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Growing Africa's Agriculture

KIT Royal Tropical Institute

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AGRA Mali

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Contents

Acronyms

AFAAS	African Forum for Agricultural Advisory Services
AGRA	Alliance for Green Revolution in Africa
AOPP	Association des Organisations Paysannes Professionnelles
APCAM	Assemblée Permanente des Chambres d'Agriculture du Mali
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
CENA	Comité Exécutif National de l'Agriculture
CMDT	Compagnie Malienne pour le Développement des Textiles
CNOP	Coordination Nationale des Organisations Paysannes
CPS/SDR	Cellule de Planification et Statistique du Secteur Développement Rural
CREDD	Cadre stratégique pour la Relance Economique et le Développement Durable
C-R/L/C-OCSAD	Comité Régional/Local/Communal d'Orientation, de Coordination et de Suivi des Actions de Développement
CSA	Conseil Supérieur de l'Agriculture
CSA	Commissariat à la Sécurité Alimentaire
DNA	Direction Nationale de l'Agriculture
EAC	Enquête Agricole de Conjoncture
ECOWAS	Economic Community of West African States
GDP	Gross Domestic Product
GoM	Government of Mali
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IHfRA	Innovative Hub for Research in Africa
KIT	Royal Tropical Institute
MINUSMA	United Nations Multidimensional Integrated Stabilisation Mission in Mali
OHVN	Office de la Haute Vallée du Niger
ON	Office du Niger
PPAD	Promotion de la Productivité Agricole Durable
PDA	Plan de Développement Agricole du Mali
PIATA	Partnership for Inclusive Agricultural Transformation in Africa
PNISA	Plan National d'Investissement dans le Secteur Agricole
PolNSAN	Politique Nationale pour la Sécurité Alimentaire et Nutritionnelle
PPAD	Promotion de la Productivité Agricole Durable au Mali
PPAAO	Programme de Productivité Agricole en Afrique de l'Ouest
PPP	Public Private Partnership
RESCAR-AOC	Réseau des Services de Conseil Agricole et Rural de l'Afrique de l'Ouest et du Centre
RGAE	Recensement Général de l'Agriculture et de l'Élevage
SME	Small and medium-sized entreprise
SNDR	Stratégie Nationale pour le Développement de la Riziculture
UE	European Union

UMEAO	Union Monétaire et Economique de l'Afrique de l'Ouest
USAID	United States Agency for International Development
VBA	Village-based advisor

List of tables

List of figures

1 Summary of results

1.1 Introduction

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

AGRA's theory of change is that sustainable agricultural transformation can be facilitated through a combination of:

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

In Mali, AGRA seeks to contribute to increased resilience, productivity, incomes and food security of farmers and other value chain actors through:

- Developing policy and state capability to:
    - improve planning, coordination, and implementation of initiatives in the agricultural sector under the leadership of the Ministry of Agriculture;
    - develop partnerships with the private sector to scale up and sustain investments in targeted areas (Koulikoro, Sikasso and Ségou regions) and value chains (cowpea, maize, millet and sorghum).
- Strengthening the market system by improving linkages between farmers and buyers (aggregators, agro-processors and traders), as well as financial service providers and technology providers in the targeted regions and value chains.
- Accompanying the extension system for enhanced information and demonstration on the use of agricultural inputs and thus contribute to the expansion of input systems in the regions.
- Working with partners at all levels to:
    - crowd in private and public investment to develop a flagship programme;
    - derive synergies to reduce duplication of efforts;
    - increase the reach of AGRA's investments (impact at scale).

By executing this strategy, AGRA expects to improve food security and increase incomes for at least 940,000 smallholder farmers in the Koulikoro, Sikasso and Ségou regions, while targeting four key crops: cowpea, maize, millet and sorghum. Deployment of this strategy in Mali began in Q2 of 2018 and, to date, AGRA has invested ~US$7.5 million

With these funds, AGRA has invested in the following areas:

- In policy and state capability, AGRA supports the Government of Mali (GoM) to strengthen the monitoring and evaluation (M&E) system of the Ministry of Agriculture, rationalise and rollout the existing input subsidy programme, cascade the *Plan National d'Investissement dans le Secteur Agricole* (PNISA) to sub-national level, and develop a flagship agricultural extension project for the promotion of sustainable agricultural productivity.
- In extension systems development, AGRA currently funds consortia and organisations that develop and strengthen a network of village-based advisors (VBAs) in order to increase the network of extensionists (from one agent for 6,000 farmers to one agent for 500 farmers).

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

For the 2019 outcome monitoring, AGRA Mali elected to focus on two crops – cowpea and maize. For the qualitative systems analysis, AGRA selected policy and state capability and extension system.

1.2 System analysis

Policy and state capability

System change needs
Agricultural transformation is high on the agenda in Mali through the Agricultural Orientation Act (LOA), which was adopted in 2006 and since then is the overall framework for elaborating agricultural policies and strategies. The LOA puts (predominately smallholder) farmers at the centre of relevant policies and strategies.

In line with the LOA, the GoM has put in place adequate policies and strategies for agricultural transformation, and, has the required institutional setting for coordination and implementation of agricultural transformation policies; particularly through the unit for planning and statistics of the rural development sector (Cellule de Planification et Statistique du Secteur Développement Rural - CSP/SDR). Regular stakeholder consultation seems to be limited (frequency) but the ongoing regionalisation of the PNISA offers perspectives for improving coordination and consultations at decentralised levels.

Mali has elaborated adequate policies and strategies for enhancing access of smallholder farmers to agricultural inputs such as improved seeds and fertilisers. These policies offer institutional opportunities for the domestication of the Economic Community of West African States (ECOWAS) seed and fertiliser regulations. The national programme for input subsidies, implemented for almost a decade, requires an update in order to increase its effectiveness, efficiency and impact.

AGRA objectives and activities
AGRA is committed to aligning with the GoM's priorities and programmes in agricultural transformation, adapting policies, and enhancing the coordination, M&E and accountability systems, which contributes to creating enabling conditions for increased public and private investments. At the same time, AGRA also works with the government to strengthen implementation capacity.

AGRA's portfolio for policy and state capabilities in Mali contains the following support activities:

- Strengthening GoM's capacity in planning and budgeting (PNISA) of the agricultural sector policy, and the coordination and monitoring of policy implementation – mainly through reinforcing the capacities of CPS/SDR;
- Reinforcing GoM's capacity to deliver services that are considered essential for agricultural transformation; particularly the implementation of the agricultural input subsidy system;
- Accompanying GoM, and specifically the national directorate for agriculture (DNA) to develop a country flagship programme in the field of agricultural extension (PPAD – Promotion of sustainable agricultural productivity in Mali) and to leverage funds for its implementation.

Early results and recommendations

- AGRA's PIATA (Partnership for Inclusive Agricultural Transformation in Africa) activities fully align with GoM's rural agricultural development policies and strategies. This is the result of regular consultations between AGRA and the Ministry of Agriculture and the good relations between the AGRA Mali team and policymakers.
- The programme's interventions are on track, highly effective and might achieve the targets set for 2021. However, there are some exceptions, notably for funds mobilised by the government for investments in the value chains, which might be due to budget constraints; and the rate of implementation of recommendations from the joint sector review.
- AGRA's interventions stand out for being at the (national) centre of agricultural policy development, implementation and review. They focus on the coordination of the planning and implementation of national policies; concentrating on those policies and strategies that facilitate access of smallholder farmers to inputs and technologies.
- Two support activities of AGRA Mali to the Ministry of Agriculture through the CSP/SDR stand out:
    - Cascading the PNISA reinforces commitment of the regional public sector structures to agricultural transformation and closes the 'gap' between policymakers and (non-state) leaders in the agricultural sector.
    - Rationalisation and rollout of the existing input subsidy programme, which may have a determining effect on the livelihoods of (small-scale) farmers. According to a recent survey, 70% of households do not use improved seed varieties or phytosanitary products, and only 44% of agricultural households use inorganic fertilisers. At the same time, the poorest farmers using hardly any fertiliser are hard to reach by e-voucher-based programmes because of the high rate of illiteracy within this target group.
- AGRA's system approach and involvement in policymaking and reforms at the national level is relatively recent in Mali. Support activities only became effective in 2018 and therefore it is too early to fully assess the effectiveness of the support. Nevertheless, it is expected that the two above-mentioned support activities will have a positive impact on the food security situation and agricultural revenues within a relatively short notice.
- The strong alignment of AGRA's efforts with GoM's agricultural transformation policies is an important factor in facilitating sustainability.
- However, there is a strain on public funds for rural development because of the current insecurity situation.

Extension system

System change needs

The agricultural extension and advisory services in Mali can be characterised as pluralistic, in terms of service providers as well as methods. Considering the variety of service providers and approaches, and their overlap, effective communication and coordination among agricultural research, extension and advisory services is a key challenge.

The number of public sector extension agents remains low. It is estimated that, in general, one field agent has to serve some 4,700 farmers and some 20% of farmers have access to extension services. The public sector agricultural services face challenges due to limited public funding, which thus considerably limits the performance of the public sector.

Besides the still worsening security situation, structural constraints slow down Mali's economic development, which negatively affects revenues by state and the private sector including producer organisations. This means that there is less income from agricultural value chains on which financing of agricultural extension and advisory services by both state and non-state actors relies.

AGRA objectives and activities

AGRA's objective is to develop integrated value chains including production, aggregation, processing and marketing. As for the specific role of 'agricultural extension', AGRA considers extension services primarily to be carriers of knowledge and information for farmers and their organisations on quality agricultural inputs, good agricultural practices, and access to finance and market outlets.

For this purpose, the programme funds consortia that intervene within the regions of Koulikoro, Sikasso and Ségou. Each consortium consists of specialised, private (non-profit) service providers in agricultural extension, facilitating aggregation and access to finance and markets, and (for-profit) agro-dealers and seed companies. The service providers for agricultural extension work with village-based advisors (VBAs), which is part of AGRA's ambition to increase the network of extensionists from one agent for 6,000 farmers to one agent for 500 farmers.

Early results and recommendations

- As for the extension system, the M&E data provided by AGRA indicate that the achievement of the targeted outputs is on track (recruitment of VBAs, organisation of and farmer participation in extension and training events). However, the data from the KIT household survey indicates that in the sample:
    - 37% of maize farmers had met with an agricultural extension officer in the last year, and 43% of cowpea farmers. Farmers met, on average, around three to four times with their extension officer;
    - VBAs are the most common provider of extension services. Yet, only 9% of cowpea farmers and 6% of maize farmers have received extension services through a demo plot.
- Since AGRA's strategy is heavily reliant on VBAs and demo plots, capacity building through training and coaching of VBAs might require more attention from the contracted service providers (AGRA grantees).
- As for the AGRA support to agricultural extension, the distinctive feature of the AGRA strategy, compared to other donors and development partners, is the

involvement of VBAs, which are respected and knowledgeable members of village communities.

- AGRA's support to agricultural extension in Mali is relevant. All the more since there is a lack of capacity (staff, equipment) in the national agricultural extension and advisory system.
- AGRA could also consider support the governance and management of the national agricultural extension and advisory system (NAEAS); whether it would be at national or regional levels. Such support could contribute to more effective and efficient service provision through a division of labour and subsequent allocation or pooling of human and financial resources.
- Despite these advantages of the target regions (agro ecology, infrastructure, communication etc.), the consortium members (interviews) pointed out the general illiteracy of VBAs, particularly women, which hampers handing down information to farmers.
- The VBA network allows a high number of farmers to be reached within a relatively short period. The approach involves a trade-off between long-term institution building (network of VBAs and agro-dealers) and short-term achievement of results (farmers reached, inputs distributed, production increase, outputs traded).
- Whether VBAs continue to play their role after the ending of the projects (grants for consortia) is questionable. Experimented options for sustaining the VBA networks include integrating VBAs into existing unions of farmer cooperatives and their employment as commercial representatives of agro-dealers.

1.3 Household survey

A household survey was carried out amongst a group of maize farmers (N=1,002) and a separate group of cowpea farmers (N=1,000), both farmer groups 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 cowpea farmers based on the 2018 crop season. These indicators are used to measure progress at farmer level towards the AGRA goal of catalysing agricultural transformation for increased income and food security.

Table 1: AGRA outcome indicators (2018 cropping season)

Outcome indicator	Maize farmers	Cowpea farmers
Goal indicator 2: Average number of months of adequate household food provision	11.6	11.6
Goal indicator 6: Wealth assets index score	-0.504	-0.450
1. Average yield (kg/ha) (Indicator 1)	1.488	300
3. Rate of application of target improved technologies or management practices (Indicator 14)	99%	55%
4.4 Average distance (km) from farmers to agro-dealers (Indicator 15)	7.7	8
4.4 Distance to nearest agro dealer (minutes conversion 5.5 km/hr)	*84*	*87*
4. Percent of farmers accessing agricultural advisory extension support services (Indicator 16)	37%	43%

Percent of hectares under improved technologies or management practices (Indicator 20)	99%	39%
Average fertiliser use (Total N + P + K, kg/ha) (Indicator 21)	82.9	12.5
6. Percent of post-harvest losses (at farm level) (Indicator 22)	2%	4%
33. Percent of total household produce sold through structured market facilities/arrangements (Indicator 30)	2%	0%
10. Value of smallholder sales (US$) (Indicator 36)	$80.3	$16.7
13. Percent farmers using financial services of formal institutions (Indicator 43)	27%	29%
Numbering according to the terms of reference. In parenthesis numbering of AGRA's Theory of Change		

1.4 SME performance

An important pathway of change of the PIATA programme is supporting the development of small and medium-sized enterprises (SMEs) operating in agricultural value chains and providing support services to these chains. Key findings from a rapid SME survey (18 SMEs) indicate that:

- AGRA-supported seed companies (eight companies interviewed; nine staff on average, 5% women) have 'good' financial stability (access to formal credit) and acceptable ('average') human capital, with room for improvement. Business resilience however is weak ('average') and, particularly, investment in new technologies is very weak. These companies are new enterprises, which have been in business for three years on average.
- Input supply companies or agro-dealers (only two enterprises were interviewed; six staff on average, 30% women) have a moderate ('average') business resilience because they are young and do not offer diversified services or have many buyers. Technology investment is very low ('poor'). Levels of human capital and financial stability are moderate ('average').
- Agri-value chain actors include aggregators, processors and traders (eight enterprises; seven staff on average, 4% women). This group paints the same picture as input supply companies, displaying weak resilience ('average') to market shocks and making very limited investments in R&D, storage or equipment. They have good access to formal credit, strengthening their financial stability score ('good'). On average, the level of human capital is moderate ('average').

Overall, the SMEs sampled are young (less than 5 years) and have yet to demonstrate their resilience to changing market and business contexts. Notably, their access to formal credit is generally very good while employing skilled staff, including female employees, and their innovation capacity is very weak.

2 Objectives and scope of the report

KIT Royal Tropical Institute was contracted by AGRA to implement annual outcome monitoring of its activities under the 2017-2021 Partnership for Inclusive Agricultural Transformation in Africa (PIATA).

The annual outcome surveys have 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;
    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, but also external, interventions.

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

- two international experts in quantitative data collection in agriculture;
- an international expert in qualitative data collection in agriculture;
- a regional expert for data collection on SMEs;
- a regional expert for the coordination for quantitative field-data collection in agriculture;
- a team of 10 local enumerators trained on the specific components of the survey and data management.

AGRA Mali selected maize and cowpea as priority crops for reporting for 2018. AGRA also selected the policy and state capability and extension system as the priority domains for system analysis.

Primary data was collected by the qualitative team in Bamako, Koulikoro and Sikasso over a period of two weeks in November 2019. For each system, information was collected via workshops and key informant interviews. AGRA identified key informants, and a small number were 'snowball' referrals i.e. a small number were referrals that were suggested whilst in-country (see Annex 1: List of key informants for system analysis).

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 each location, randomly selecting beneficiaries. Households were randomly selected from this population, using two-stage clustered sampling. A total of 1,002 households were interviewed for maize and 1,000 for cowpea in the Koulikoro and Sikasso regions. SME surveys were administered to 18 randomly selected companies and businesses linked to AGRA interventions.

AGRA Mali made available country programme roadmaps and information related to issued and planned grants. Secondary data and online reports completed the data sources.

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

The report results should be interpreted with caution. The household data represents the 2018 main cropping season, and should be considered as a baseline for monitoring future change, as AGRA-PIATA interventions had not been implemented at a scale 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. However, the fieldwork could, because of the limited field time, only cover a portion of AGRA's intervention portfolio.

Part I: Qualitative system analysis

3 Introduction

3.1 Agricultural policy context

Mali is a vast, semi-arid, landlocked country in the Sahelian belt of West Africa. The country is classified as a low-income country. Its economy relies mainly on agriculture and remains undiversified and vulnerable to raw material price fluctuations (cattle, cotton and gold). Climate change and a high and sustained population growth rate of 3% per year with an estimated life expectancy of 56 years (2018), and a fertility rate of six children per woman (2017) are challenges for developing the agricultural sector and improving food security (World Bank Mali webpage 2019[1]; World Bank, 2019c).

On the United Nations Human Development Index, Mali ranks 182 out of 188 countries with poverty being mainly a rural phenomenon (90% of all poor living in rural areas; whereas only 56% of the total population lives in rural areas;). An estimated 50% of the population relies on less than US$1.90 per day. In 2016, approximately 25% of households (over 2.5 million people) were moderately to severely food insecure (WFP, 2018). Malnutrition is also an important problem and latest survey data for 2012 indicates that over 38% of children under five were stunted. Although primary school enrolment reached 75.6% in 2017, primary school completion does not exceed 50%, and secondary school enrolment is even lower with 41% (World Bank Mali webpage; World Bank, 2019c; DLEC, 2019).

Agriculture, dominated by smallholder farmers, is the main pillar of Mali's economy and is considered essential for the country's economic growth. The agricultural sector accounts for approximately 40% of the country's gross domestic product (GDP) and employs about 85% percent of the labour force. Annual overall economic growth in Mali from 2014 to 2016 averaged 6% and was primarily driven by the agriculture and services sectors. However, GDP growth showed a decline in 2015 with 5.2% compared to 5.8% in 2014, with agricultural growth dropping from 14.8% in 2014 to only 3.9% in 2015. Furthermore, the population growth rate is 3% annually, resulting in an expected total population of 20.9 million in 2020, which poses the challenge of feeding an increasing population (World Bank and African Development Bank sources cited by DLEC, 2019).

There are an estimated one million farms throughout Mali, which are mainly family-run, smallholder farms. Cotton is the major cash crop, accounting for over 80% of export earnings, followed by rain-fed cereals, such as rice, millet, maize and sorghum. Cereals (rice, millet, maize, sorghum and fonio) contributed 16% to Mali's GDP, followed by cotton with 15% and livestock with 11%. Average cereal productivity is approximately 1,500 kg per ha, which is higher than in Burkina Faso, Niger and Senegal (World Bank, 2019c; DLEC, 2019).

Mali faces significant challenges in agriculture. Staple crop productivity remains relatively low in rain-fed farming systems because of the adverse impacts of climate change, poor soils, limited use of quality inputs and ineffective extension services. Furthermore, significant gender inequalities limit women's potential and negatively affect the performance of the agriculture sector (AGRA, 2019).

[1] See https://www.worldbank.org/en/country/mali/overview 2019

Another complicating factor is the increasing instability and spreading of armed conflicts since the military coup of 2012 in the northern and central regions of the country. These led to the deployment of French-led military forces in January 2013, which handed over to the United Nations Multidimensional Integrated Stabilisation Mission in Mali (MINUSMA) in July 2014. The spreading insecurity has negatively affected growth rates in the recent history, which is currently 4.7% (2018).

3.2 AGRA objectives and activities

AGRA's plans in Mali on policy and state capability aims to improve planning, coordination, and implementation of initiatives in the agricultural sector under the leadership of the Ministry of Agriculture and develop partnerships with the private sector to scale up and sustain investment in high impact areas (Koulikoro, Sikasso and Ségou regions) and targeted value chains.

The AGRA portfolio concerning policy and state capability includes the following activities:

- Strengthening GoM's capacity in planning and budgeting (PNISA) of the agricultural sector policy, and the coordination and monitoring of policy implementation;
- Reinforcing GoM's capacity to deliver services that are considered essential for agricultural transformation; particularly the implementation of the agricultural input subsidy system;
- Accompanying GoM, and specifically the national directorate for agriculture (DNA) to develop a country flagship programme in the field of agricultural extension and to leverage funds for its implementation.

As for the extension system, AGRA contributes to building downstream delivery systems that are closer to smallholder farmers through interventions for upgrading the millet, sorghum, maize, and cowpea value chains, improving seeds and fertiliser systems, strengthening the extension services system, increasing financial inclusion, and facilitating structural linkages between farmers and markets (aggregators, processors and traders).

The AGRA portfolio under extension system includes the following activities:

- facilitate the development of market systems that improve linkages between farmers and buyers (aggregators, agro-processors and traders), as well as financial service providers and technology providers in the Koulikoro, Sikasso and Ségou regions in targeted value chains (cowpea, maize, millet and sorghum);
- support the expansion of input systems in order to ensure an uninterrupted supply of improved seed and fertiliser, as well as strengthening accompanying extension services.

Having worked in Mali over the last 12 years, AGRA and its partners have built an asset base in technologies, partnerships and models that, if scaled, can have significant impact on the status of inclusive agriculture in Mali.

4 Policy and state capacity

4.1 System performance

The performance of the agricultural sector (cotton exports) and mining (gold production) sector has allowed the annual economic growth rate (5%) to be maintained. However, public investment in 2018 shrank by 2.4% of GDP since 2015, as the GoM had to consolidate expenditures in response to falling revenue (World Bank Mali webpage 2019).

Increased tax evasion and fuel tax waivers issued have put further pressure on tax revenues, which declined and, in turn, negatively affected the budget deficit from 2.9% of the GDP in 2017 to 4.7% in 2018. In response, the GoM reduced public spending from 23% of GDP in 2017 to 20% of GDP in 2018. The deficit nevertheless grew, owing to insufficient external aid, and was largely compensated by issuing regional bonds. Military expenditure, as part of GDP, increased from 1.5% in 2014 to 2.9% in 2018 (World Bank Mali webpage 2019; World Bank, 2019c).

