
Export Trading Group Ltd		Mahimba Agrovet		Donati Tarimo
Highland Seed Growers Ltd		Makoye Agrovet		Flamingo Foods
Kipato Seed Company Limited		Mpanda Maranatha Agrovet		Grain Planet Agro Farming Company Ltd
Meru Agro-Tours & Consultants Co. Ltd		Mwakalobo Agrovet		Ibra Madina Milling Machinery
Mashamba and Tractors Solution (T) Ltd		Mwami Agrovet		Johari Milling Machine
Namburi Seed Company Ltd		Mwesigwa Bugenyi agrovet		Joshua Samson
Suba Agro Engineering & Trading Co Ltd		Suzy Agrovet and General supply		Kaderes Peasants Development Plc
Tetra M Express				Kileo/Kiona Mbali
				Kulwa Company
				Kupo Investment
				Lucas Milling Machine
				Madale Milling Machine
				Mashamba and Tractors Solution (T) Ltd
				Mashauri Milling Machine

	Mbomole Investment Ltd
	Ratec Group
	Reuben Luhende
	Super Seki Investment
	Tetra M Express