The performance of the agricultural sector during the last three years contributed to reducing the extreme poverty rate from 43.4% in 2017 to 41.3% in 2019, after having risen between 2011 and 2013 because of the security crisis. However, the added value of agriculture to annual growth decreased from 8.8% in 2014 to 5.8% in 2018. (World Bank Mali webpage 2019; World Bank, 2019c)

Mali has significant agricultural potential in terms of land and water resources with about 44 million ha (34% of its land area) being suitable for agriculture and livestock, with only 12% being cultivated and even less being irrigated. The main rivers, the Niger and Senegal Rivers with their tributaries, form two watersheds that offer an irrigable potential estimated at more than two million ha (World Bank, 2019c; DLEC, 2019).

Mali's livestock sector (including fisheries and aquaculture) is an important part of agriculture, which provides income to about 30% of the population. Livestock systems include extensive nomadic practices, sometimes associated with oasis agriculture in the far north; extensive transhumance in the north, west and centre; and semi-sedentary and sedentary livestock in the centre and south. Fish farming is growing increasingly around urban centres due to the development of communal fish farming and aquaculture (DLEC, 2019).

As a landlocked country, Mali depends on trade relations with coastal countries such as Benin, Côte d'Ivoire, Ghana and Togo for its imports and exports. Mali is an active member of the ECOWAS, which promotes the creation and regulation of a regional market, and the West Africa monetary and economic union (UMEOA), which has a common currency with the CFA franc.

Over the last five years, the GoM has allocated an average of 13% of the public budget to the agricultural sector (AGRA Mali, 2019). In 2017, 12.5% of total public expenditure was dedicated to financing agricultural development (AGRA, 2018). In 2017, Mali only invested 0.1% of GDP in agricultural research and, in 2016, it was still only 0.44%, against 0.97% in the year 2000. As a result, Malian agricultural research is particularly dependent on donor

funding, which affects negatively its performance and sustainability (AGRA, 2018a; IFPRI/IER, 2018).

In 2006, GoM adopted the Agricultural Orientation Act (LOA), which drives Mali's agricultural development policy in the long term. This aims for promoting sustainable, modern family farming through the creation of an environment conducive to the development of a structured agricultural sector. The high council for agriculture (CSA), presided over by the Head of State, represents all key stakeholders in the agricultural sector and defines the main orientations of agricultural development. The national executive committee for agriculture (CENA) oversees and monitors the implementation of the policy orientations.

A key stakeholder group in the agricultural sector of Mali are the producer organisations, in the crop as well as the livestock sector. The most important national umbrella organisations are the national coordination of producer organisations (CNOP), whose members are mainly national subsector and commodity producer organisations, and the association of professional farmer organisations (AOPP). The latter represents about 130 producer organisations across the country and is a CNOP member. (DLEC, 2019).

Mali has several decades of experience with organising smallholder farmers in the cotton (export crop) and rice (food security crop) sectors, which were created by parastatals (CMDT – Compagnie Malienne pour le Développement des Textiles – for cotton and Office du Niger (ON) for rice) to take up functions in the supply chains, such as managing supply of credit and inputs, and aggregation of produce. Established at village level, these organisations have created their own multi-tier networks and have taken up other functions such as agricultural extension and advice and lobbying-advocacy (IRDR, 2018). Their increased influence in the agricultural sector was also an inspiration for the creation of producer organisations in other commodity sub-sectors (maize, sorghum/millet, fruits/vegetables, Irish potato, meat, etc.).

The permanent assembly of chambers of agriculture (APCAM) is the state's official consultation platform with agricultural producers and their organisations. Each region of Mali has its own chamber of agriculture. Authorities have also made efforts to facilitate the creation of inter-professional organisations, for instance the cotton inter-profession (IRDR/LARES, 2019).

Mali's Strategic Framework for Economic Revival and Sustainable Development (CREDD, 2015-2025; GoM, 2019) presents the main outline for Mali's economic and social development for the coming years. It builds on the vision of a "well-governed Mali, where the harmonious living together of the different components of society is restored, peace consolidated and collective and individual security ensured in unity, cohesion and diversity; where the wealth creation process is inclusive and respectful of the environment; and where human capital is valued for the benefit of young people and women". In order to achieve this vision, the CREDD defines five strategies: (i) consolidation of democracy and improvement of governance, (ii) restoration of peace and security and strengthening of social cohesion, (iii) inclusive growth and structural transformation of the economy; (iv) environmental protection and strengthening of resilience to climate change; and (v) development of human capital.

The third strategy includes two relevant objectives for Malian agriculture. One being the objective to "promote a sustainable, modern and competitive agricultural sector". The

strategy includes enhancing agricultural productivity and competitiveness, increasing the contribution of the livestock and fisheries sectors to economic growth, poverty reduction, and food and nutrition security. The other one is the objective to “develop an industry that is integrated into the economy, competitive and job creator”, including the creation of industries in agricultural value chains. A proposed instrument to achieve the latter objective is the concept of ‘agropôles’ – a network of companies in a given geographical area, which develop and maintain functional relationships for production, processing, support services and product marketing activities of a specific plant, animal, fishery or forest product.

The National Policy for Food and Nutrition Security (PolNSAN; GoM 2017) aims to contribute to food security of the Mali population, improve the nutritional status of vulnerable groups and strengthen their resilience capacity. The national food security commission Commissariat à la Sécurité Alimentaire - CSA), which falls under the Office of the Prime Minister, is responsible for coordinating the implementation of the policy, which involves the ministries in charge of food security stocks, nutrition and social protection.

Through the implementation of CREDD, the GoM aims to achieve an average annual economic growth rate of 6.5% for the period 2015-2025. This aim is based on several assumptions; i.e. the continuation of developing the agro-pastoral potential, strengthening the programme for investment in basic infrastructure, promotion of the private sector through Public and Private Partnerships (PPPs), investment in human resources, and the allocation of 15% of the national budget to agriculture, which is the lever for growth in the primary sector. The continued implementation of the National Strategy for Rice in Mali (SNDR; GoM, 2009; modernisation and intensification of rice production systems) is expected to contribute significantly to agricultural growth.

The GoM has developed two policies and programmes that are relevant for orienting and achieving agricultural transformation.

- The Plan for Agricultural Development (PDA; GoM 2013) aims to "contribute to making Mali an emerging economy with agriculture being an engine for the growth of the national economy and a guarantee for food sovereignty in a sustainable way”. Its objectives are: (i) guarantee the population’s food security and the country’s food sovereignty; (ii) rationalise environmental and natural resource management; (iii) modernise the agricultural production systems and improve the competitiveness of agricultural value chains; (iv) ensure agricultural innovation through research and vocational training; and (v) improve the status of agricultural producers and strengthen capacities of all actors in the agricultural sector.
- The National Agricultural Investment Plan (PNISA; GoM, 2014) defines Mali’s investment programme (national or external funds) in agriculture, taking into account the achievements, needs (operations and investment) and funding gaps of the sector over a rolling 10-year horizon. It federates all projects and programmes in progress and in the pipeline in the sector.

Finally, yet importantly, the ongoing deterioration of the security situation in the northern and central regions of Mali since 2012 because of attacks by armed militia, not only negatively affects farming households, it also puts a strain on the national budget and has consequences for the allocation of resources to the agriculture sector. However, through its national policies and strategies for rural and agricultural development, the GoM remains committed to transforming the agriculture sector. This commitment includes the allocation of

10% of the national budget each year to agriculture (2011-2015), which is in line with African Union (AU) Maputo targets.

Based on its assessment of Mali's progress in implementing the Malabo declaration on agricultural transformation, the African Union (AU) made four recommendations to the GoM (see Table 2). Regarding the target area of agricultural policies, the GoM should invest in nutrition interventions to reduce malnutrition among children under five years old. In addition, strategies and programmes should place emphasis on women's access to financial services. On an institutional level, the GoM should increase and sustain its funding allocation to agricultural research and development as one of the strategies to enhance productivity. Furthermore, the government should harness the potential of agricultural trade with the continent to increase the volume of intra-African trade for agricultural commodities and services (AU, 2018).

Table 2: Mali's progress in 2017 towards implementing the Malabo Declaration on agricultural transformation in Africa

Five key areas of strong performance		**Five key areas of weak performance**	
Increase the size of irrigated areas from the year 2000 value	337.6%	Total agricultural research spending as a share of agriculture GDP	0.1%
Evidence-based policies, supportive institutions and corresponding human resources	100%	Increase of agricultural value added per arable land	1.8%
Comprehensive Africa Agriculture Development Programme (CAADP) process completion	88%	Farm, pastoral and fisher households are resilient to climate and weather-related shocks	2.0%
Increased yield for the country's priority agricultural commodities	18.5%%	Men and women engaged in agriculture having access to agricultural finance	7%
Annual growth of value-added agriculture (agricultural GDP)	7.6%	Prevalence of stunting among children under 5 years old	26.2%
Country progress score (out of 10): 5.6 – *on track*			

Source: AU, 2018

The GM has put agricultural transformation high on the agenda through the adoption of the Agricultural Orientation Act (LOA) as the overall framework for elaborating agricultural policies and strategies. The LOA puts (predominately smallholder) farmers at the centre of relevant policies and strategies. Through the CSA presided by the President of Mali, farmers, their organisations, and other key sector stakeholders have a voice in defining the main orientations of agricultural development.

The GoM has put in place adequate policies and strategies for agricultural transformation, and has the required institutional setting for coordination and implementation of agricultural transformation policies; particularly through the CSP/SDR under the Ministry of Agriculture. Regular stakeholder consultation seems to be limited (frequency) but the ongoing regionalisation of the PNISA offers perspectives for improving consultations at decentralised levels (see Table 3).

Since 2016, through the CSP/SDR, the Ministry of Agriculture coordinates a sector review involving other ministries in charge of the rural sector. The review assesses the activities undertaken in the agricultural development sector and the progress made, using the PNISA indicators. Sub-national preparatory workshops and the overview of the Ministry's portfolio of projects and programmes provide input for the review.[2]

Structures for delivering the required public services are in place but their capacities (human and financial resources) are limited compared to the ambitions as defined in the relevant policies and strategies. The current insecurity situation negatively affects the national economy and hence the tax revenues, which thus affects the room for public investments in rural and agricultural development (see Table 3).

There are several key challenges that prevent the unlocking the full potential of the private sector for contributing to agricultural transformation. There is a thriving agri-food sector, although largely informal. A major barrier is access to finance and a set of structural constraints. Firstly, the insecurity in parts of the country and the negative effect it has on the image of the country outside of Mali. Secondly, the inappropriate 'hard' infrastructure, particularly (rural) roads and electricity as well as the 'soft' infrastructure with difficulties of the provision of skilled human resources (see Table 3).

Table 3: State and policy capability: system indicators for Mali

Dimension	Indicators	Status	Narrative	Sources
1. Political commitment	Agricultural transformation is high on political agenda		▪ In 2006, the GoM approved the Agricultural Orientation Law (LOA); the President of Mali presides over the CSA that regularly meets and monitors the implementation of the LOA. ▪ The agricultural sector is the driver for inclusive growth and structural transformation of the economy (CREDD 2015-2025).	▪ GoM, 2019 ▪ Key informant interviews
	Government expenditures on agriculture (share of agriculture in total expenditure)		▪ Mali is 'on track' with regard to the implementation of CAADP commitments; with a score of 5.6/10. ▪ Public investments in the agricultural sector were increasing from 2010-2015; an average of 11% of the national budget was spent on agriculture. ▪ Disbursements do not follow implementation of plans; slow procedures. ▪ Budget (public funding) of the agricultural sector is diminishing because of resources needed for security.	▪ AU, 2018 ▪ AGRA, 2017
2. Agriculture transformation policies	Clear vision and strategy for agricultural transformation		▪ CREDD 2015-2025 aims for "inclusive growth and structural transformation of the economy". ▪ The agricultural sector is key to inclusive growth and economic transformation; CREDD "promotes a sustainable, modern and competitive agricultural sector".	▪ GoM, 2019 ▪ Key informant interviews

[2] (IFPRI https://www.resakss.org/sites/default/files/Country-JSR-Schedules.pdf

Dimension	Indicators	Status	Narrative	Sources
			▪ PAD and, particularly, PNISA are important programmatic and budgeting instruments for agricultural development.	
	Policy coherence		▪ Agriculture is central to "inclusive growth and structural transformation of the economy" (Axis 3 of CREDD 2015-2025), through enhanced competiveness of the sector, value addition (income and jobs), and food and nutrition security. ▪ Policy implementation and monitoring instruments (i.e. PNISA) are in place and are being decentralised.	▪ GoM, 2019 ▪ Key informant interviews
	Policy responsiveness		▪ In line with the decentralisation and deconcentration committees policy of Mali, regional, local and communal for steering, coordinating and monitoring development actions (CR/L/C-OCSAD) are in place. ▪ However, institutional transaction costs remain high and are largely supported by donors.	▪ MDFL,2017 ▪ Key informant interviews
3. Enabling environment	Legal framework for private sector development		▪ Doing Business Index 2020: Mali ranks 148/190, scoring well on starting a business (84.3/100), dealing with construction permits (61.4/100), and trading across borders (73.3/100). Scoring remains poor on getting credit (30.0/100), protecting minority investors (42.0/100) and enforcing contracts (42.8/100). ▪ EBA 2019 assessment: Mali's aggregated score is 33.70/100. Highest scores on trading food (79.07/100) and registering fertiliser (adoption of ECOWAS fertiliser guidelines; 73.32/100). Low scores on securing water (10.00/100), quality of seed and phytosanitary regulation (20.00/100) and access to finance (30.00/100). ▪ Global Competitiveness Index 2019: Mali ranks 129 out of 141 and scores 43.6/100; relatively low scores on ICT, institutions and infrastructure (enabling environment); skills (human capital) and labour market and financial systems (markets). Particular high score on macroeconomic stability (institutions).	▪ World Bank, 2019a Doing Business, 2020 ▪ World Bank, 2019b; EBA, 2019 ▪ WEF, 2019
	Economic or regulatory incentives support private sector development		▪ Private sector development and enhancing business climate are key for "inclusive growth and structural transformation of the economy" (Axis 3 of CREDD 2015-2025). ▪ Critical bottlenecks: increasing insecurity, access to finance for (local) enterprises (credit), access to energy, high costs for transport and logistics, and lack of certain skills, which undermine Mali's competitive advantages; despite nearby markets and ongoing trade with neighbouring (coastal) countries. ▪ Only 7% of men and women have access to financial services.	▪ GoM, 2019 ▪ World Bank, 2018; CPIA, 2017 ▪ TI, 2019; Score, 2018 ▪ AGRA, 2018a

Dimension	Indicators	Status	Narrative	Sources
			▪ Overall, 2017 CPIA score for Mali: 3.4 above SSA average score of 3.1. However, reduction in governance score (-0.5) between 2006/08 and 2015/17. Also, reduction of scores on economic management, public sector management and policies for social inclusion and equity. ▪ Corruption Perception Index 2018: Mali ranks 120 out of 180 countries; the perceived level of public sector corruption is relatively high with a score of 32 out of 100 in 2018.	
	Rural infrastructure		▪ Poor rural infrastructure (high transportation costs) and poor access to electricity (in 2017, only 12% of the rural population had access to electricity) are critical issues in accessing input and output markets and value addition (private sector). ▪ In 2017, 35% of the population (+15 years old) owned an account with a financial institution or mobile money service provider. ▪ Net enrolment rates in primary (2017: 61-76%) and secondary education (2018: 29-41%) showed fluctuations during 2008-2017. ▪ Literacy rates increased over recent years; 36% of the population is literate (+15 years old in 2018); with 46% of men and 26% of women being literate.	▪ World Bank, 2019c (WDI: rural electrification, account ownership and school enrollment) ▪ UNESCO, 2019 (literacy and education) ▪ Oxfam, 2019
4. Implementation and delivery	Organisational structures for policy implementation & service delivery		▪ Public agricultural services are in place and functioning. Local governments (regional and local) and non-state actors play a key role in implementing policies. ▪ While agricultural services and local governments receive public funding, donors often support operational costs. ▪ Local governments and public services are absent in the insecure localities (North and Center).	▪ Key informant interviews
	Organisational capacity for implementation and service delivery		▪ In 2017, GoM spent 0.44% of its agricultural GDP on agricultural research (below UA requirement); research depends largely on donor funding. ▪ In 2016, 70% of PhD researchers were close to the retirement age, which means a loss of research capacity if no adequate recruitment will take place.	▪ IFPRI /IER, 2018 (ASTI, 2017)
	Mobilisation/leveraging of private sector and donor investments for implementation and service delivery		▪ The government acknowledges the key role of the private sector in agricultural development and the need for increased private investments. ▪ Mali has opened most of its sectors and the government specifically aims for enhancing the enabling the business environment. ▪ However, during the period 2013-2017, private investment declined with 5% of GDP.	▪ GoM, 2019
5. Coordination	Different government agencies/units at national and local levels coordinate on		▪ Coordination mechanisms exist that allow for policy coherence in the rural development sector; i.e. regional, local and communal for	▪ Key informant interviews

Dimension	Indicators	Status	Narrative	Sources
	agricultural transformation		steering, coordinating and monitoring development actions (CR/L/C-OCSAD). ▪ However, articulation of local and sector development programming and budgeting remains a challenge.	
	Government coordinates with stakeholders, including development partners and the private sector		▪ The state has progressively withdrawn from agricultural production, processing and marketing and given place to the private sector. ▪ However, the private sector still faces challenges (see part 3. Enabling environment). ▪ Regional and communal authorities lack appropriate instruments for private sector development and enhancing the business climate. ▪ Through it's decentralisation policy (effective since 2006) and related institutions, Mali has a strong tradition of local-level stakeholder consultation for rural development. ▪ Mali has some fairly well organised multi-tier producer organisations whose representatives participate in policy formulation, implementation and monitoring.	▪ MDFL/DGCT, 2017 ▪ IRDR, 2018 ▪ Key informant interviews
6. Accountability	Policies on agricultural transformation are developed based on feedback from rural stakeholders		▪ Through sector and local level multi-stakeholder platforms, Mali facilitates mutual accountability (see part 5. Coordination). ▪ Mali obtains high AU scores for "fostering peer review & mutual accountability" (10/10) and "conducting a biennial agricultural review process" (9.82/10)	▪ GoM, 2019 ▪ AU, 2018
	Policies and results on agricultural transformation are published and accessible		▪ Through the implementation of its decentralisation policy, citizen participation in local development planning and monitoring has increased.	▪ MDFL/DGCT, 2017 ▪ Key informant interviews
	Results-driven monitoring & evaluation of agricultural transformation		▪ Mali scores good in terms of promoting evidence-based policies and institutions.	▪ AU, 2018 ▪ World Bank, 2018

Source: own elaboration

Considerable progress made
Progress made but lagging behind
Considerable progress still needs to be made

4.2 AGRA change ambitions

AGRA's PIATA (2017-2022) ambition in Mali is to catalyse and sustain an inclusive agricultural transformation to strengthen resilience, increase incomes and improve food security of smallholder farming households. The underlying theory of change is that unlocking sustainable transformation combines strengthening policy and state capability, agricultural inputs, extension and market systems development and building of partnerships.

Under policy and state capability, AGRA is committed to aligning with GoM's priorities and programmes in agricultural transformation, and working with the government to strengthen

implementation capacity while enhancing accountability systems and enabling environment for increased public and private investments that facilitate the transformation of Malian agriculture.

In May 2019, AGRA's portfolio for policies and state capabilities in Mali contained the following support activities:

- The development of PNISA and one or several agricultural development flagship programmes;
- The rationalisation and roll out of the existing government's programme for subsidies of agricultural inputs;
- The domestication of the ECOWAS seed and fertiliser regulation;
- The improvement of the planning and implementation capacities of the Ministry of Agriculture for enhancing effective service delivery;
- The preparation of a Memorandum of Agreement for the next Biennial Review Rating of the CAADP process.

At present, AGRA effectively provided support through three pilot projects (see Table 4).

The grants provided (a total of US$698,000) aim to:

- strengthen the GoM's capacity in planning and budgeting (PNISA) of the agricultural sector policy, and the coordination and monitoring of policy implementation; mainly through reinforcing the capacities of CPS/SDR;
- reinforce the GoM's capacity to deliver the services that are considered essential for agricultural transformation; particularly the implementation of the agricultural input subsidy system;
- accompany the GoM, and specifically the DNA to develop a country flagship programme in the field of agricultural extension (PPAD) and to leverage funds for its implementation.

Table 4: AGRA Mali investments in state and policy capability

Grant number	Description/purpose of grant	Partners	Expected outcomes *	Progress to date
-	Domestication of ECOWAS seed and fertiliser regulation	CPS/SDR, DNA & ECOWAS	Strengthened sector system functioning (a)	Under preparation
-	Strengthen the M&E system of the Ministry of Agriculture through the CPS/SDR	CPS/SDR, DNA & European Union	Strengthened sector system functioning (b)	Active & on track
-	Support the GoM to develop a country flagship programme	Ministry of Agriculture, development partners, agricultural organisations, private sector & NGOs	Strengthened sector system functioning (a)	Active & on track
-	Support to the Ministry of Agriculture for the rationalisation and rollout of the existing	Ministry of Agriculture, WB, EU & USAID	Strengthened sector system functioning (a)	Active & on track

	input subsidy programme			
-	Assist the Government in cascading the PNISA to sub-national level and developing regional investment plans	Ministry of Agriculture, development partners, agricultural organisations, private sector & NGOs,	Strengthened sector system functioning (a)	Active & on track

* Outcome (a): Strengthened government and agricultural planning, coordination, performance, and agricultural advocacy.
* Outcome (b): Harmonised system for tracking and measurement of agricultural transformation at national level.

Sources: AGRA Mali, 2017; 2019

4.3 AGRA system change results

In 2017, AGRA's support to the GoM under the PIATA started with a one-year grant, which became a full grant from September 2018 (US$698.000). However, because of disbursement issues, AGRA gave a budget neutral extension until September 2020. AGRA's support is motivated by the GoM's commitment to inclusive agricultural transformation (see Table 3; political commitment; LOA and HCA) and the translation of this commitment into policies and strategies (see Table 3; agriculture transformation policies).

Strengthen the M&E system of the Ministry of Agriculture through the CPS/SDR
AGRA Mali provided technical assistance (TA) to CPS/SDR, for the computerisation of the M&E system of the Unit. The computerisation allows for a swifter processing and analysis of data on the structure of Malian agricultural sector (information from the agricultural census) and the ongoing projects and programmes (listed in the PNISA, with their objectives, indicators and up-to-date values of the indicators). This facilitates the alignment of various agricultural development initiatives with national policies, the rational allocation of financial resources to programmes, and the coordination of the different interventions. It also will improve accessibility of data to key stakeholders in the sector and reduce transaction costs.

Despite a delay in the TA recruitment, the CPS/SDR staff considers the computerisation of the M&E system an important step in improving the performance of the Unit. Presently, a pilot is running in relation with the regionalisation of the PNISA (see below).

Support the GoM to develop a country flagship programme
At the request of the GoM, AGRA Mali provided TA (consultants) for the identification and formulation for a flagship project for PPAD in Mali. The DNA is the project owner and, with support from AGRA Mali, organised workshops (September and October 2019) to validate the project proposal and inform development partners on the proposal (resource mobilisation). Project implementation will contribute to strengthening the capacity of delivery of extension services.

In order to improve agricultural productivity, the project intervenes in four areas:

- Develop a private sector led agricultural input distribution system, household survey results in the Koulikoro and Sikasso regions indicate that the average distance to agro-dealers is 7-8 km for both maize and cowpea farmers (see Section 7.7 and 8.7). Yet, these results were acquired in two regions that are well known for their extensive system of extension services (see Section 5.1). Of maize farmers, 99% apply inorganic fertiliser, yet only 7% apply AGRA-endorsed fertiliser (DAP and urea). For cowpea farmers, 36% of farmers apply inorganic fertiliser, yet 0% applies

the endorsed combination of DAP and urea. As such, it seems that access to inputs is less of a problem than access to information in the survey regions.

- Improve market access through aggregation and contractual agreements with private sector buyers. In the sample of the household survey, 0% of cowpea farmers and 2% of maize farmers sold produce under contractual arrangements (see Sections 7.11 and 8.11). Either this indicates well-functioning spot markets, or a system that does not sufficiently provides the opportunity for structural arrangements.
- Enhance the financial inclusion of micro, small and medium enterprises in the agri-food sector. Looking at farmers in the household survey, it is noted that around 24% of the households has a bank account currently (across maize and cowpea farmers), 19% of the households have taken out a loan, and 1% has crop insurance (see Sections 7.8 and 8.8). Regarding smallholder farmers, a lot can be gained regarding financial inclusion. However, looking at the results of our rapid SME survey, it is observed that seed companies have a formal credit score of 3.6/4, input-suppliers/agro-dealers score 4/4 on formal credit, and agri-value chain actors 3.6/4 on formal credit (see Section 9.3). It seems that these enterprises often already have the opportunity to acquire formal credit.
- Strengthen the resilience capacity of agricultural systems to climate change through the dissemination of technologies and advice on good practices for climate-smart agriculture.

Support to the Ministry of Agriculture for the rationalisation and rollout of the existing input subsidy programme

In 2017, AGRA conducted an assessment and evaluation of agricultural input subsidy strategies and programmes in 10 countries in sub-Saharan Africa. The Mali input subsidy programme started as an action plan related to the GoM's Rice Initiative (Initiative Riz) in the 2008/2009 planting season, with the aim of intensifying rice production through the supply of subsidised inputs (fertiliser, seeds). It was extended to other crops, such as millet, sorghum, maize, wheat and even cotton, and other regions (rain-fed agriculture). In the 2016/2017 planting season, a pilot e-voucher programme for inputs started in the Sikasso and Ségou regions. In 2017, 44% of all farmer households in Mali benefited from the national programme and used the inputs on estimated total of 6 million ha of food crops (cotton excluded). However, since the start of the national programme, yields did not improve for all crops (millet and sorghum), the number of beneficiary households only slightly increased, whereas the overall budget for the programme augmented significantly, and transaction costs also increased. Furthermore, smallholders do not always have access to the mobile phone network in the case of e-vouchers (AGRA, 2018b).

This evaluation resulted in a series of conclusions and recommendations to the GoM for adapting and improving strategies (targeting and graduation of beneficiaries), mechanisms (input delivery systems, timing) and enabling policies (alignment with regional rules and regulations for agricultural input, quality control, involvement of local governments and agricultural services; AGRA, 2018b). The AGRA team presented the results for Mali case during a validation workshop for stakeholders in the agricultural inputs system (January 2019). Currently, AGRA Mali supports the Ministry in reviewing procedures through organising stakeholder meetings and providing TA (consultants).

To see if the decision to use improved agricultural inputs depends on the financial capacities of smallholder farmers, the KIT team compared the use of agricultural inputs between the

two lowest income distribution quintiles and the two highest quintiles for the two crops in the household survey dataset (see Table 13 and Table 62). The results show that there is no indication that poorer farmers use less inorganic fertiliser than richer farmers (see Table 5). The input use that seems to be most driven by financial means is pesticide, which could therefore be an efficient target of a rationalised input subsidy programme.

Table 5: Use of several input supplies by poorest and richest farmers in household survey dataset

	Cowpea		Maize	
	Poorest	Richest	Poorest	Richest
Inorganic fertiliser	39%	36%	98%	99%
Pesticide	33%	45%	5%	11%
Herbicide	43%	49%	86%	93%
Fungicide	13%	9%	20%	19%
Inoculants	1%	2%	NA	NA

Assist the GoM in cascading the PNISA to subnational level and developing regional investment plans

The PNISA defines Mali's public investment programme in agriculture, taking into account the achievements, needs and funding gaps of the sector. AGRA Mali supports the development of the PNISA into five regional programmes,[3] which form the framework for stakeholder consultation and mutual accountability (between the Ministry of Agriculture and other agriculture stakeholders) at regional level. For this purpose, AGRA also supports the computerisation of the M&E system being used by CPS/SDR, which provides inputs for the regional programmes. Several regional programmes are available but still need to be validated by the key stakeholders and the regional and national authorities.

Support by AGRA Mali in the pipeline or ongoing

At the end of 2019, the AGRA team was preparing two support activities with the Ministry of Agriculture. The first being the already planned review and domestication of ECOWAS regulation regarding agricultural inputs (seeds, fertilisers and crop protection products). This aims to align national and regional policies, which contributes to an improved functioning of a regional market for agricultural inputs, and hence an improved accessibility of inputs to farmers. The second one is a study, on behalf and for the benefit of DNA, on so-called 'emerging' value chains besides the conventional staple-food value chains (millet, sorghum, maize, rice and cowpea). The candidate emerging value chains are Irish potato, sweet potato, sesame, fonio, '*souchets*' [sedges] and cassava. These crops either are occasions for responding to growing market-demands (Irish potato, sesame) or are of particular interest to women (fonio). They are offer opportunities for the development of inclusive value chain development and the improvement of smallholder incomes.

According to data provided by the AGRA Mali team for the PIATA output and outcome indicators, despite some initial challenges, the programme's interventions are on track,

[3] The five regions are: Tombouctou, Gao, Kidal, Taoudénit and Ménaka. The other regional plans (Kayes, Koulikoro, Sikasso, Ségou and Mopti) were developed by CPS/SDR with support from other partners.

highly effective and might achieve the targets set for 2021 (see Table 6). However, there are some exceptions, notably for funds mobilised by the government for investments in the value chains, which might be due to budget constraints; the review of agricultural policies; and the rate of implementation of recommendations from the joint sector review.

Table 6: AGRA Mali target values and performances on selected indicators for policy and state capabilities

System components	Indicators	Target values 2019	Actual values 2019*	Achievement 2019 (%)	Target values 2021	Achievement 2021 (%)**
Investments	Value of government investment leveraged (US$) to strengthen agriculture and selected value chains	1,200,986	35,000	3%	1,862,795	2%
	Value of donor investment leveraged (US$) to strengthen systems and selected value chains as a result of AGRA support	1,470,455	3,870,954	263%	1,409,091	343%
Sector coordination	Number of agriculture sector working group meetings held	11	7	64%	11	100%
	Number of mutual accountability forums (JSR) held	2	2	100%	4	200%
	Percent of JSR recommendations implemented	75	19	25%	75	20%
	Percent of donors/NGOs projects aligned with national agricultural priorities	30	84	36%	84	36%
	Number of joint monitoring visit's reports to AGRA supported interventions produced and shared with local authorities	12	17	142%	36	108%
	Number of quarterly planning and review meeting reports produced	12	12	100%	36	50%
Policy implement-tation	Number of agricultural policies completing the process steps*	2	0	0%	2	0%
	Rate of implementation of annual national agriculture sector programmes and/or strategies	25	86	344%	70	120%
Lobby and advocacy	Number of policy advocacy meetings	3	4	133%	3	133%

System components	Indicators	Target values 2019	Actual values 2019*	Achievement 2019 (%)	Target values 2021	Achievement 2021 (%)**
	and roundtables organised to improve advocacy efforts by key policy and regulatory stakeholders	60	250	417%	60	417%
	Number of participants in policy advocacy meetings and roundtables					
Technical assistance	Number of strategies/NAIPs developed/reviewed with AGRA support	5	5	100%	5	100%
	Number of agriculture development programmes designed and implemented	91	94	103%	91	103%
	Number of flagships designed and implemented	2	1	50%	2	50%
	Number of technical experts seconded to government ministries with AGRA support	2	2	100%	2	150%

* Process steps: 1. Analysis; 2. Stakeholder consultation/public debate; 3. Drafting or revision; 4. Approval (legislative or regulatory); 5. Full and effective implementation.

Sources: AGRA Mali, 2019 (not published).

4.4 Analysis of AGRA system interventions

AGRA's position in the intervention landscape

The CSP/SDR also receives support from the European Union (EU), the International Fund for Agricultural Development (IFAD), and the World Bank. The latter funds and supports various projects and programmes that are relevant for AGRA's support to policy and state capability. These World Bank initiatives are listed below and cover the areas of decentralisation, enabling an environment for economic development and coping mechanisms of rural households with shocks.

Deployment of State Resources for Better Service Delivery Project for Mali

This project's aim is to improve the availability and timeliness of resources from the central government to local governments, as well as the management and accountability of these resources by local governments and service centres. This project has two intervention components: i) supporting deployment to and management of resources from the central government to local levels, all the way to service centres; 2) strengthening institutions and capacity for more inclusive and accountable local governments (strengthening of institutional capacity at local levels to better manage resources, and strengthening oversight and citizen engagement mechanisms).

The World Bank approved financing by International Development Association (IDA) to improve agricultural productivity and the resilience of drylands communities, foster inclusive growth and support social protection in Mali.

Second Poverty Reduction and Inclusive Growth Development Policy Operation
This operation aims to sustain the foundations for inclusive, pro-poor economic growth and enhance protection for the most vulnerable. It supports policy reforms with respect to land tenure, energy, agricultural subsidies, telecommunications, social protection and microfinance.

Drylands Development Project
This project combines a set of interventions that aims to reduce the impact of drought and climate change on an area covering roughly the northern part of the regions of Kayes, Koulikoro, and Segou, and the whole of the Mopti region. It combines direct and productive cash transfers with the delivery of agricultural inputs, services and infrastructures while supporting local community and national institutions. This will keep at least 20,000 households out of danger in areas that constitute some of Mali's poorest zones.

Safety Nets Project (Jigisemejiri); additional financing through an IDA grant)
This project's overall purpose is to further strengthen the country's current social safety net system and increase the resilience of poor and vulnerable households. It builds on the Emergency Safety Nets Project approved in 2013. To date, the project is providing quarterly cash transfers to 67,845 families (90% of target), reaching 390,465 individuals, of which 49% are women, in the regions of Kayes, Sikasso, Koulikoro, Segou, Mopti, Gao, and in Bamako. The additional financing interventions will help promote development and supporting households' food security.

Compared to these World Bank interventions, AGRA's interventions stand out for being at the centre of agricultural policy development, implementation and review. They focus on the coordination of the planning and implementation of national policies in the agriculture sector; concentrating on those policies and strategies that facilitate access of smallholder farmers to inputs and technologies. In the same time, through its grantees in the target regions (Koulikoro, Sikasso and Ségou) and value chains (cowpea, maize, millet and sorghum), AGRA combines operating at local level (extension system) with activities at national level (policy and state capabilities). This allows for fruitful interactions between policy and practice. It thereby aims for systemic changes that are vital for making agricultural transformation a reality for the benefit of smallholder farmers.

Relevance
AGRA's PIATA activities fully align with GoM's rural agricultural development policies and strategies. This is the result of regular consultations between AGRA and the Ministry of Agriculture and the good relations between the AGRA Mali team and policymakers in the Ministry.

AGRA's support is also in line with the recommendations from the AU that resulted from the assessment of the progress made by Mali under the Maputo Declaration for agricultural transformation (see Table 2) and the insights gained from the overall system analysis (see Table 3).

When comparing the insights from the overall system analysis with the support activities of AGRA, it can be concluded that these activities address systemic issues. Specifically through: the review and adaptation of policies (domestication of ECOWAS seed and fertiliser regulations); the improvement of sector coordination and accountability mechanisms (strengthening of the sector M&E system and cascading the PNISA to subnational level); and the reinforcement of service delivery by the public sector (rationalisation and rollout of the national input subsidy programme and development of a flagship programme for agricultural extension) (see Table 4).

Two support activities of AGRA Mali to the Ministry of Agriculture through the CSP/SDR stand out: strengthening the sector's M&E system by enhanced computerisation and regionalisation of the PNISA (regional rural and agricultural investment programmes).

In a vast country, such as Mali, with a large diversity of crop and livestock systems, stakeholder consultation for national policies is a challenge. Cascading the PNISA reinforces commitment of the regional public sector structures to agricultural transformation and closes the 'gap' between policymakers and (non-state) leaders in the agricultural sector. Computerisation certainly allows CSP/SDR to improve the collection, analysis and publication of relevant data (reliability and speed) and to reduce the transaction costs involved. It may also have a positive spin-off for other tasks of the CSP/SDR; i.e. the annual permanent agricultural conjuncture survey (EAC), and the periodic general census of agriculture and livestock (RGAE).

Another striking AGRA support activity is the rationalisation and rollout of the existing input subsidy programme, which may have a determining effect on the livelihoods of (small-scale) farmers. According to a recent survey, 70% of households do not use improved seed varieties or phytosanitary products, and 44% of agricultural households use inorganic fertilisers (EAC 2017-2018).[4] At the same time, the poorest farmers using hardly any fertiliser are hard to reach by e-voucher based programmes because of the high rate of illiteracy within this target group (World Bank, 2019). Fertiliser subsidy has always been an integral part of the agricultural development strategies of successive governments of Mali. Input subsidies aim to encourage the use of fertilisers for improved agricultural production and productivity in order to ensure food security, protect farmers against the volatility of fertiliser prices, and increase farmers' incomes (Koné et al, 2019).

During interviews with policymakers at the Ministry of Agriculture, they mentioned other reforms that are in the pipeline and would be eligible for AGRA support. These reforms concern agricultural inputs (quality control of fertiliser, certification of seeds, and information of farmers and agro-dealers on the related laws, regulations and standards) and agricultural finance (productive investments).

Expected impacts

Preceding PIATA, AGRA support in the Malian agricultural sector targeted particular stakeholder groups and activities that are relevant for service provision to farmers. AGRA funded the training of sector professionals (33 MScs and 7 PhDs), the development of varieties (66 varieties), the improvement of input supply (4,689 agro-dealers and seven seed companies), the development of financial products (three products and two finance

[4] http://blogs.worldbank.org/opendata/new-mali-survey-data-now-available

institutions), and the training on farmers on integrated soil fertility management, and bulking and trading of produce (AGRA Mali, 2019).

AGRA's system approach and involvement in policymaking and reforms at the national level is thus relatively recent in Mali. Support activities only became effective in 2018 and therefore it is too early to fully assess the effectiveness of the support. Nevertheless, it is expected that two support activities will have a positive impact on the food security situation and agriculture within a relatively short period:

- The rationalisation and further role out of the national input subsidy programme. It is expected that within a short period, this will reach and better target more smallholder farmers, provide inputs on time, and reduce transaction costs. However, additional efforts might be needed to inform and train farmers on the use of inputs and the application of other good agricultural practices.
- The cascading of PNISA to the regional levels. These programmes are ready for validation and allow, in the medium term, for developing more tailor-made agricultural development projects and programmes and the improved rational use of financial resources.

Sustainability of results

The strong alignment of AGRA's efforts with the agricultural transformation policies of the GoM is an important factor in facilitating institutional sustainability. Furthermore, several indicators point out the overall quality and stability of governance institutions in Mali[5] and the institutionalised stakeholder participation in policy formulation, implementation and M&E.

However, various interviewees stressed the strain on public funds for rural development under the pressure of the current insecurity situation. This might imply an increased reliance on donor funding of agricultural development projects and programmes, and hence the importance of enhanced rational use of financial resources and strong accountability mechanisms.

[5] In 2017, the overall Country Policy and Institutional Assessment (CPIA) score for Mali was 3.4 (out of 4.0); with a decline of 0.3 between 2008 (3.7) and 2012 (3.4) after which the score remained stable (World Bank, 2018b).

5 Agricultural extension system

5.1 System performance

Evolution of agricultural extension and advice in Mali

The evolution of agricultural extension and advisory services in Mali very much followed the same pathway as it did in the other French-speaking countries of the West African Sahel.

In the 1960s, after the country's independence, under a socialist regime, and in the 1970s, agricultural extension services were exclusively provided by the public sector. Its role was to transfer information and technologies, as defined by policymakers at central level and agricultural research organisations, to (mainly male) farmers who headed and managed their small-scale and family-run farms. During the same period, parastatals (CMDT for cotton, ON for rice) and state-run rural development operations (OHVN for groundnuts) developed their own agricultural extension organisation and approaches.

Under the pressure of structural adjustment programmes in the 1980s, public agricultural services were scaled down and, in some cases, even dismantled, which led to underfunding and understaffing; for instance, retired extension agents were not being replaced. From then on, the increased reliance on donor-funded projects and programmes had an influence on the way agricultural extension was organised. Through various World Bank-funded programmes, the training & visit (T&V) approach was implemented, which was a generic and top-down approach requiring rigorous management in order to be effective. NGO-led projects introduced participatory training and learning approaches for agricultural extension that are more demand-driven and take into account the diversity of farmer households and their livelihood strategies. Several approaches also went beyond farm level and included village land management (*gestion du terroir*), while drawing on methods and tools that were developed for Rapid Rural Appraisal approaches (DLEC, 2018).

A specific case is the agricultural extension and advisory system of the Malian cotton company (Compagnie Malienne pour le Développement du Textile – CMDT) and, to a lesser extent, that of OHVN (Office de la Haute Vallée du Niger). The CMDT was responsible for managing the cotton supply chain in the southern Mali from the distribution of inputs to smallholder cotton farmers to the ginning of the harvested cotton, including training and advisory services for farmers. Since GoM had mandated CMDT to provide extension and advisory services to all farmers in its intervention zone, beyond the sole crop of cotton, the parastatal developed an advisory approach for improved management of smallholder farms. ON (Office du Niger), the parastatal responsible for managing the large-scale rice irrigation scheme in the inner delta of the Niger River, developed a similar advisory approach. From 2000, when the GoM initiated a long process of institutional repositioning and organisational reform of the CMDT, the parastatal gradually withdrew from public agricultural services and refocused it extension services on cotton.

Because of the liberalisation of the Malian agricultural sector and the privatisation of functions such as input supply and marketing of outputs, in the 1990s and 2000s, private enterprises and producer organisations also engaged in provision of extension and advisory services. In the case of farmer and livestock holder organisations, they were often supported

by (non-profit) NGOs and donor-funded projects, which assumed that such member-based organisations know best what agricultural producers need and that they could fill in the gap that was left by a withdrawing public sector. At present, the involvement of (for-profit) private enterprises is rather limited to input dealers and veterinary service providers, who provide embedded extension and advisory services to targeted farmer clients (DLEC, 2019). There are some examples of aggregators, processing and trading companies that provide extension and advisory services to farmers (IFDC, 2017).

Pluralistic agricultural extension and advisory services

From a systems point of view, the agricultural extension and advisory services in Mali can be characterised as pluralistic, in terms of service providers as well as methods.

Various types of service providers are active in Mali:

- The DNA (public sector) through its regional offices and network of field agents in the whole country, and thus interacting with a large variety of farming systems.
- The most important parastatals in Mali, the CMDT and the ON, which still maintain an extensive network of agents, and make use of and collaborate with (cotton and rice) producer organisation for extension purposes. The CMDT network covers the southern part of Mali and the ON provides services to rice producers in the irrigation scheme of the inner delta of the Niger River. Both organisations focus on advisory services for farm management.
- There are numerous donor-funded and NGO-led projects, which support farmer-led innovation, training and extension.
- Agro-dealers, processing units and traders offer extension services (training, inputs) to farmers and their organisations.

In the household survey sample, the most common provider of extension services to maize farmers were VBAs (48%), followed by the NGOs (31%), the government (29%), and cooperatives (3%). For cowpea farmers, the order of providers is the same with VBAs at 38%, followed by NGOs (37%), the government (33%), and cooperatives (5%) (see Table 39 and Table 90).

As for the diversity of methods, three main types of approaches can be distinguished (Keïta et al, 2017):

- The conventional agricultural extension approach through which field agents transfer information and technologies to individual or groups of farmers, mainly through trainings and demonstrations (e.g. demo plots). All the above-mentioned service providers use this approach to various extents. It usually focuses on technologies and access to inputs. In combination with farmer-led networks and audio-visual means, the approach allows for reaching many farmers within a short period of time.
- The group-based learning approach commonly referred to as Farmer Field Schools (FFS), which teaches farmers how to solve problems and experiment practical solutions, often in the form of integrated management of crop protection and soil fertility, which combines several technologies (packages). The field agent is a process facilitator, as well as a broker for establishing relations between the farmer group and other service providers, such as agricultural research, seed producers and agro-dealers, but also off-takers of agricultural products. In the latter case, the approach evolves towards Farmer Business Schools (FBS), which includes learning how to make crop management operations and farming as an enterprise profitable and responding to market demand.

- The management advice for (family) farms approach (in French: *conseil de gestion aux exploitations agricoles*), which is the methodology that supports the farmer when making farm management decisions, which are based on his objectives as head of a farm household (food security, income) and his own assessment of the performance of the farm. For that purpose, the farmer records technical and economic data on the farm's performance. The role of field agents is to assist farmers in the assessment, give advice on improved crop, herd and farm management and, eventually, broker linkages with other service providers.

For many organisations involved in agricultural extension, radio programmes are an important means to reach farmers, particularly those who are illiterate. Radio programme methods are five times more effective in reaching their results than conventional approaches (DLEC, 2018).

Looking again at the household survey sample data in the Koulikoro and Sikasso regions, it is noted that 6% of maize farmers make use of extension services provided through the demo plot method, and 9% of cowpea farmers. Only 3% of households cultivating maize make use of FFS, whereas 4% of cowpea cultivating households do so. More common extension methods are a transfer of knowledge within farmer organisation (cowpea: 14%; maize: 12%), support by farmer promoter (cowpea: 8%; maize: 7%), and mentoring by lead farmers (cowpea: 8%; maize: 6%). Notably, 69% of maize farmers and 47% of cowpea farmers do not make use of extension services in any form (see Table 41 and Table 92).

Until present, the use of information and communication technologies (ICT) for agricultural extension purposes is limited to some innovative projects, such as information services for livestock herders and for smallholder farmers and the e-voucher system for managing agricultural input subsidies.

As for the first category of initiatives, there are two remarkable initiatives in Mali:

- The Sustainable Technology Adaptation for Mali's Pastoralists (STAMP; 2015-2018 and 2019-2021), which is implemented by the Netherlands Development Organisation (SNV), facilitates access to and use of geo-satellite derived data via the development of a dedicated information service in order to strengthen resilience among pastoralists affected by extreme climate events;[6]
- Sènèkèla (2012-2020), which is a mobile agricultural value-added service (Agri VAS) provided by Orange Mali offering information on agricultural topics and market prices (maize, onion, shea and cashew; MAgri, 2014; 2015).[7]

Examples of the second category are:

- myAgro, a private company, which – with support from various donors – developed a mobile layaway system that relies on myAgro scratch cards, with which farmers can purchase seeds and fertilisers in increments that are small and convenient.[8]
- A pilot, with support of the World Bank of an electronic voucher (e-voucher) system for fertilisers in the regions of Mopti, Tombouctou, Gao in 2015-2016, and Ségou (districts of Bla and Niono; millet, sorghum and rice) and Sikasso (Koutiala and Yanfolila districts; maize) in 2017-2018 (World Bank, 2019d).

[6] See https://snv.org/project/stamp-building-success
[7] See https://www.gsma.com/mobilefordevelopment/resources/orange-senekela-project-update-insights-from-the-midline/
[8] See https://www.myagro.org/

The use of ICT for agricultural information and extension services in Mali seems promising because of still increasing mobile phone penetration (estimated at 60% in 2017; DLEC, 2018) and number of mobile cellular subscriptions (115 per 100 people in 2018; DLEC, 2018), and the increased user-friendliness of mobile phones and applications. On the other hand, access to electricity – only 12% of the population in rural areas – and the persisting level of illiteracy remain structural barriers for going to scale and particularly for making it inclusive. In fact, the illiterate and often poor farmers make less use of such ICT-based services (information) and are more difficult to reach for e-voucher schemes that particular target smallholder men and women farmers (MAgri 2015; World Bank, 2019d).

Governance, coordination and collaboration

Considering the vastness of the country, the variety of service providers and methodological approaches, as well as the overlap of services among them, effective communication and coordination among agricultural research, extension and advisory service providers remains a challenge. Organisations, such as CMDT and ON, which are important agricultural service providers, have developed coordination mechanisms within their intervention zones.

At the national level, DNA is responsible for the coordination of agricultural and advisory services with other departments. Regional and local offices of DNA, in collaboration with districts (communes) also embark on similar initiatives but often lack the resources to sustain the mechanisms. In general, the public sector appears to be adept at collaborating with private for-profit and non-profit service providers. Furthermore, poor transportation and communication infrastructure and the insecurity situation in certain parts of Mali make coordination even more difficult, let alone delivering services to farmers (DLEC, 2018).

In 2015, a group of civil society and producer organisations and NGOs created the Platform for agricultural and rural advice (FOSCA). It aims for harmonising and improving the provision of agricultural extension and advisory services in order to address effectively the development challenges of the Malian agricultural and rural sector. This platform is member of the Network of West and Central African Agricultural and Rural Advisory Services (RESCAR-AOC)[9] and the African Forum for Agricultural Advisory Services (AFAAS).

Financing and funding

Although exact data is not available, interviewees state that the public sector agricultural services face challenges due to limited public funding. While salaries of field agents are regularly paid, operational costs, such as equipment, transport and training of farmers, are hardly covered by the available budget, which thus considerably limits their performance. When working with donor-funded projects and programmes, such costs are paid for by the donor. Part of the costs could be rationalised through improved coordination and division of labour among different service providers. Despite the political willingness of DNA, effective coordination also remains a challenge.

The parastatals CMDT and ON finance the costs for service delivery through revenues from selling produce (CMDT - levies) and maintenance and development of irrigation works (ON - management fees). However, through support from donor-funded projects, specialised research and extension organisations, both national and foreign partners (such as the French agricultural research institute CIRAD), the parastatals were involved in developing the methodological approach for management advice to (family) farms and setting up the

[9] See http://rescar-aoc.org/?lang=fr

required institutions. For instance, both parastatals created specialised support centres that give advice to farmers (farm management), as well as local organisations of cotton and rice producers (financial management). Yet, it remains unclear to what extent the approach went to scale and how farmers benefited from it.

Several donor-funded projects in Mali, in some cases with FAO technical assistance, were instrumental in introducing the FFS and FBS approach and adapting them to local circumstances. Although local NGOs and producer organisations often are in the driver's seat and co-financed the implementation of the approach, external funding remains the predominant determinant for effective and sustained up scaling.

Some private companies benefited from donor support for training of client farmers (input buyers and output sellers) and their organisations. Principally, the costs for the agricultural extension services that they provide are implicitly funded through the sales of agricultural inputs and outputs. However, messages disseminated through extension are limited to the specific agricultural inputs (seeds, fertilisers, etc.) and outputs (agricultural produce) and target farmers (clients) with whom private companies work.

Human resources

Although there are no up-to-date reliable data on the field extension agent–farmer ratio, it is estimated that, in Mali, in general, one field agent has to serve some 4,700 farmers and some 20% of farmers have access to extension services (AGRA 2017; AGRA 2019). Data from 2009 show that the public sector agricultural extension and advisory systems employed 839 staff of which 646 were field agents, who are in direct contact with farmers (DLEC, 2019). Overall, in the light of an increasing rural population, the number of public sector extension agents remains low. The gender balance among extension agents varies but numbers of female agents tends to be low; typically between 10 and 25% (DLEC, 2018).

Whenever the national budget allows, the DNA makes an effort to recruit agents. It is more common for the public sector agricultural extension to rely on farmers for extension as part of the system to reach more farmers. However, many farmers do not have the requisite professional qualifications. DNA also collaborates with NGOs or projects, which employ their own extension agents. Another imbalance is the professional background and technical expertise of public sector agents of whom most have a technical training (crop farming, livestock breeding and forestry) and relatively few have knowledge and experience in rural sociology and economy (DLEC, 2018).

Accountability

Throughout the national agricultural extension and advisory services system, accountability from services providers to farmers is a common practice. This is mainly due to the acknowledged role of producer organisations, which exist in all agricultural sub-sectors and agro-ecological regions and, at all levels, as representatives of smallholder farmers. Several producer organisations also offer extension services to their members who require accountability. Furthermore, decentralisation has brought public services closer to their users.

Table 7: Performance of the agricultural extension and advice system in Mali

System components	Strengths	Weaknesses	Opportunities	Threats
Pluralism	• Various state (public) and non-state (POs & private companies) AEA service providers • A wide range of AEA methodologies available (extension, learning/experimentation & advice)	• Overlap of functions (subsectors & regions) • Insufficiently addressing emerging and cross-cutting topics (e.g. climate change & resilience)	• Diversity of demand from various types of farmers for EAS • Increased involvement of non-state actors in agricultural extension and advisory system (AEAS) • Interesting and innovative experiences with ICT-based AEAS methodologies	• Insecurity: sub-sectors and regions being underserved • Underestimation: the potential of the pluralism; particularly non-state actors • High rate of illiteracy among farmers (women)
Policy framework	• Importance of well-functioning public AEAS acknowledged by key national policies	• Lack of a genuine national AEAS strategy and/or system	• Political will and mandate of DNA to coordinate NAEAS	
Governance and coordination	• Political will to coordinate • Functional linkages between research and AEA service providers	• Effective coordination at local level but almost absent at national level	• Existence of a national platform (FOCAS Mali) • Interest of non-state actors to coordinate and collaborate (win-win)	• Lack of a genuine national AEAS strategy and/or system
Financing	• State AEAS funded by GoM (salaries)	• Fragmentation of services across several departments • State AEAS under-funded • Non-state AEAS dependent on project funding and value chain performance (levies & fees)	• Non-state AEAS service providers, particularly private companies, gain importance	• Insecurity and binding constraints for private sector development hamper value performance
Staff	• State AEAS staff is present at field level all over the country • Skills of non-state AEAS are up-to-date	• State AEAS understaffed & non-up-to-date capacities (disciplines & skills) • Some sub-sectors and regions adequately staffed, others understaffed		• Inadequate match between demand for staff competences and offer by training institutes

Effectiveness	• Well-organised AEAS in the rice and cotton sub-sectors	• AEAS for other staple crops	• Interest of non-state actors to coordinate and collaborate (win-win) • Interesting and innovative experiences with value chain embedded services • Interesting and innovative experiences with pro-poor and inclusive AEAS methodologies	• High rate of illiteracy among farmers (women)
Accountability	• Effective accountability mechanisms at local level	• Weak accountability at national level	• Presence of functioning producer organisations	• -

Key challenges

The Malian National Agricultural Extension and Advisory System (NAEAS) faces some important challenges (see Table 7), and not only by the ministerial departments in charge of agricultural extension and advice, which are confronted with the 'usual' budget constraints. For instance, besides the still worsening security situation, structural constraints slow down Mali's economic development. This negatively affects revenues by state and the private sector, including producer organisations and this results in less income from agricultural value chains on which financing of agricultural extension and advisory services by both state and non-state actors relies.

The practical experiences with a pluralistic 'system' of agricultural extension and advice – various service providers and diversity of methodologies – provide a solid basis for organising a formal and functional NAEAS. Such a system could allow for more effective and efficient service provision through a division of labour (target groups, messages and methodologies) and subsequent allocation or pooling of human and financial resources. This calls for strong national leadership by the public sector but requires commitment and alignment from non-state actors.

Increasing demand for food by a growing population forms an opportunity for agricultural producers, agri-food processors and traders to improve their incomes and many of them are grasping this prospect. It also implies that producers and their organisations need to strengthen their market intelligence (information) and master the basics of agricultural entrepreneurship (skills). This, as already demonstrated by various initiatives in Mali, is an incentive for agricultural extension and advisory service providers to target specific groups of farmers and adapt their extension methodologies.

There is overwhelming evidence that climate change effects – especially unpredictable precipitation and extreme weather situations – have had a damaging impact on smallholder farmers' livelihoods in Mali. Additional research as well as integrating options for climate-resilient agriculture and natural resource management are needed in order to equip farmers with the required knowledge and skills. However, increased resilience is not only about

farmers and their communities applying appropriate climate-resilient practices, it is also about strengthening their capacities to adapt to climate change, for example, through accessing weather information.

Cross-cutting challenges such as strengthening climate resilience and pro-poor and inclusive (women and youth) local economic development involve addressing livelihood strategies and engaging grassroots communities. For the most part, Malian agricultural extension and advisory service providers do not have detailed strategies for community engagement. They could benefit from experiences with tailored approaches that address social inclusion elements, such as gender, youth, marginalised social groups and other vulnerable populations (Berthé, 2015; DLEC, 2018).

5.2 AGRA change ambitions

AGRA's PIATA (2017-2022) ambition in Mali is to catalyse and sustain an inclusive agricultural transformation to strengthen resilience, increase incomes and improve food security of smallholder farming households. The underlying theory of change is that unlocking sustainable transformation combines strengthening policy and state capability, agricultural inputs, extension and market systems development and building of partnerships.

Concerning agricultural extension systems development, the programme's interventions in Mali aim to:

- upgrade (reduction of post-harvest value losses, value addition at all levels and increased employment and entrepreneurship) of maize, millet, sorghum and cowpea value chains;
- improve seed and fertiliser distribution systems (vital for improving yields);
- strengthen agricultural extension services (transfer and adoption of improved agricultural productivity technologies);
- link farmers with remunerative markets ('structured markets'); and
- enhance financial inclusion and resilience, with particular attention on economic empowerment of women (agri-enterprise development).

Where necessary and feasible, AGRA Mali works with relevant development partners and private companies in targeted value chains, at all levels to crowd in private and public investments, to create synergies and reduce duplication of efforts, and increase the reach and impact of AGRA's investments (impact at scale).

The ambition is to develop integrated value chains, including production, aggregation, processing and marketing. As for the specific role of 'agricultural extension', AGRA considers extension services primarily to be carriers of knowledge and information for farmers and their organisations on quality agricultural inputs, good agricultural practices, and access to finance and market outlets in order to integrate value chains and thus benefit through improved income (AGRA Mali, 2019). For this purpose, the programme funds consortia that intervene within the regions of Koulikoro, Sikasso and Ségou. These regions were selected because of their high impact potential (number of smallholder farmers demanding support services) and their enabling environment for effective service delivery (road and communication infrastructure, presence of capable service providers). Besides, these regions are also vital for national food security through their considerable contribution to staple food production.

Each consortium consists of specialised, private (non-profit) service providers in agricultural extension, facilitating aggregation and access to markets, and (for-profit) agro-dealers and seed companies. Public sector services are less involved in fieldwork per se but are key in the supply of basic seed and the certification of multiplied seeds (agricultural research; Institut d'Economie Rurale – IER) and the coordination and the delivery of complementary agricultural extension services (DNA regional offices).

In all three consortia, the service providers for agricultural extension work with VBAs, who are male and female, adult as well as youth, farmers taking up extension tasks. This is part of AGRA's ambition to increase the network of extensionists from one agent for 6,000 farmers to one agent for 500 farmers. These farmer extensionists are a key strategic element in reaching the target number of 940,000 farmers. The agricultural extension grantees started to implement this strategy during the agricultural season of 2018.

Each field officer from the specialised service providers in agricultural extension will identify and train 20 to 50 VBAs (one man and one women per village) during group sessions in setting up and organising 'mother demonstration plots' on improved production technologies. In turn, each VBA will train 200 farmers, also during several group sessions, to set up 'baby demonstration plots'. Each VBA and each voluntary farmer setting up a baby demo receive a small bag (50g) of improved seeds.

The demonstrated technologies include: use of seeds of improved varieties (maize, sorghum, millet and cowpea); the application of manure and the use of fertiliser; following the recommended seed quantities and fertiliser doses; planting distances and fertiliser application techniques (pockets). Mother demos compare three improved varieties with one commonly used variety (four sub-plots) and baby demos use only one variety (one sub-plot).

Table 8: AGRA Mali investments in market system development including agricultural extension

Grant number	Title	Partners	Investment (US$)	Expected outcomes *	Timeframe	Progress to date
-	Koulikoro Inclusive and Competitive Agricultural Market Systems for Smallholders.	Faso Kaba, Camara semences & IER Mission Sahel, AMDD & DNA AMASSA & MALIMARK	2,929,046	• Increased use of structured markets	2017-2019	Active & on track
-	Improving Smallholder Farmers' Incomes and Food Security Through Enhancing Productivity and Market Access in Sikasso Region	SOPROSEK, SODIAF & IER AMEDD, Eucord & DRA AMASSA & ZAMOHO	2,048,658	• Reduced post-harvest losses • Increased agricultural employment and entrepreneurship • Increased use of structured markets • Strengthened and expanded business development,	2017-2019	Active & on track

Grant number	Title	Partners	Investment (US$)	Expected outcomes *	Timeframe	Progress to date
				financial and risk management services		
-	Enhancing crop production and access to profitable markets for smallholder farmers in the region of Segou	Comptoir 2000 SA, Doun Ka Fa & IER Faso Jigi & DNA AMASSA & MALIMARK	1,842,611	• Strengthened agricultural input systems, technology development and supply chain • Increased adoption of agriculture productivity enhancing technologies	2017-2019	Active & on track

Legend:
Organisations
- AMASSA: *Association Malienne pour la Sécurité et la Souveraineté Alimentaires*
- AMDD: *Association Malienne pour le Développement Durable**
- DNA: *Direction Nationale de l'Agriculture*
- DRA: *Direction Régionale de l'Agriculture*
- EUCORD : European Cooperative for Rural Development*
- IER: *Institut d'Economie Rurale*
- Faso Jigi: Farmers' organisation*
- Faso Kaba: Seed company
- MALIMARK: NGO (service provider)
- Mission Sahel (service provider)*
- SODIAF: *Société Diarisso et Frères*
- ZAMOHO: *Société Coopérative Simplifiée de Services Agricoles de Koutiala*

* Agricultural extension grantees

Source: AGRA Mali, 2017; 2019

5.3 AGRA system change results

Based on the data for indicators for the market system that were provided by AGRA Mali, it can be stated that the consortia are particularly successful, both on the 'input side' and 'output side' of the value chain systems (see Table 9). The number of improved seed varieties, the area under improved seed production and, to a lesser extent, the quantity and value of improved seeds sold are on track concerning the targets set for 2019 and 2021. The quantity of seeds sold highlights the constraints for effective adoption of improved seed varieties. The number of farmers linked to agro-dealers, the amount and value of fertiliser sold are all on track concerning the targets set for 2019 and 2021. Numerous agri-entreprises, led by men, women, as well as youth, are supported by AGRA along the targeted value chains and access financial service providers.

The high number of SMEs supported by AGRA (1,262 SMEs in 2019) might also explain the number of farmers which sell their products (volume and value) through so-called 'structured markets'. The household survey, though, shows that a relatively low percentage of farmers sell their produce through so-called 'structured trading facilities/arrangements' (only 2% of the maize growing households; see Table 49 and Table 99). Either this indicates differences in perception, well-functioning spot markets, or a system that does not sufficiently provide the opportunity for structural arrangements.

As for the extension system, the data provided (see Table 9) indicates that the achievement of the targeted outputs is on track (recruitment of VBAs, organisation and farmer participation in extension and training events). However, the data from the household survey that was conducted in the areas in which the AGRA interventions on agricultural extension take place (see Table 39 and Table 84) indicate that:

- In the sample, 37% of maize farmers had met with an agricultural extension officer in the last year, and 43% of cowpea farmers. Farmers met, on average, around three to four times with their extension officer.
- In the sample, VBAs are indeed the most common provider of extension services. Yet, only 9% of cowpea farmers and 6% of maize farmers have received extension services through a demo plot. Since AGRA's strategy is heavily reliant on VBAs and demo plots, capacity building through training and coaching of VBAs might require more attention from the contracted service providers (AGRA grantees).

Table 9: AGRA Mali target values and performances on selected indicators

System components	Indicators	Target values 2019	Actual values 2019*	Achievement 2019 (%)	Target values 2021	Achieve-ment 2021 (%)**
Farmers (outreach)	Number of farmers reached with promoted interventions	405,713	493,087	122%	811,426	95%
	Number of individuals who have received AGRA supported short-term agricultural sector training	103,120	394,411	382%	242,496	192%
Post-harvest practices	Number of farming households using post-harvest technologies/facilities	114,000	25,744	23%	228,000	11%
Aggregation and trade	Number of storage facilities refurbished/ developed	75	41	55%	136	96%
	Number of farmers selling produce through structured trading facilities/ arrangements	118020	131,375	111%	128,020	142%
	Quantity (MT) of crops sold through structured markets	300,000	339,484	113%	544,860	64%
	Value (US$) of target crops sold through structured markets	60,000,000	70,954,416	118%	73,190,009	67%
	Number of market information systems supported	1	1	100%	1	100%
	Number of farmers accessing market information	10,000	5,712	57%	58,320	10%
Agribusiness (SMEs)	Number of new enterprises supported and operating along	850	1,262	148%	1,200	130%

System components	Indicators	Target values 2019	Actual values 2019*	Achievement 2019 (%)	Target values 2021	Achieve-ment 2021 (%)**
	the focus value chains as a result AGRA interventions					
	Number of new people employed by SMEs receiving AGRA support	260	1,009	388%	884	184%
	Number of women-owned input and output market enterprises along the focus value chains supported	90	215	239%	117	197%
	Number of youth-owned input and output market enterprises along the focus value chains supported	40	154	385%	55	338%
Seed system	Area (ha) under seed production	5,600	5,283	94%	5,600	94%
	Quantity (MT) of improved varieties produced	4,060	3,921	97%	11,346	53%
	Quantity (MT) of seeds sold as a result of AGRA support	3,248	1,802	55%	9,077	33%
	Value (US$) of seed sold as a result of AGRA support	3,305,600	2,121,351	64%	9,218,800	36%
	Number of seed varieties and other technologies commercialised with AGRA support	6	5	83%	10	140%
	Percent of seed that pass the lab testings	95	n/a	n/a	95	n/a
	Percent of hectares of seed planted fields meeting inspection standards	95	96	101%	98	98%
Input system	Number of agro-dealers linked to input and/or output markets	250	259	104%	250	192%
	Number of farmers linked to agro-dealers and accessing inputs	92,000	123,159	134%	132,000	102%
	Amount of fertiliser sold by supported enterprises	6,300	7,685	122%	22,125	78%
	Value (US$) of fertiliser sold	4,009,091	4,229,941	106%	14,097,546	73%
Finance system	Value (US$) of loans leveraged as a result of AGRA investment	2,000,000	1,190,792	60%	6,100,000	44%

System components	Indicators	Target values 2019	Actual values 2019*	Achievement 2019 (%)	Target values 2021	Achieve-ment 2021 (%)**
	Number of financial products developed to provide financial services to smallholder farmers	2	6	300%	3	200%
	Number of financial institutions providing financial services for farmers and SMEs	2	9	450%	4	300%
	Number of target farmers receiving financial services (credit, savings, insurance)	60,857	92,077	151%	121,714	77%
	Number of supported SMEs receiving financial services (loan, overdraft, insurance, financial literacy)	680	753	111%	960	85%
	Number of women-owned input and output market enterprises along the focus value chains accessing financial services	4	21	525%	14	150%
	Number of youth-owned enterprises along the focus value chain accessing financial services	32	120	375%	44	273%
Extension system	Number of VBAs	2,150	2,546	118%	4,135	91%
	Number of post-harvest technologies demonstrated	0	0	-	3	100%
	Number of post-harvest technologies sold	600	593	99%	1,300	99%
	Number of extension service events completed	240,592	549,577	228%	422,918	184%
	Number of farmers and other value chain actors participating in AGRA-supported extension services	413,010	449,693	109%	670,020	99%
	Number of training events held to build capacity of farmers and other value chain actors along focus value chains					

Source: AGRA Mali, 2019

* Results uniquely achieved in 2019. ** Based on results achieved in 2017-2019 (cumulative).

5.4 Analysis of AGRA system interventions

AGRA's position in the intervention landscape

Many of the projects and programmes in the Malian agricultural sector, and particularly those targeting specific crop and livestock value chains, have some sort of support activity for extension and advisory. Furthermore, as mentioned before, farmer organisations and private companies currently employ extension agents, without support from (donor-funded) projects.

Here after follows a description of some projects and programmes that intervene in the same crop sectors and regions as AGRA, disseminate similar technologies and with which AGRA Mali already coordinates its interventions and collaborates.

Compact Consortiums – Technologies for African Agricultural Transformation (TAAT)

The TAAT multi-country project (2017-2025), financed by the African Development Bank (AfDB) and implemented by a consortium of international NGOs, national research organisations and CGIAR member institutes, targets the millet-sorghum, rice, and wheat value chains. The project aims to raise agricultural productivity, mitigate risks and promote diversification and processing. In Mali, it specifically intends to contribute to creating an enabling environment for an incentive system for agro-dealers and their access to finance to support large-scale dissemination of agricultural technologies. These technologies include balanced and specific manuring formulas, good practices of integrated soil fertility management, use of micro-doses and fertiliser deep placement.

USAID – Feed the Future[10]

This U.S. Government's global hunger and food security initiative increases agricultural and nutrition by delivering technology and knowledge, and building local institutional capacity to spur a vibrant private sector-led approach to achieve economic and food security. Feed the Future invests in four value chains in Mali: millet and sorghum for food security and poverty reduction; rice for growth in household incomes and food security; and, livestock for growth in household incomes and nutrition in the Sikasso, Mopti and Timbuktu regions.

IITA – Climate-Smart Agricultural Technologies project (CSAT)

The CSAT project (2019–2024), implemented by International Institute of Tropical Agriculture (IITA), aims to reduce poverty and food insecurity; protect natural resources; and grow farmers' incomes through increased agricultural productivity, access to markets, and promoting the creation and/or strengthening of agribusiness enterprises, especially those run by women and youth. The project will provide farmers with options to increase their resilience and the ability to adapt to the effects of climate change. At least 20,000 rural households will directly benefit from interventions in the Kayes, Koulikoro, Ségou, and Sikasso regions. The project will strengthen 250 agricultural enterprises and facilitate the creation of 100 new agribusinesses run by young people and women. In addition, 600 young graduates and rural people will be trained in agribusiness.

LuxDev – Programme on rural development and food security in the southern region of Mali

This LuxDev programme in the southern region of Mali (2016-2020) intervenes in three crop sectors: rice, fonio and sesame. The programme supports and strengthens local stakeholders and government services harmoniously with sectorial policies and strategies at

[10] USAID Feed the Future is currently issuing several calls for project proposals.

national and local levels. Its overall objective is to diversify and build sustainable sources of agricultural income and household food security. The specific objective is to develop and increase the productivity, sustainability and profitability of targeted crop sectors. The programme operates in the districts of Segou, San, Tominian, Bla, Barouéli (Segou region) and Yorosso (Sikasso region). The targeted direct beneficiaries include 190 selected producer organisations, as well as a hundred micro and small businesses specialised in rice and fonio processing.

Whereas the above-mentioned initiatives focus on one (extension and advice) or several support functions (business development services), AGRA's focus is more comprehensive including all key support services for inclusive value chain development. Through this integrated consortium-based ('agribusiness clusters'), AGRA Mali enhances agri-business development (seed and input supply) and enterprise development (production, aggregation, processing and trading), which creates opportunities for (youth) employment and economic empowerment of women (gender). As for the AGRA support to agricultural extension, the distinctive feature of the AGRA strategy is the involvement of VBAs, which are respected and knowledgeable members of village communities.

Relevance

Considering the food security situation in Mali, the gap between actual and potential yields of the targeted food crops, the importance of agriculture for national and local economic development, and the GoM's agricultural policy, AGRA's support to agricultural extension in Mali is very relevant. Even more since there is a lack of capacity (staff, equipment) in Mali's NAES.

The membership of specialised extension service providers of regional consortiums (see Table 8), combined with the VBA approach, results in agricultural extension becoming an embedded service within the value chains. On the one hand, farmer extensionists sensitise and inform farmers on improved varieties and accessing quality seed. On the other hand, they inform farmers about the off-take opportunities for their produce.

Through the challenging VBA approach, AGRA has the ambition to increase the coverage and network of extensionists from one agent for 6,000 farmers to one agent for 500 farmers. It thus addresses one of the key challenges of the NAEAS system, i.e. the lack of field agents (see Section 5.1). In line with AGRA's experiences with and results from support to policy and state capability, it could also consider supporting the governance and management of the NAEAS system at national or regional levels. This is another key systemic challenge (see Section 5.1). Such support could contribute to a more effective and efficient service provision through a division of labour and subsequent allocation or pooling of human and financial resources. The DNA, with which AGRA already collaborates, would be a candidate for providing the required leadership.

Expected impacts

The aggregated data available show that the consortia in the Koulikoro, Sikasso and Ségou regions are effectively achieving the expected outputs; in terms of the number of VBAs recruited and trained. AGRA Mali introduced the VBA approach coupled with the mother and baby demo plots only in 2018. In 2019, the AGRA Mali team provided instructions to the agricultural extension grantees for training of VBAs on setting up demo plots. It is therefore too early to fully assess the results of the approach. However, the data from the sample of the household survey in the Koulikoro and Sikasso regions indicate that the percentage of

farmer households having demo plots is relatively weak (see Table 39 and Table 84). This may relate to the required capacities of VBAs to deliver.

The expected impact of the extension approach is potentially high because of the consortium (or cluster) approach used by AGRA. Targeting specific crops and related markets, underpinned by result-driven contractual arrangements, are an incentive for consortium members to collaborate and agree on priority activities to be undertaken, and hence contribute to the expected outcomes. The quantity and value of crops sold through structured markets in 2019 (see Table 9) reflects their potential impact on farmer households. These data might, by proxies, point to improved farmer household food security and incomes.

The consortium approach of AGRA directly involves value chain actors (farmers, aggregators, processors and support services) in order to enhance the transformation of the crop subsector. There is a trade-off risk between long-term institution building and short-term achievement of results (farmers reached, production increase, volumes traded and processed).

The Mali target regions of PIATA are relatively well off in terms of agro-ecological conditions, local development and security, compared with other regions, which were also criteria used by AGRA to select these regions. This is particularly the case for the Koulikoro and Sikasso regions, where parastatals such as CMDT and OHVN have considerably invested in agricultural extension and advice. Furthermore, CMDT and OHVN extension officers were also instrumental in capacity strengthening community-based organisations for taking up functions within the cotton value chain; e.g. handling of credits and agricultural inputs, and bulking of cotton for the supply of ginneries. This was accompanied by extensive functionally literacy programmes in order to prepare farmers to take up management functions within their organisations. Finally, yet importantly, investments were made in upgrading rural road infrastructure in order to facilitate the transport of cotton and inputs for cotton growing, which payed-off well for farmers and turned southern Mali into the ‘breadbasket of Mali’.

Despite these main regional advantages, consortium members (interviews) pointed out some difficulties. The illiteracy of VBAs, particularly women, hampers handing down information to farmers and bringing up information for reporting to the consortium. Notwithstanding the relatively good roads, reaching farmers for setting up baby demo plots in their fields during the planting (rainy) season is a big challenge.

Sustainability of results

The market for cereals is a so-called ‘spot market’, dominated by local traders who deal directly with farmers and their local organisations. There is an emerging processing industry for maize in Mali, which could drive the development of a private sector-led “structured market” (see also the discussion on “structured trading facilities/arrangements” in Section 5.3). This calls for a greater involvement of medium- and large-scale processors in the consortia and relevant support (grants) to processors by AGRA Mali, which could also lead to a better balance between the supports at the ‘push-side’ (seeds, inputs, production) and ‘pull-side’ (processing and consumption) of the value chains.

Because of earlier development investments in the Koulikoro and Sikasso regions (see sections above), there exists considerable organisational capacity of producers at local level, including organisations that aggregate and trade cereals. They represent a cornerstone

institutional achievement, on which the consortiums could rely when developing structured market outlets for smallholder farmers. AGRA Mali now co-finances the construction of aggregation centres.

As mentioned before, the VBA network allows a high number of farmers to be reached within a relatively short period. Whether VBAs continue to play their role after the ending of the projects (grants for consortia, NGOs and consultancy firms) is questionable. Options for sustaining the VBA networks – as for instance tested by the consortia – include integrating VBAs into the existing unions of farmer cooperatives and their employment as commercial representatives of agro-dealers. Currently 88 VBAs in the Koulikoro region have started, with support from AGRA Mali, an input shop in their village.

The VBA network provides a short-term solution to the shortage of extension agents in the AGRA intervention regions. A long-term, and more sustainable, complementary solution would be effective coordination of the provision of agricultural extension and advisory services at national and regional levels (e.g. adapting messages and approaches to the knowledge and skills of the target farmer groups, rationalisation and pooling of financial resources).

Part II: Household survey

6 Methodology of the household-level survey

6.1 Introduction

One of AGRA's intervention instruments is funding farmer-level interventions through consortia projects and other investments. AGRA considers the continued use of outdated production technologies and practices as one of the biggest hurdles to increasing smallholder farmer productivity in Africa. However, farmers are known to adopt new technologies when they are useful, affordable, and available locally. In the past, AGRA has invested in the development and production of new crop varieties that 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 focusing 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's survey monitored the following indicators:

- Average number of months of adequate household food provision (Goal indicator 2)
- Wealth assets index score (Goal indicator 6)
- 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
- Value of smallholder incremental sales (value of additional volumes sold)
- Percent of farmers accessing financial services of formal institutions
- Average age of varieties of focus value chains on farmer fields
- Additional indicator 1: Average distance to agro-dealer
- Additional indicator 2: Hectares under improved productivity technologies or management practices
- Additional indicator 3: Farmers' clients
- Additional indicator I 4: Small seed pack' exposure and utilisation

6.2 Sampling strategy

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

The target population for this study are all AGRA beneficiaries in the Sikasso and Koulikoro regions in Mali. Since reliable lists of beneficiaries for sampling were unavailable, sampling from VBAs was done. A sample of 40 VBAs was randomly selected. From these 40 VBAs, 26 were in Sikasso and 14 were in Koulikoro; these numbers were determined proportionally to the total number of AGRA-supported VBAs in the region. A buffer of 16 VBAs was selected, in case the VBAs that were sampled originally could not be found. Upon arrival in the community, the team, in consultation with the VBA, randomly sampled 25 beneficiaries per VBA to be interviewed. In some cases, communities/VBAs had to be replaced from the buffer list, based on non-existence of the community, and inability to reach the VBA after at least three attempts.

The total number of surveys was agreed between KIT and AGRA, based on budget availability, and power considerations. The sample size per crop was set at 1,000. With a sample size of 1,000 observations, it is expected to detect a change in yields of 10% among the survey population with a confidence level of 95% (see Figure 1). Based on agreements between AGRA and KIT, a total sample of 1,000 farm households was selected to be interviewed on both maize and cowpea.[11]

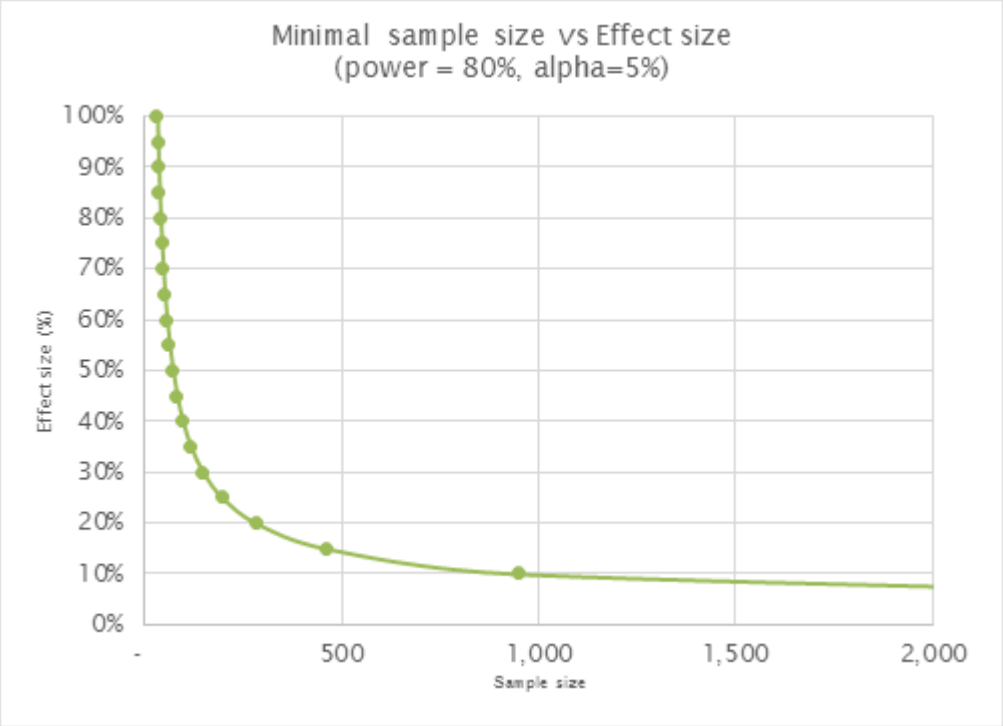

Figure 1: Power calculation

[11] Due to budget restrictions, it was decided to interview households on both crops in two countries (Mali and Rwanda).

6.3 Survey structure

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

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

6.4 Limitations of the household survey

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

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

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

Specifically, in Mali, there is information missing on the indicators for the use of crop varieties because the date of release of AGRA promoted varieties was not available in the national seed catalogues.

Finally, comparisons are made between male-headed and female-headed households. However, the latter group is very small (n=10), so the findings cannot be extrapolated to female-headed households in general.

7 Household-level results: maize in the Sikasso and Koulikoro Regions (2018)

7.1 Sample description

Survey area

Out of the 1,000 sampled households, 876 cultivated maize. Therefore, 876 interviews were conducted on maize in Mali. Interviews were conducted in 27 districts. Out of this sample, 590 households (67%) were living in Sikasso region, while 286 (33%) were living in Koulikoro region. Within these districts, households, supported by 27 VBAs were visited. Figure 2 shows the geographical spread of surveyed households.

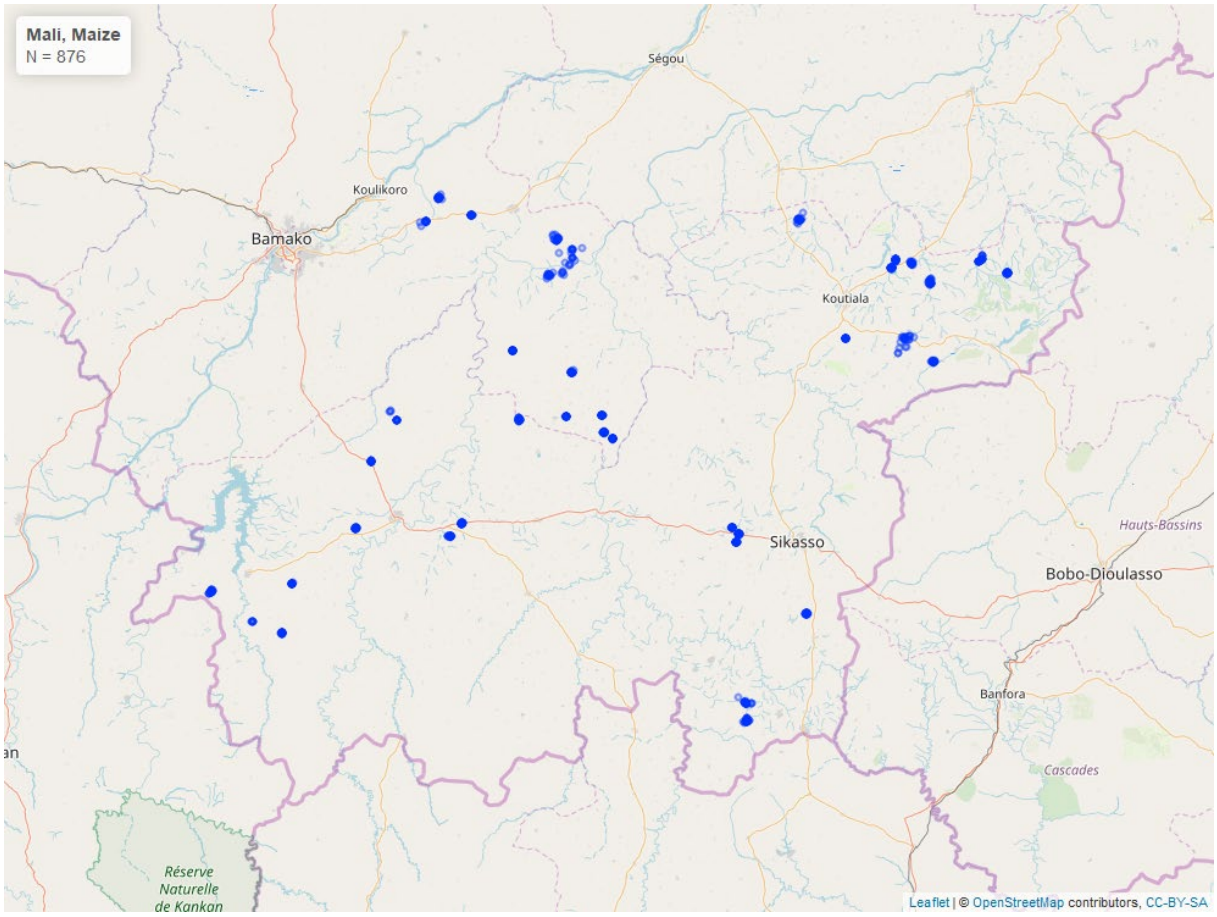

Figure 2: Location of farm household interviews, maize sample

Farm household characteristics (maize farm households)

Respondents were all AGRA beneficiaries; 86% of respondents were male, 14% were female. In 59% of the cases, the beneficiary is also the head of the household. Respondents were, on average, 46 years old (see Figure 3).

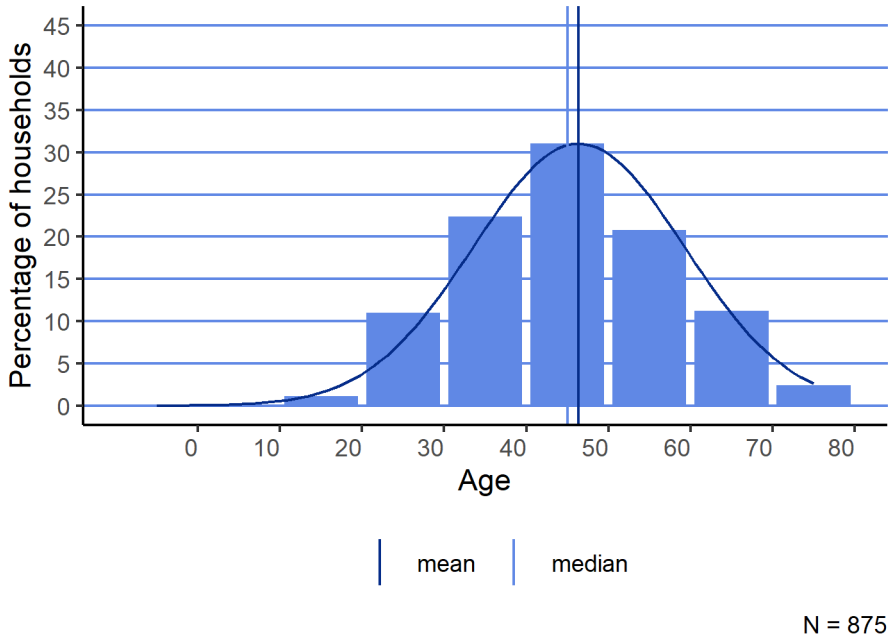

Figure 3: Distribution of respondent age

The vast majority (99%) of farm households are male-headed; only 10 households had female household heads. Households in Mali are large. On average, they consist of 22.7 members (10.6 adults and 12.2 children), with female-headed households being significantly smaller (see Table 10).

Table 10: Household composition

Household size	All	Male-headed	Female-headed	sig
Number of children in the household	12.2	12.3	4.1	***
Number of adults in the household	10.6	10.7	3.9	**
n	875	865	10	

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

All households, without exception, own agricultural land. The average amount of land owned is 14.3 ha. Of this land, 11.6 ha are, on average, cultivated. Figure 4 shows the land allocated to maize cultivation, which shows only a quarter of the cultivated land (2.8 ha) is allocated to maize.

In our sample, 11% of farm households have intercropped maize with other crops. Most commonly, maize is intercropped with cowpea (79%) and sorghum (11%).

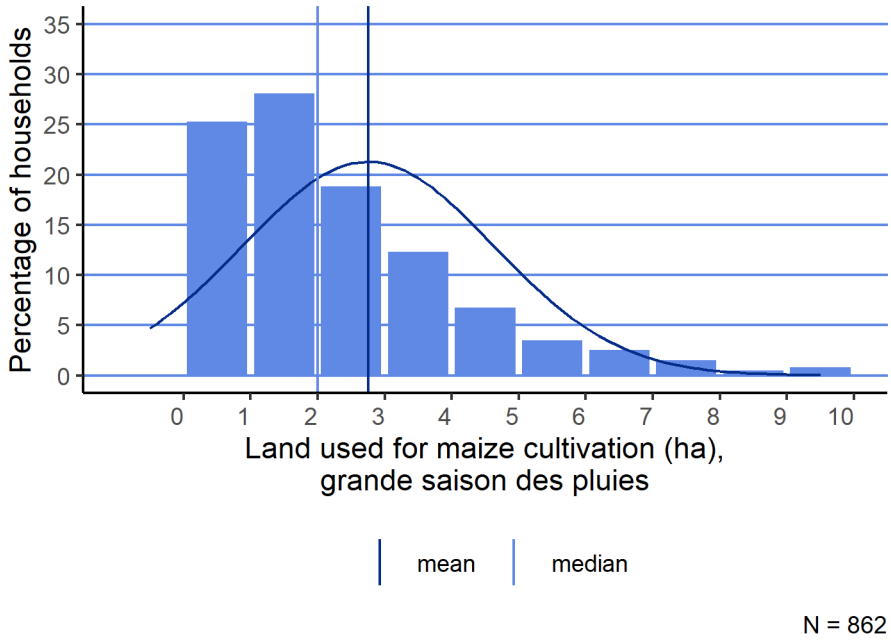

Figure 4: Distribution of land allocated to maize (ha), grande saison des pluies

Mali only has one farming season for maize. This season is locally referred to as *grande saison des pluies*, which ranges from May to September. All data presented in this report is on the main season of 2018.

7.2 Main indicators

Table 11 gives an overview of the primary indicators collected. See Annex 2: Data dictionary of main indicators) for definitions for each indicator. The indicators and the underlying behavioural patterns are discussed in further details in the following sections.

Table 11: Overview of main indicators, maize-farming households

	All	Male-headed	Female-headed
Goal indicator 2: Average number of months of adequate household food provision	**11.6**	**11.6**	**11.6***
Goald indicator 6: Wealth assets index score	**-0.504**	**-0.503**	**-0.538***
G6.1 Share of households in first wealth quintile (%)	23%	23%	22%*
G6.2 Share of households in second wealth quintile (%)	30%	30%	22%*
G6.3 Share of households in third wealth quintile (%)	32%	32%	44%*
G6.4 Share of households in fourth wealth quintile (%)	15%	15%	11%*
G6.5 Share of households in fifth wealth quintile (%)	0%	0%	0%*
IWI International Wealth Index	43.8	43.8	42.6*
1. Average yield (kg/ha)	**1488**	**1495**	**932***
3. Rate of application of target improved technologies or management practices	99%	99%	100%*

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	28%	28%	20%*
3.2 Adoption of endorsed varieties (%)	1%	1%	0%*
3.3 Number of seasons variety is recycled	6.4	6.4	6.7*
3.4 Adoption of endorsed planting practice (%)	16%	15%	3%*
3.5 Adoption of inorganic fertiliser (%)	99%	98%	100%*
3.6 Adoption of endorsed fertiliser (%)	7%	7%	0%*
3.7 Adoption of organic fertiliser (%)	80%	80%	80%*
3.8 Adoption of inoculants (%)	NA	NA	NA
3.9 Adoption of pest-management practices (%)	90%	90%	80%*
3.10 Adoption of endorsed post-harvest practices (%)	13%	12%	40%*
3.11 Adoption of improved storage (%)	0%	0%	0%*
3.12 Use of designated storage facilities (%)	0%	0%	0%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	34%	34%	43%*
Hectares under improved technologies or management practices (%)	**99%**	**99%**	**99%***
3.14 Area under improved varieties (%)	28%	28%	28%*
3.15 Area under inorganic fertiliser (%)	99%	99%	99%*
3.16 Area under pesticides (%)	96%	96%	96%*
4. Access to agricultural advisory extension support services	**37%**	**37%**	**40%***
4.1 Avg. no. of visits per year by agri. advisory extension support services	3.3	3.2	10.2*
4.2 Received small seed pack (%) (additional indicator 4)	41%	41%	50%*
4.3 Used small seed pack (%) (additional indicator 4)	81%	81%	80%*
4.4 Distance to nearest agro dealer (km)	7.5	7.5	7.3*
4.4 Distance to nearest agro dealer (minutes conversion 5.5 km/hour)	*84*	*84*	*80*
5. Nitrogen application (kg/ha)	**52.3**	**52.3**	**58.0***
5.1 Phosphorus application (kg/ha)	16.2	16.2	17.0*
5.2 Potassium application (kg/ha)	17.8	17.8	24.3*
Average fertiliser use (Total N + P + K, kg/ha)	**82.9**	**82.8**	**92.0***
6. Percent of post-harvest losses (%)	**2%**	**2%**	**0%***
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**80.3**	**80.4**	**68.6***
13. Access to formal financial services (%)	**27%**	**27%**	**20%***

	All	Male-headed	Female-headed
13.1 Bank account (%)	23%	23%	20%*
13.2 Agricultural loan (%)	13%	13%	10%*
13.3 Agricultural insurance (%)	1%	1%	0%*
17. Average age of varieties used (years)	**21.2**	**21.2**	**22.5***
33. Sale through structured trading facilities/arrangements (%)	**2%**	**2%**	**0%***
33.1 Selling to traders/middlemen (%)	10%	10%	0%*
33.2 Selling to consumers (%)	5%	5%	20%*
33.3 Selling to friends/neighbours (%)	2%	2%	0%*
33.4 Selling to aggregation centre (%)	NA	NA	NA
33.5 Selling to farmer organisation (%)	3%	3%	20%*
33.6 Selling to wholesalers (%)	62%	62%	60%*
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	22%	22%	20%*
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 (%)	**1%**	**1%**	**10%***

The composition of variables can be found in the data dictionary in Annex 1; 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 12 reports the average number of months of adequate household food provision as per the index of the same name (MAHFP). It shows that the AGRA-supported farm households have, on average, enough food to meet their family's needs during 11.6 months of the year. Food security is thus high in the sample. There is no difference in food security between female-headed and male-headed households.

Table 12: 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	11.6	11.6	11.6*

Figure 5 shows the MAHFP distribution. It shows that 80% of AGRA beneficiaries reported having had enough food to meet their family's needs during the entire year. Only 6% experienced one month of food insecurity, and 7% did not have enough food for two months. None of the farm households struggled to meet food needs during six months or more; nobody reported being chronically food insecure.

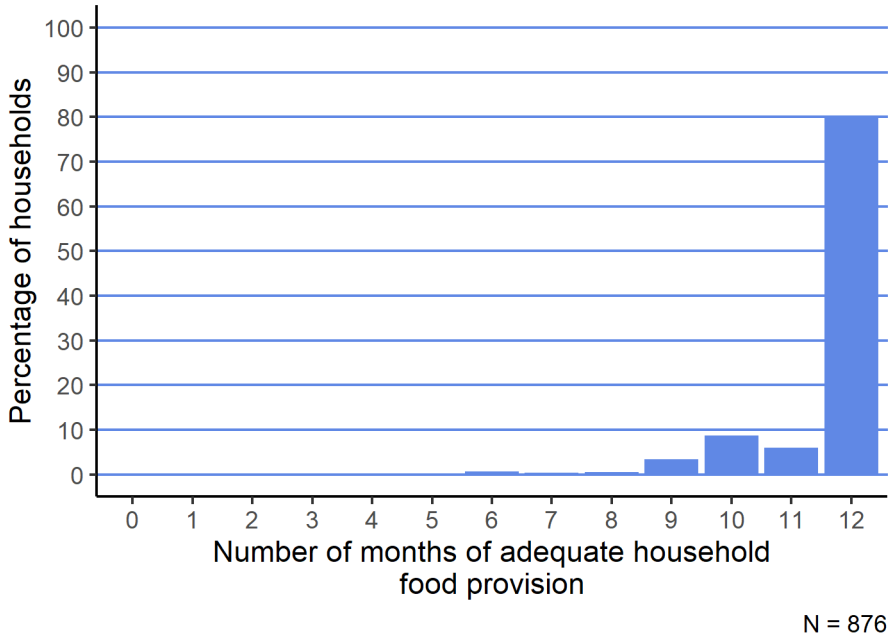

Figure 5: Distribution of number of months of adequate household food provision (G2)

Figure 6 shows the distribution of months with adequate household food provision over the year. The figure shows that the period between May and September were the months in which food insecurity was highest. This is in line with expectations, as these months are in the middle of the main cropping season (*grande saison des pluies*) and food insecurity is usually highest right before harvest.

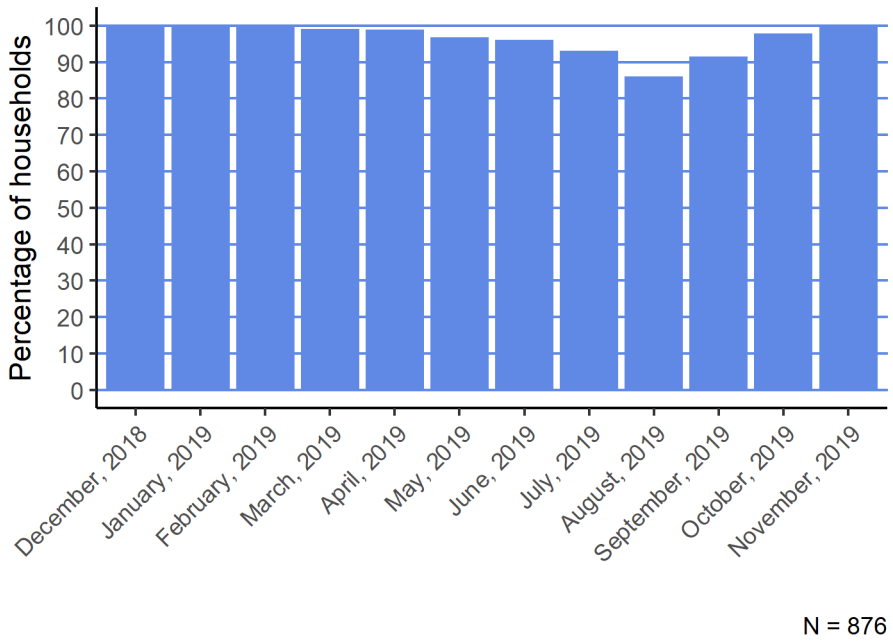

Figure 6: Distribution of months with adequate household food provision

7.4 Wealth asset index score (indicator G6)

Table 13 shows the quintile distribution of the Demographic and Health Surveys (DHS) wealth index. The DHS household wealth index is a composite measure of a household's

cumulative living standard. It is composed of data on asset ownership, materials used for housing construction, and types of water access and sanitation facilities.[12] Wealth index scores were compared with the national Malian DHS distribution for rural areas to determine the household's relative wealth as compared to the country average. The wealth index score by itself is not straightforward to interpret, but is used to classify households in wealth quintiles specific to Mali. As can be seen from Table 13, most households are in the 3rd quintiles, followed by the 2nd quintile, and the 1st (poorest) quintile. No household from the sample is in the 5th (wealthiest) quintile. There is no significant difference in wealth status between male-headed and female-headed households.

Table 13: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	-0.504	-0.503	-0.538*
G6.1 Share of households in first wealth quintile (%)	23%	23%	22%*
G6.2 Share of households in second wealth quintile (%)	30%	30%	22%*
G6.3 Share of households in third wealth quintile (%)	32%	32%	44%*
G6.4 Share of households in fourth wealth quintile (%)	15%	15%	11%*
G6.5 Share of households in fifth wealth quintile (%)	0%	0%	0%(
IWI International Wealth Index	43.8	43.8	42.6*

7.5 Yield (indicator 1)

Maize yields are calculated by dividing the total maize production by the amount of land under maize cultivation. To enhance data accuracy, respondents were able to answer questions in units of their preference for both production and land size. The preferred unit for production is most often bags, followed by kilogrammes. The preferred unit of land size was, in all cases, hectares. Production and land data units were then converted to kilogrammes and hectares. Out of 876 interviewed households, 31 respondents did not know their maize production, while 36 respondents did not know how much land was used to cultivate maize.

Respondents reported an average maize production of 4,020 kg. Figure 7 shows the distribution of quantity of maize harvested. Production is higher among male-headed households (see Table 14); this difference is large and significant.

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

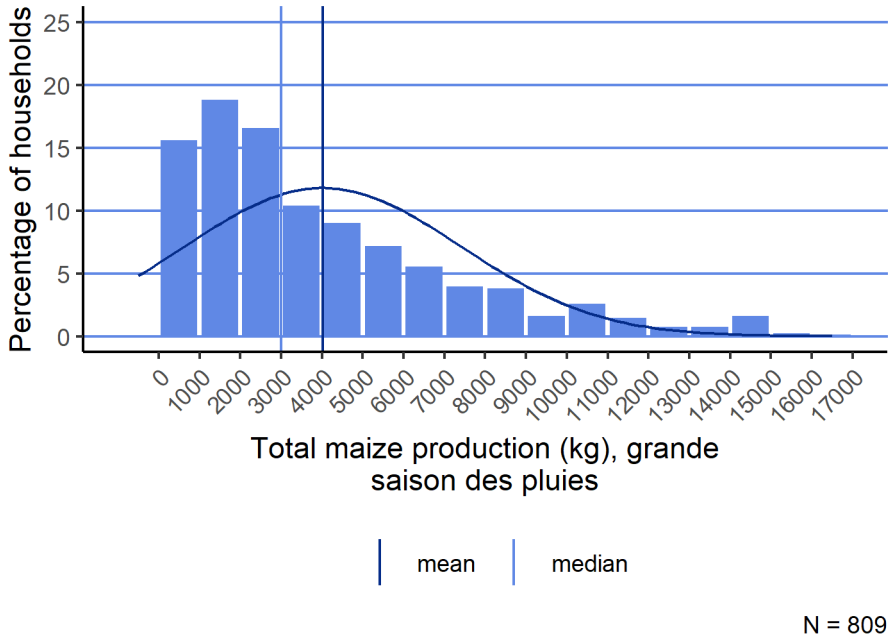

Figure 7: Distribution of total production of maize (kg), grande saison des pluies

Table 14: Total production of maize (kg), grande saison des pluies

Total maize production (kg), *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	4020.2	4056.8	1094.5	***
median	3000.0	3000.0	911.5	
n	809	799	10	

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

Maize yields are, on average, 1,488 kg/ha (see Table 15 and Figure 8). A substantial difference exists between male-headed and female-headed households; this difference is large (on average 564 kg/ha) and highly significant.

Table 15: Average maize yield (kg/ha)

	All	**Male-headed**	**Female-headed**
1. Average yield (kg/ha)	1,488	1,495	932*

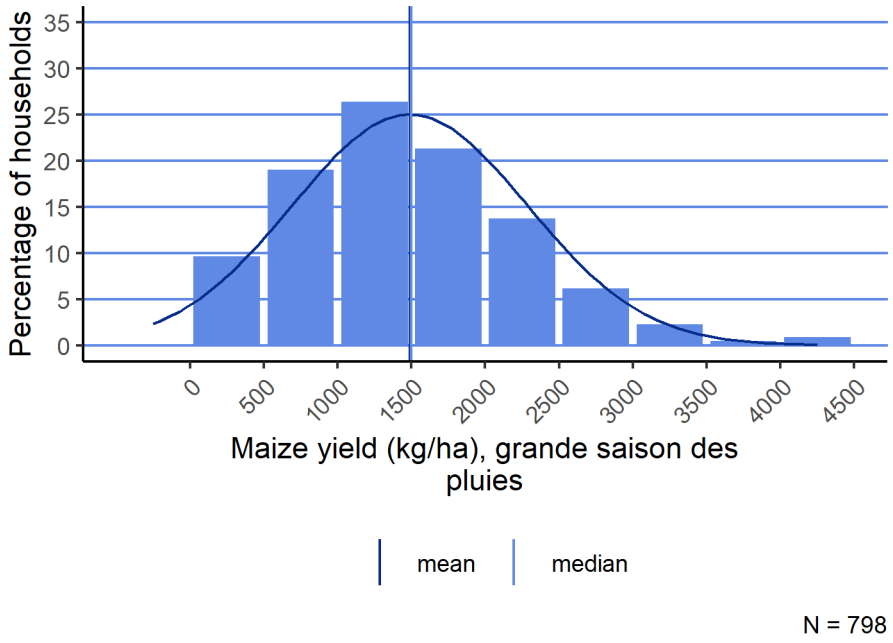

Figure 8: Distribution of average maize yield (kg/ha), grande saison des pluies

Most farm households (44%), perceived the harvest of the wet season of 2018 to be comparable to normal seasons. The season was considered better than usual by 39%; the remaining 17% considers the season to be worse than usual (see Table 16).

*Table 16: Ranking of this season's maize harvest (*grande saison des pluies*) compared to other seasons (percentage of households per answer),*

This season's harvest relative to other seasons	All	Male-headed	Female-headed	sig
Normal	44%	44%	33%	
Worse than usual	17%	17%	22%	
Better than usual	39%	39%	44%	
n	844	835	9	

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

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

Improved varieties, recycling and planting practices

Improved varieties

Table 17 shows that 28% of farm households make use of improved maize varieties. These improved varieties are either hybrids or improved open-pollinated varieties (OPVs). In Mali, the varieties promoted by AGRA are Farako, Tcheba and Filani. In 2018, only 1% of farm households used these endorsed varieties (see Table 17).

Table 17: Main indicators for the use of improved varieties, recycling, and planting practices.

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	28%	28%	20%*
3.2 Adoption of endorsed varieties (%)	1%	1%	0%*
3.3 Number of seasons variety is recycled	6.4	6.4	6.7*
3.4 Adoption of endorsed planting practice (%)	16%	15%	3%*
17. Average age of varieties used (years)	21.2	21.2	22.5*
Hectares under improved technologies or management practices (%)	99%	99%	99%*

Table 18 lists the varieties grown, which shows that local varieties such as yellow maize, white maize and other local varieties are the most popular. After that, Dembanuyman is cultivated most. The three varieties endorsed by AGRA are not in the table, since each of these varieties is used by less than 1% of the households.

Table 18: Maize varieties used (percentage of households per variety), grande saison des pluies

Varieties	All	Male-headed	Female-headed	sig
Yellow maize	30%	30%	50%	
White maize	28%	28%	40%	
Local variety, unspecified	19%	19%	10%	
DEMBANUYMAN	18%	19%	10%	
SOTUBAKA	9%	9%	10%	
Other	8%	9%	0%	
Don't know	6%	6%	0%	
Hybrid, unspecified	1%	2%	0%	
OPV, unspecified	1%	1%	0%	
BRICO	1%	1%	0%	
n	876	866	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%

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

Table 19 groups the varieties that are cultivated in the hybrid, local variety, or OPV categories. However, due to the large number of households only specifying a general type of variety (such as white or yellow maize), about half of the varieties could not be classified within one of the groups. Local varieties are used by 19% of farm households. Table 19 also shows that 27% of farm households have, in fact, cultivated an improved OPV; only 1% has cultivated a hybrid variety. It stands out that varieties could more often not be classified for female-headed households.

Table 19: Type of main maize variety (percentage of households per variety type), grande saison des pluies

Type of main variety, *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
Not able to classify	53%	53%	70%	
OPV	27%	27%	20%	
Local variety	19%	19%	10%	
Hybrid	1%	1%	0%	
n	875	865	10	

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

The main motivation for selecting a certain variety is, by far, yields (87%). In addition, households select varieties based on their taste (61%) or short maturing time (37%). Table 20 shows that yields, tolerance to droughts and diseases and buyer appreciation were significantly mentioned more as motivation to cultivate an improved variety. Also, 10% of farm households indicate having grown a hybrid variety because it was given to them for free.

*Table 20: Appreciated traits of the main maize variety used (percentage of households per trait) by type of variety (*grande saison des pluies*).*

Maize variety traits	**All**	**Local variety**	**OPV**	**Hybrid**	**sig**
Yields	87%	84%	95%	90%	***
Taste	61%	49%	62%	40%	**
Maturing time	37%	30%	36%	50%	
Tolerance to droughts	11%	25%	8%	30%	***
Conservation (storage time)	7%	5%	7%	0%	
Appreciated by buyers (market)	6%	2%	11%	10%	***
Tolerance to diseases	4%	1%	7%	0%	**
Processing	4%	1%	5%	0%	*
Colour	3%	4%	4%	0%	
It was free	3%	0%	1%	10%	***
Other	2%	3%	2%	0%	
n	876	162	238	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%
Note: Categories smaller than 1% are combined in 'Other'

The average number of years since release in the national catalogue of hybrid and OPV varieties used by farming households is 21.2 years (see Table 21). Seeds are, on average, recycled for 6.4 seasons before they are renewed. Table 22 shows the source of seeds. It shows that local varieties are most often (90%) recycled from fields in the community. OPVs are in 47% of the cases also recycled from fields in the community. Hybrid seeds are often obtained from NGOs or at the farmer organisation (both responsible for 29% of cases).

Table 21: Age of main maize variety (years), grande saison des pluies

Age of main variety (years), *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	21.2	21.2	22.5	
median	21.0	21.0	22.5	
n	240	238	2	

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

Table 22: Source of seed of main maize variety (percentage of households per source), by type of variety, grande saison des pluies

Source of the seed, *grande saison des pluies*	**All**	**Local variety**	**OPV**	**Hybrid**	**sig**
Recycled from the field of friend/family/neighbour… etc.	64%	90%	47%	14%	
Seed producer	2%	0%	1%	14%	
Agro-dealer	12%	0%	20%	14%	**
Farmer Organisation	6%	0%	12%	29%	
NGO distribution	13%	10%	13%	29%	
Other	3%	0%	7%	0%	
n	200	20	76	7	

*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'

As is in line with expectations, a large and significant difference in yields exists per variety type. However, this difference is particularly large between local varieties and improved OPVs, which is not fully expected (see Table 23). The low number of households cultivating hybrids influences the representativeness of this result.

Table 23: Total production of maize (kg), by type of variety, grande saison des pluies

Total maize production (kg), *grande saison des pluies*	**All**	**Local variety**	**OPV**	**Hybrid**	**sig**
mean	4020.2	3133.3	5190.9	3225.7	***
median	3000.0	2077.0	4177.0	2017.5	
n	809	153	223	9	

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

Planting practices

Table 17 shows the percentage of farm households adopting endorsed planting practices. more than half (66%) of farm households plant using fixed spacing. In Mali, the planting practice promoted by AGRA concerns spacing and the number of seeds per hole: farmers are advised to plant two seeds per hole, with a spacing of 40 cm intra-row and 75 cm inter-row. Only 26% of households using fixed spacing uses such endorsed planting practice. Another 23% broadcasts their seeds, while 12% plants without measuring distances (scattering). Table 24 shows that 30-70cm is indeed the most commonly used spacing.

Table 24: Spacing between maize seeds (percentage of households per method), grande saison des pluies

Planting method, spacing, ***grande saison des pluies***	All	Male-headed	Female-headed	sig
25-75 cm	22%	22%	22%	
30-70 cm	44%	44%	33%	
75-40 cm	26%	33%	33%	
Other	8%	8%	12%	
n	582	573	9	

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

Fertiliser use

Table 25 presents the main indicators on fertiliser use. Almost all farm households (99%) apply inorganic fertiliser. Farmers that apply fertiliser typically do this on all their cultivated land, so in total, 99% maize land is applied with some sort of fertilisers.

Table 25: Main indicators for the adoption and use of fertilisers

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	99%	98%	100%*
3.6 Adoption of endorsed fertiliser (%)	7%	7%	0%*
3.7 Adoption of organic fertiliser (%)	80%	80%	80%*
3.15 Area under inorganic fertiliser (%)	99%	99%	99%*
5. Nitrogen application (kg/ha)	52.3	52.2	58.0*
5.1 Phosphorus application (kg/ha)	16.2	16.2	17.0*
5.2 Potassium application (kg/ha)	17.8	17.8	24.3*
Average fertiliser use (Total N + P + K, kg/ha)	82.9	82.8	92.0*

In Mali, AGRA promotes DAP and urea. Although many households apply fertiliser, only 7% applies these endorsed fertilisers. Instead, many households (93%) apply NPK (particularly NPK 17-17-17 and NPK 15-15-15).

On average, NPK users apply 122.6 kg of NPK per ha. Urea users apply, on average, 83.6 kg/ha and DAP users, on average, 109,6 kg/ha. There is no significant difference in application between households for NPK and urea. DAP was only used by male-headed households.

Overall, nitrogen is the macronutrient applied in the largest quantity (52.3 kg/ha), followed by potassium (17.8 kg/ha) and phosphorous (16.2 kg/ha). In addition, low quantities of the secondary macronutrient sulphur is applied in Mali (see Table 26). Some households also apply the micronutrient boron (this is the case for households applying NPK 14-18-18 + 6S + 1B).

Table 26: Nutrients applied for maize (kg/ha), grande saison des pluies

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), *grande saison des pluies*	52.3	52.3	58.0	
Phosphorus application (kg/ha), *grande saison des pluies*	16.2	16.2	17.0	
Potassium application (kg/ha), *grande saison des pluies*	17.8	17.8	24.3	
Sulphur application (kg/ha), *grande saison des pluies*	2.1	2.1	NA	
Calcium application (kg/ha), *grande saison des pluies*	0.0	0.0	NA	
Magnesium application (kg/ha), *grande saison des pluies*	0.0	0.0	NA	
Boron application (kg/ha), *grande saison des pluies*	0.4	0.4	NA	
Zinc application (kg/ha, *grande saison des pluies*	0.0	0.0	NA	
n	872	862	10	

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

The most common source of information on fertiliser types is from government extension agents (38%). Quite a large share (28%) indicates being self-taught when it comes to fertiliser. Also, households often learn about fertiliser from observation in the community (15%) or from the farmers' organisation (13%); only 1% of households received information on fertiliser type from the VBA. The large majority of households uses fertiliser for longer than four years. The most common fertiliser application method is top dressing; 48% uses this method. In most cases, fertiliser is applied four weeks after planting.

The majority of households (80%) use organic fertiliser. Organic fertiliser is most often manure (90%) or compost (54%) (see Table 27). Crop residues are used by 32% of fertiliser users; only 1% uses granular fertiliser. The fact that these percentages add up to more than 100% shows that households usually use more than one type of organic fertiliser. Information on organic fertilisers mainly comes from traditional knowledge. Most farm households (91%) obtain information on organic fertiliser from other people in their household or community members. The large majority of farmers has used organic fertiliser longer than four years.

Table 27: Types of organic fertiliser used for maize (percentage of households per type)

Types of organic fertiliser	All	Male-headed	Female-headed	sig
Granular	1%	1%	0%	
Compost	54%	54%	62%	
Manure	90%	90%	88%	
Crop residues	32%	32%	38%	
n	699	691	8	

*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 who apply fertiliser and farm households who do not are large. In line with expectations, yields are higher amongst farmers that apply fertilisers (see Table 28). This difference of more than 0.5 t per ha is highly significant. However, it should be noted that the number of households not applying any fertiliser is low.

*Table 28: Average maize yield (kg/ha), by fertiliser use (yes/no) (*grande saison des pluies*)*

Maize yield (kg/ha), *grande saison des pluies*	All	No	Yes	sig
mean	1488.0	968.0	1495.3	**
median	1500.0	708.0	1500.0	
n	798	11	787	

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

Pest management practices

Table 29 shows the percentage of households that have adopted pest management practices. In Mali, 90% of farm households indicated having applied pest-management practices. Adoption of pest-management practices is defined as the percentage of households applying pesticides, herbicides and/or fungicides.

Table 29: Adoption of pest-management practices

	All	Male-headed	Female-headed
3.9 Adoption of pest-management practices (%)	90%	90%	80%*

From all three types of agro-chemicals, herbicides are used most (88%), followed by fungicides (21%); only 6% of households used pesticides (see Table 30). Male-headed households seem to apply agro-chemicals more often than female-headed households do, but this difference is not statistically significant.

*Table 30: Percentage of households applying agro-chemical inputs (*grande saison des pluies*)*

	All	Male-headed	Female-headed	sig
Pesticide application, *grande saison des pluies*	6%	6%	10%	
Herbicide application, *grande saison des pluies*	88%	88%	80%	
Fungicide application, *grande saison des pluies*	21%	21%	0%	
n	876	866	10	

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

In most cases, agro-chemicals are applied on the entire land area. Of the total land area, 85% is treated with herbicides and 20% is treated with fungicides (see Table 31). Due to the low number of households applying pesticides, pesticides are applied on less than 1% of the cultivated land.

*Table 31: Percentage of total land area used for maize cultivation under agro-chemical inputs (*grande saison des pluies*)*

	All	Male-headed	Female-headed	sig
Percentage of total land area under pesticides, *grande saison des pluies*	1%	1%	0%	
Percentage of total land area under herbicides, *grande saison des pluies*	85%	85%	80%	
Percentage of total land area under fungicides, *grande saison des pluies*	20%	20%	0%	

	All	Male-headed	Female-headed	sig
n	876	866	10	

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

In most cases (83%), farmers apply herbicides before weeds emerge and 42% of households (in addition) applied herbicides pre-emergence (see Table 32). Both pre- and post-emergence application of herbicides are endorsed by AGRA. In addition to herbicide use, 71% of households apply weeding. On average, people weed their crops 1.8 times per season.

Table 32: Timing of herbicide application for maize (percentage of households per answer), grande saison des pluies

	All	Male-headed	Female-headed	sig
Pre-emergence	43%	42%	62%	
Post-emergence	83%	83%	100%	
n	768	760	8	

*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

The type of herbicide that is used most frequently is Nicosulfuron (Nicomais), which is applied by 46% of herbicide users and is endorsed by AGRA. Dougoukoli and Bin Korofagalan are also frequently applied. The other herbicide that is endorsed by AGRA is Stomp455 CS (Pendimethalin 455g/l). However, this herbicide is not used by any of the farm households (see Table 33).

Table 33: Types of herbicides applied, grande saison des pluies

	All	Male-headed	Female-headed	sig
Nicosulfuron (Nicomais) (promoted)	46%	46%	50%	
Dougoukoli	41%	41%	62%	
Bin Korofagalan	26%	26%	25%	
Beretrouge	16%	16%	12%	
Autre	3%	3%	0%	
Pendimethalin (ALLIGAR Alligator 400)	1%	1%	0%	
Glyphosate (Roundup 450)	1%	1%	0%	
Cletodime (Select 120EC)	0%	0%	0%	NA
Pendimethalin (Stomp455 CS) (promoted)	0%	0%	0%	
n	768	760	8	

*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

The pesticides endorsed by AGRA are Lamdacyalothrin (LAMDRAF SUPER 2/K-Optimal and Indoxarbe (VIPER 46 EC) (promoted). Lamdacyalothrin is applied by 32% of farm households, while Indoxarbe is only applied by 2% of pesticide users. All other households used other pesticides. Most pesticide users started the application of pesticides before 2016,

though information on pesticides obtained from other sources besides community members is limited.

Post-harvest practices

Table 34 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 double in silos or liner hermetic storage bags (such as Purdue Improved Crop Storage (PICS) bags). Households use designated storage facilities (indicator 3.12) when they store maize at farmer's organisations, private storage facilities, or through the warehouse receipt systems.

Table 34: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	13%	12%	40%*
3.11 Adoption of improved storage (%)	0%	0%	0%*
3.12 Use of designated storage facilities (%)	0%	0%	0%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	34%	34%	43%*

A small share of farm households (13%) use a tarpaulin at least once during processing. Tarpaulin use is especially low when drying maize. Only 2% of households indicate having used a tarpaulin when drying maize (see Table 35).

The large majority of households (88%) let their maize dry in the field until the cob was hanging. For 73%, this was the only way of drying maize (see Table 35). Other households dried maize on the ground without using sheets (19%) or used drying sheds (4%).

Table 35: Drying method for maize (percentage of households) (grande saison des pluies)

Main method for drying maize, *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
In field only	73%	73%	60%	
On the ground	19%	19%	30%	
On sheets/tarpaulins	2%	2%	0%	
Temporary shed	1%	1%	10%	
Drying sheds	4%	4%	0%	
Other	0%	0%	0%	
n	876	866	10	

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

Tarpaulin use is slightly higher for threshing maize: among the 42% of households that manually thresh maize, tarpaulin use during threshing was 12%. Farm households' main

source of information on tarpaulin use is observation in the community (91%); 95% of households that use tarpaulins for threshing have been doing so for over four years.

Improved storage facilities, such as silos, are not yet used in Mali. None of the interviewed farm households indicated having used silos or improved bags for maize storage. Also, none of the households tested their maize for aflatoxins (see Table 36).

*Table 36: Use of silo's for maize storage (*grande saison des pluies*)*

Usage of silos to store maize, *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	0%	0%	0%	
n	874	864	10	

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

The use of improved storage facilities is low, some households use preservative tablets to prevent losses in the maize stock. Table 37 shows that 34% of the households recycling seeds make use of tablets that prevent quality loss in seed stock.

*Table 37: Use of preservative tablets for maize seeds (*grande saison des pluies*)*

Usage of preservative tablets for maize seed, saison principale	**All**	**Male headed**	**Female headed**	**sig**
mean	34%	34%	43%	
n	712	705	7	

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

Besides stocking maize with the purpose of personal consumption later, it can also be stocked for the purpose of selling it later (when prices are higher). Only 5% of households stock maize for this purpose. On average, households who did stock maize, stocked 1,269 kg. The percentage of households using designated storage facilities is negligible: 0% store their harvest in improved storage facilities. Instead, everybody uses their own storage (see Table 38).

*Table 38: Type of storage used for maize (percentage of households per type) (*grande saison des pluies*)*

	All	**Male-headed**	**Female-headed**	**sig**
Own storage	100%	100%	NA%	
Farmer organisation storage	0%	0%	NA%	
Warehouse receipt system	0%	0%	NA%	
Private storage rental	0%	0%	NA%	
n	51	51	0	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%

7.7 Access to agricultural advisory support services (indicator 4)

Access to agricultural advisory extension support services is defined as the percentage of households that interacted with an agricultural extension officer during the last 12 months.

During these months, 37% of households were visited by an agricultural extension officer (see Table 39). On average, households that met with an extension officer were visited between three and four times. It stands out that female-headed households were visited around three times more than male-headed households; this large difference is statistically significant.

Table 39: Main indicators for access to agricultural advisory support services

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	37%	37%	40%*
4.1 Avg. no. of visits per year by agri. advisory extension support services	3.3	3.2	10.2*
4.2 Received small seed pack (%) (additional indicator 4)	41%	41%	50%*
4.3 Used small seed pack (%) (additional indicator 4)	81%	81%	80%*
4.4 Distance to nearest agro dealer (km)	7.5	7.5	7.3*
4.4 Distance to nearest agro dealer (minutes conversion 5.5 km/hour)	*84*	*84*	*80*

Table 40 shows that extension officers were most often VBAs (38%). When female-headed households were visited by extension officers, these were always VBAs. Also, extension officers were often affiliated with NGOs (37%) or the Malian government (33%).

Table 40: Affiliation of extension service provider (percentage of households per provider)

Type	All	Male-headed	Female-headed	sig
Government	33%	33%	0%	
Company	1%	1%	0%	
NGO	37%	38%	0%	
Farmer promoter/VBA	38%	37%	100%	*
Cooperative	5%	5%	0%	
Other	1%	1%	0%	
n	153	151	2	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
Note: Categories smaller than 1% are combined in 'Other'

The extension method that is most common among the people that have participated in any kind of extension activities is the transfer of knowledge in the farmer organisation; 14% of households indicated having used this method of extension. Participation in a demonstration plot, mentoring by lead farmers and support from the VBA were mentioned by 9%, 8% and 8% of farm households, respectively (see Table 41).

Table 41: Type of extension method used (percentage of households per method)

Method	All	Male-headed	Female-headed	sig
None	69%	69%	62%	
Farmer Field Schools	4%	4%	0%	
Demonstration plot	9%	10%	0%	
Technology packages	1%	1%	0%	
Mentoring by lead farmers	8%	8%	12%	
Transfer of knowledge within farmer organisation/training of trainers	14%	13%	25%	
Support by farmer promoter	8%	7%	12%	
Other	1%	1%	12%	***
n	355	347	8	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
Note: Categories smaller than 1% are combined in 'Other'

Another aspect of advisory extension services is the distribution and use of promotional seed packs. Table 39 shows that 41% of households indicate having received a small seed pack. The uptake of promotional seed packs is high: 81% of farmers planted the seeds from the received seed pack.

Generally, appreciation of the seed packs is high: 87% of the households that planted the seeds are appreciative of them. Table 42 shows that farmers mainly appreciate the seeds for their yields and the (short) maturing time. Another appreciative aspect that was also frequently mentioned is taste (41%).

Table 42: 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	85%	85%	100%	
Maturing time	52%	52%	50%	
Taste	41%	41%	50%	
Tolerance to droughts	5%	6%	0%	
Conservation (storage time)	5%	5%	0%	
It was free	5%	5%	0%	
Tolerance to diseases	3%	3%	0%	
Appreciated by buyers (market)	3%	3%	0%	
Colour	3%	3%	0%	
Other	2%	2%	0%	
n	256	254	2	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
Note: Categories smaller than 1% are combined in 'Other'
n = households that appreciated the seeds from the promotional seed pack

Households that did not appreciate the seed pack, indicated in 36% of the cases that they didn't appreciate them because the seed packs arrived too late (after the optimal planting conditions).

Access to agricultural extension services also includes distance to the nearest agro-dealer. Distance to agro-dealers is based on travel time. As can be seen in Table 43, in terms of distance, farm households live, on average, 7.7 km away from agro-dealers. When visiting the agro-dealer, households most often go by motorbike (43%), followed by donkey carts (30%) or by foot (15%). Using a 5.5 km/hour conversion rate this would mean 84 minutes walking.

Table 43: Average distance to agro-dealer (kilometres)

Distance to agro-dealer in km	All	Male-headed	Female-headed	sig
mean	7.7	7.7	9.3	
median	4.0	4.0	10.0	
n	541	536	5	

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

7.8 Access to formal financial services (indicator 13)

Table 44 shows that 27% of surveyed households have access to formal financial services. This means that 27% of the households has access to at least one bank account, a formal agricultural loan, or an agricultural insurance. This indicator thus only includes access to formal financial services, provided by formal financial institutions and excludes access to informal financial services, such as from village money lenders, relatives, or saving groups.

Table 44: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13. Access to formal financial services (%)	27%	27%	20%*
13.1 Bank account (%)	23%	23%	20%*
13.2 Agricultural loan (%)	13%	13%	10%*
13.3 Agricultural insurance (%)	1%	1%	0%*

Assessing the three components of this variable, it is noted that the most accessible financial service is a bank account. Around 23% of households have at least one bank account. Much lower, with 13%, is access to a loan. Only 1% of households took an agricultural insurance in 2018.

While only 13% of farm households took a loan through a formal arrangement (banks, microfinance institutions, savings and credit cooperatives or mobile money), in total, 19% of farmers took a loan in 2018.

Table 45 shows the types of loan providers that are being used, which shows that that most loans (73%) were provided by formal financial institutions (bank, MFI or SACCO). Informal loans were most often obtained through village money lenders, family or friends or traders.

Table 45: Types of loan providers (percentage of households per provider)

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	12%	12%	0%	
Village money lender	7%	7%	0%	
VSLA/ISLC/VICOBA (Informal savings and loans group)	2%	2%	0%	
Savings and Credit Cooperative (SACCO)/Credit Union	14%	14%	0%	
Microfinance institution (MFI)	45%	45%	100%	
Bank	14%	14%	0%	
Trader	3%	3%	0%	
Company	1%	1%	0%	
Other	3%	3%	0%	
n	161	160	1	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
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 46 Main indicator for post-harvest losses

	All	Male-headed	Female-headed
6. Percent of post-harvest losses (%)	2%	2%	0%*

Table 46 shows that post-harvest losses are low; on average, 2% of maize was lost post-harvest. The majority of the sample (62%) did not lose any maize post-harvest. The farmers that lost some of their harvest, lost between 3 and 1,000 kg. The average amount of maize lost was 166 kg. While interpreting this data, it should, however, be kept in mind that post-harvest losses are typically difficult to estimate for farmers, as losses are typically not measured.

7.10 Access to market information (indicator 37)

Only 1% of maize farm households has access to formal channels of market information, such as information through SMS, radio, television, internet and the farmer's organisation (see Table 47).

Table 47: Main indicator for access to market information

	All	Male-headed	Female-headed
37. Access to market information through formal channel (%)	1%	1%	10%*

Farmers do, however, use informal channels to collect market information. Table 48 shows that, amongst farmers that sell their maize, market information is mainly acquired from buyers (57%) and, to a lesser extent, also on the market itself.

Table 48: Sources of market information used by farmers (percentage of households per source)

Source of market information	All	Male-headed	Female-headed	sig
Buyer	57%	57%	60%	
Farmer to farmer	4%	3%	40%	***
Market	35%	35%	80%	**
Farmer organisation	3%	3%	20%	**
Other	0%	0%	0%	NA
n	302	297	5	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
Note: Categories smaller than 1% are combined in 'Other'
n = households that sold maize

7.11 Sales channels (indicator 33)

Table 49 shows the main indicators for farmers' sales channels. It includes information on sale through structured trading facilities or arrangements, as well as information on farmers' clients.

Table 49: Main indicators on farmers' sales channels

	All	Male-headed	Female-headed
33. Sale through structured trading facilities/arrangements (%)	2%	2%	0%*
33.1 Selling to traders/middlemen (%)	10%	10%	0%*
33.2 Selling to consumers (%)	5%	5%	20%*
33.3 Selling to friends/neighbours (%)	2%	2%	0%*
33.4 Selling to aggregation centre (%)	NA	NA	NA*
33.5 Selling to farmer organisation (%)	3%	3%	20%*
33.6 Selling to wholesalers (%)	62%	62%	60%*
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	22%	22%	20%*
33.9 Selling to company (undefined) (%)	0%	0%	0%*
33.10 Selling to institutional buyers (%)	0%	0%	0%*

A household is considered selling through a structured trading facility when they sell at least part of their harvest through a formal contract. Only 2% of farmers sell their harvest under a formal contract. Out of the five farmers that sold maize through formal contracts, three

received inputs on credit as part of that contract; in two cases, this concerned fertiliser and, in the other case, seed was provided on credit.

Table 49 shows that farmers' clients are mainly wholesalers, retailers or traders or middlemen.

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. These values were calculated by multiplying the quantity sold (kg) by the common price received per kilogramme. Values were converted to kilogrammes in case quantities were reported in different units.

Table 50: 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$)	80.3	80.4	68.6*

On average, the revenue from selling maize is US$80.3 (see Table 50).

Total revenues from maize sales in CFA francs are shown in Table 51. There are no significant differences in sales values between male-headed and female-headed households. What stands out in the table is the large difference between the mean and median values: while the mean is CFA44,766, the median is CFA0. This indicates that more than half of the sample did not report having any revenues from maize sales. This is in line with variables on allocation: more than half of the households indicated only cultivating maize for home consumption.

Table 51: Sales value (total revenue) of maize sold, grande saison des pluies *– calculated variable (IO5.3 – 36) – KIT indicator 10*

Revenue from sales of maize, *grande saison des pluies* (CFA)	**All**	**Male-headed**	**Female-headed**	**sig**
mean	44,766.6	44,830.5	38,214.3	
median	0.0	0.0	0.0	
Standard deviation	97,320			
Minimum	0.0	0.0	0.0	
Maximum	560,000	560,000	150,000	
n	724	717	7	

*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

The average price households received for their maize was CFA86 per kg. The price difference for male-headed and female-headed households is not significant (see Table 52).

Table 52: Price received for maize (CFA)

Common price received for maize (CFA/kg), *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	85.9	85.6	111.7	
median	95.0	90.0	110.0	
n	261	258	3	

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

Table 53 shows that allocation of the harvest for different purposes, which shows that most maize (69%) is used for consumption; only 11% of the household's maize is sold. It stands out that female-headed households sell significantly larger shares of the harvest, while male-headed households give away larger shares.

Table 53: Allocation of maize harvest for different household uses (percentage of total harvest)

	All	Male-headed	Female-headed	sig
Maize used for consumption (% of harvest), *grande saison des pluies*	69%	69%	62%	
Maize kept for seed (% of harvest), *grande saison des pluies*	4%	4%	4%	
Maize given away (% of harvest), *grande saison des pluies*	10%	10%	3%	**
Maize used as payment for inputs (% of harvest), *grande saison des pluies*	3%	3%	0%	
Maize bartered or exchanged for goods (% of harvest), *grande saison des pluies*	0%	0%	0%	
Maize sold (% of harvest), *grande saison des pluies*	11%	10%	31%	***
Post-harvest losses of maize (% of total harvest), *grande saison des pluies*	2%	2%	0%	
n	785	776	9	

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

The average value of maize production per household, calculated by multiplying the quantity produced (kg) by the common price received per kg, is CFA francs 458,962 (US$824) (Table 54, Table 55).

Table 54 Crop value (CFA) of maize produced

	All	Male-headed	Female-headed
Average value of production in CFA	458,961	462,419	177,696*
n = households that sold maize			

Table 55 Crop value (US$) of maize produced

	All	Male-headed	Female-headed
Average value of production in US$	823	829	318
n = households that sold maize			

8 Household-level results: cowpea in Sikasso and Koulikoro regions (2018)

8.1 Sample description cowpea farmers

Survey area

A total sample of 355 cowpea-cultivating households were interviewed. Within Sikasso region, interviews were conducted with 191 households, Within Koulikoro, interviews were conducted with 164 households. The division of the sample over the two regions is proportional to the number of beneficiary households in each region. Figure 9 shows the geographical spread of surveyed households.

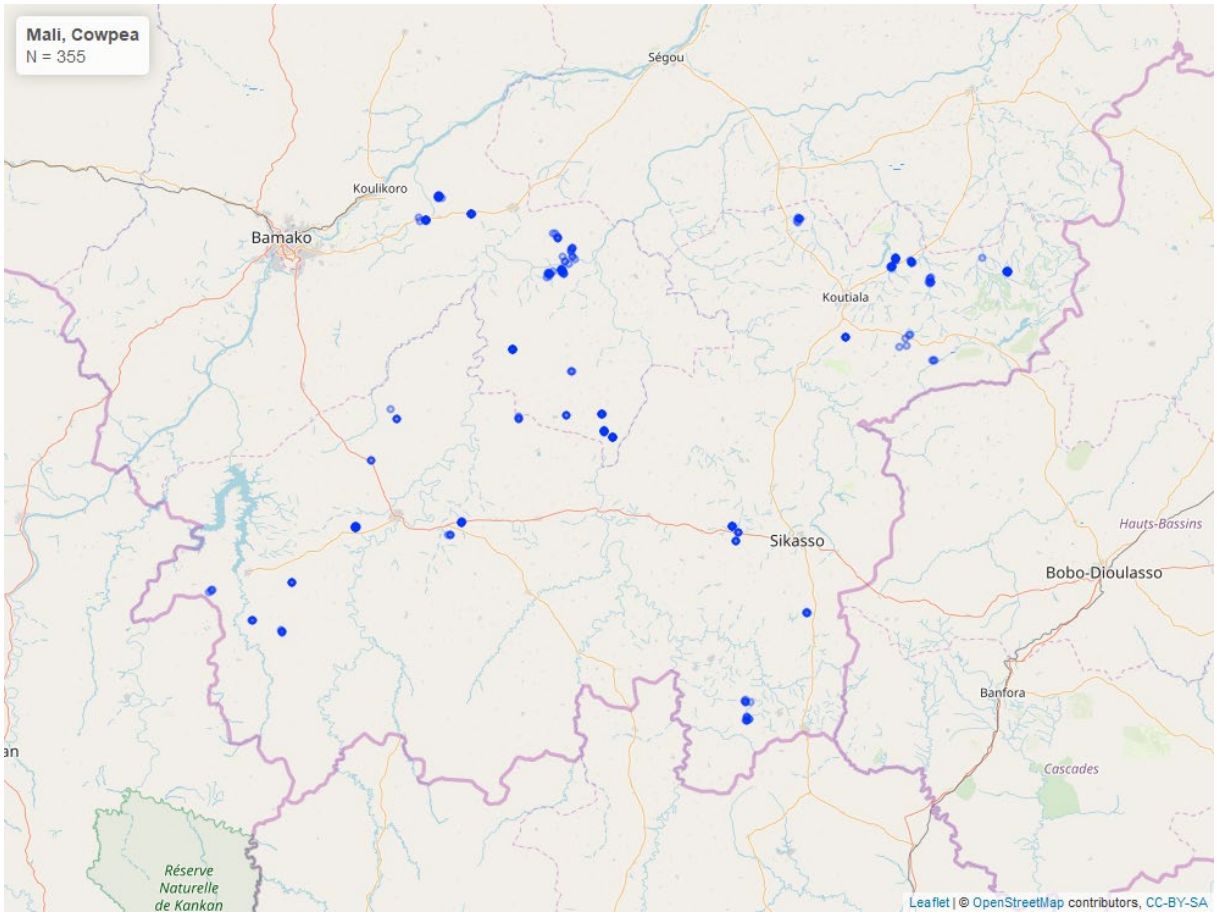

Figure 9: Location of farm household interviews, cowpea sample

Farm household characteristics (cowpea farmers)

Respondents were all AGRA beneficiaries. The sample consisted of 77% male respondents and 23% female. In 52% of the cases the respondent is also the head of the household. Respondents were, on average, 44 years old (see Figure 10).

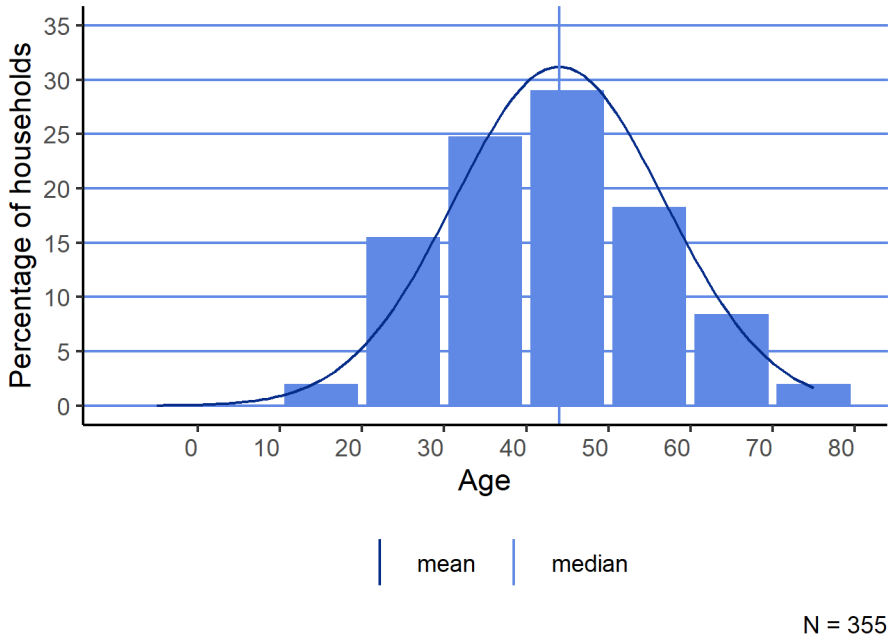

Figure 10: Distribution of age respondent

Households in Mali are large. On average, they consisted of 22.7 members (10.3 adults and 12.4 children). Female-headed households were substantially smaller; this difference is significant (see Table 56).

Table 56: Household composition

Household size	All	Male-headed	Female-headed	sig
Number of children in the household	12.4	12.6	4.5	***
Number of adults in the household	10.3	10.5	3.9	**
n	354	346	8	

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

All farm households, without exception, own agricultural land. The average amount of land owned is 14.7 ha. The large majority of this land (11.5 ha) is cultivated (see Table 57). However, only a small share of this land (0.6 ha) is, on average, allocated to cowpea cultivation (see Table 58). Both the amount of owned land and cultivated land are significantly higher among male-headed households. However, when it comes to cowpea cultivation, there is no difference in land used for cultivation between male and female-headed households.

Table 57: Total farm size (ha)

Land owned/cultivated	All	Male-headed	Female-headed	sig
Land owned (ha)	14.7	15.0	4.9	***
Land cultivated (ha)	11.5	11.6	3.0	**
n	344	336	8	

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

Table 58: Land allocated to cowpea (ha), main season

Land used for cowpea cultivation (ha), *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	0.6	0.6	0.6	
median	0.5	0.5	0.5	
n	348	340	8	

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

Usually, land is used for the cultivation of only one crop. Only 10% of farm households have intercropped cowpea with other crops, mainly maize (34%) or groundnut (14%).

Table 59 shows that all farm households cultivated cowpea in the main season, locally referred to as the *grande saison des pluies*. Consequently, this report only presents data for the main season.

Table 59: Percentage of households producing cowpea, per season

	All	Male-headed	Female-headed	sig
Grande saison des pluies	100%	100%	100%	NA
n	355	347	8	

*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 60 gives an overview of the primary indicators collected. See

Table 60: Overview of main indicators cowpea-farming households

	All	Male-headed	Female-headed
G2: Average number of months of adequate household food provision	**11.6**	**11.6**	**11.5***
G6: Wealth assets index score	**-0.450**	**-0.454**	**-0.262***
G6.1 Share of households in first wealth quintile (%)	15%	16%	0%*
G6.2 Share of households in second wealth quintile (%)	31%	31%	0%*
G6.3 Share of households in third wealth quintile (%)	37%	37%	60%*
G6.4 Share of households in fourth wealth quintile (%)	17%	16%	40%*
G6.5 Share of households in fifth wealth quintile (%)	0%	0%	0%*
IWI International Wealth Index	45.9	45.5	42.4*
1. Average yield (kg/ha)	**300**	**300**	**301***

3. Rate of application of target improved technologies or management practices	55%	55%	62%*
3.1 Adoption of improved varieties (%)	29%	29%	38%*
3.2 Adoption of endorsed varieties (%)	4%	4%	0%*
3.3 Number of seasons variety is recycled	5.6	5.6	5.8*
3.4 Adoption of endorsed planting practice (%)	18%	18%	25%*
3.5 Adoption of inorganic fertiliser (%)	36%	36%	50%*
3.6 Adoption of endorsed fertiliser (%)	0%	0%	0%*
3.7 Adoption of organic fertiliser (%)	16%	15%	62%*
3.8 Adoption of inoculants (%)	1%	1%	0%*
3.9 Adoption of pest-management practices (%)	66%	66%	75%*
3.10 Adoption of endorsed post-harvest practices (%)	44%	44%	38%*
3.11 Adoption of improved storage (%)	3%	3%	0%*
3.12 Use of designated storage facilities (%)	0%	0%	0%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	48%	48%	25%*
Hectares under improved technologies or management practices (%)	**39%**	**39%**	**39%***
3.14 Area under improved varieties (%)	33%	33%	33%*
3.15 Area under inorganic fertiliser (%)	39%	39%	39%*
3.16 Area under pesticides (%)	66%	66%	66%*
4. Access to agricultural advisory extension support services	**43%**	**44%**	**25%***
4.1 Avg. no. of visits per year by agri. advisory extension support services	3.8	3.6	15.5*
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 (km)	8.0	8.0	6.8*
4.4 Distance to nearest agro dealer (minutes conversion 5.5 km/hour)	*87*	*87*	*74**
5. Nitrogen application (kg/ha)	**8.1**	**8.0**	**10.0***
5.1 Phosphorus application (kg/ha)	2.2	2.2	1.4*
5.2 Potassium application (kg/ha)	2.5	2.6	1.8*

Average fertiliser use (Total N + P + K, kg/ha)	**12.5**	**12.5**	**12.7**
6. Percent of post-harvest losses (%)	**4%**	**4%**	**0%***
10. Value of incremental sales as a result of AGRA (crop revenue) (US$)	**16.7**	**16.8**	**7.8***
13. Access to formal financial services (%)	**29%**	**29%**	**12%***
13.1 Bank account (%)	25%	26%	12%*
13.2 Agricultural loan (%)	13%	13%	12%*
13.3 Agricultural insurance (%)	1%	1%	0%*
17. Average age of varieties used (years)	**12.7**	**12.9**	**9.7***
33. Sale through structured trading facilities/arrangements (%)	**0%**	**0%**	**0%***
33.1 Selling to traders/middlemen (%)	12%	12%	0%*
33.2 Selling to consumers (%)	15%	14%	33%*
33.3 Selling to friends/neighbours (%)	7%	8%	0%*
33.4 Selling to aggregation centre (%)	NA	NA	NA
33.5 Selling to farmer organisation (%)	2%	2%	0%*
33.6 Selling to wholesalers (%)	34%	35%	0%*
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	36%	34%	100%*
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 (%)	**1%**	**1%**	**0%***

The composition of variables can be found in the data dictionary in Annex 1; 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 61 reports the average number of months of adequate household food provision as per the index of the same name (MAHFP). It shows that AGRA-supported farmers have, on average, enough food to meet their family's needs during 11.6 months of the year.

Table 61: 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	11.6	11.6	11.5*

Figure 11 shows the MAHFP distribution. It shows that 84% of AGRA beneficiaries report having had enough food to meet their family's needs during the entire year, while 5% did not have enough food for one month; and 7% was food insecure for two months. There is a low share (4%) that struggled to meet food needs between six and nine months per year. Nobody reported being food insecure for more than six months per year.

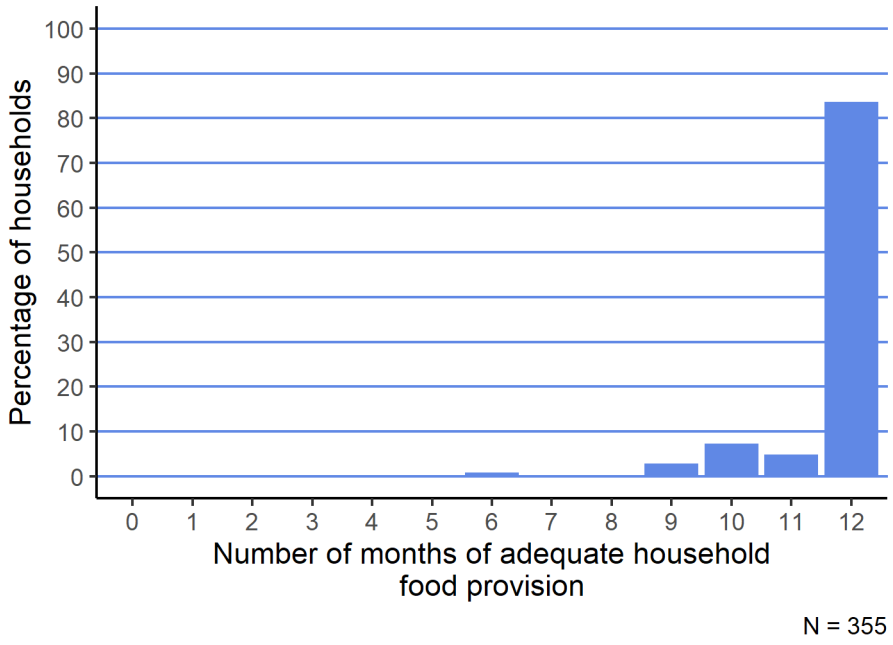

Figure 11: Distribution of number of months of adequate household food provision (G2)

Figure 12 shows the distribution of months with adequate household food provision over the year. The Figure shows that food insecurity was highest in the months of July and August 2018. This is in line with expectations, as these months fall in the main cropping season (wet season) and food insecurity is usually highest right before harvest.

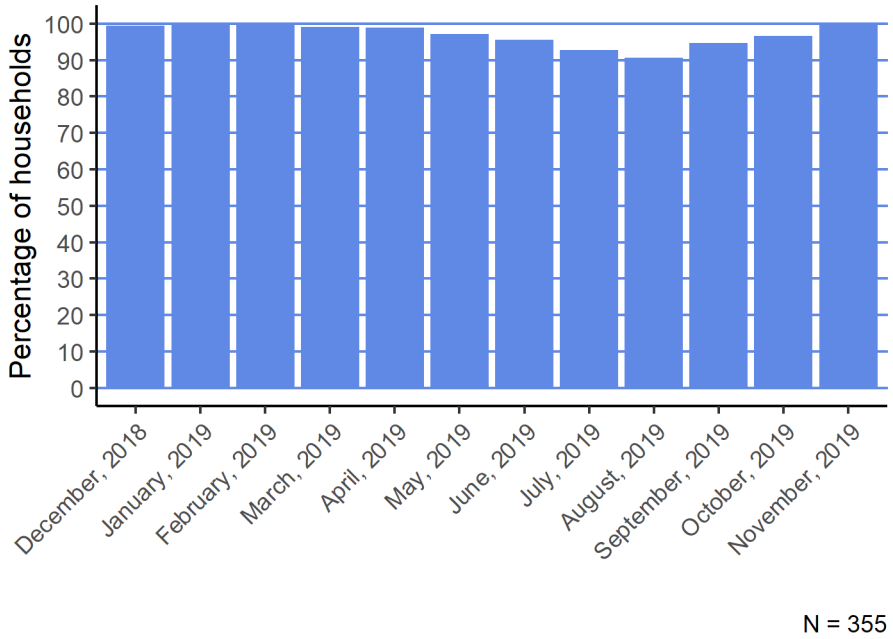

Figure 12: Distribution of months with adequate household food provision

8.4 Wealth asset index score (indicator G6)

Table 62 shows the distribution of households according to the quintiles of the Demographic and Health Surveys (DHS) wealth index. The DHS household wealth index is a composite measure of a household's cumulative living standard. It is composed of data on asset ownership, materials used for housing construction, and types of water access and sanitation facilities.[13] The score itself is not straightforward to interpret, but is used to determine in which wealth quintile a household lies. Wealth index scores were compared with the national Malian DHS distribution for rural areas to determine the household's relative wealth compared to the country average. As can be seen from Table 62, half of households are in the 1st and 2nd (poorest) quintiles (15% and 31%), while 37% and 17% are in the 3rd and 4th quintile respectively. The table also shows that female-headed households in this sample seem to be in higher quintiles, though no significant difference was found.

Table 62: DHS wealth index

	All	Male-headed	Female-headed
G6: Wealth assets index score	**-0.450**	**-0.454**	**-0.262***
G6.1 Share of households in first wealth quintile (%)	15%	16%	0%*
G6.2 Share of households in second wealth quintile (%)	31%	31%	0%*
G6.3 Share of households in third wealth quintile (%)	37%	37%	60%*
G6.4 Share of households in fourth wealth quintile (%)	17%	16%	40%*
G6.5 Share of households in fifth wealth quintile (%)	0%	0%	0%*
IWI International Wealth Index	45.9	45.5	42.4*

8.5 Yield (indicator 1)

Crop yields are estimated by dividing the total crop production by the area of land under cowpea cultivation. To enhance data accuracy, respondents were able to answer questions in units of their preference for both production and land size. The preferred unit for production was most often bags or tins, while the preferred unit of land size was, in all cases, hectares. Production data were converted to kilogrammes. As all respondents reported land size in hectares, no conversions had to be made for land size. Out of 355 interviewed farm households, forty-five respondents did not know their cowpea production, while seven respondents did not know how much land was used to cultivate cowpea.

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

Respondents reported an average cowpea production of 165 kg. Figure 13 shows the distribution of quantity of cowpea harvested. Production was not significantly higher among female-headed households (see Table 63).

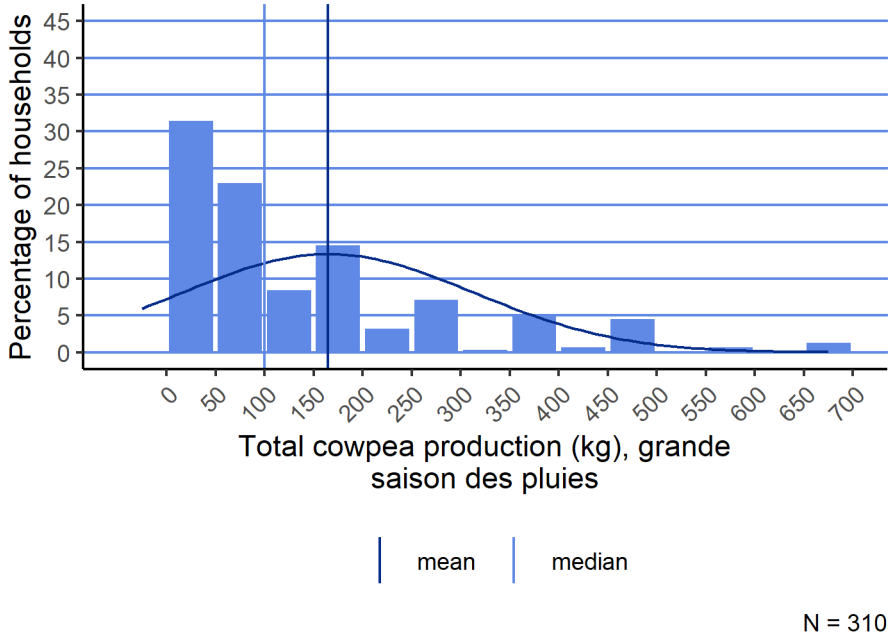

Figure 13: Total production of cowpea (kg), main season

Table 63: Total production of cowpea (kg), main season

Total cowpea production (kg), *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	164.9	164.7	173.6	
median	100.0	100.0	50.0	
n	310	303	7	

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

Cowpea yields are, on average, 300 kg/ha (see Table 64 and Figure 14), which is in line with average yield figures for Mali. Average yields were not statistically different for male-headed households and female-headed households.

Table 64: Average cowpea yield (kg/ha)

	All	**Male-headed**	**Female-headed**
1 Average yield (kg/ha)	300.3	300.2	301.4*

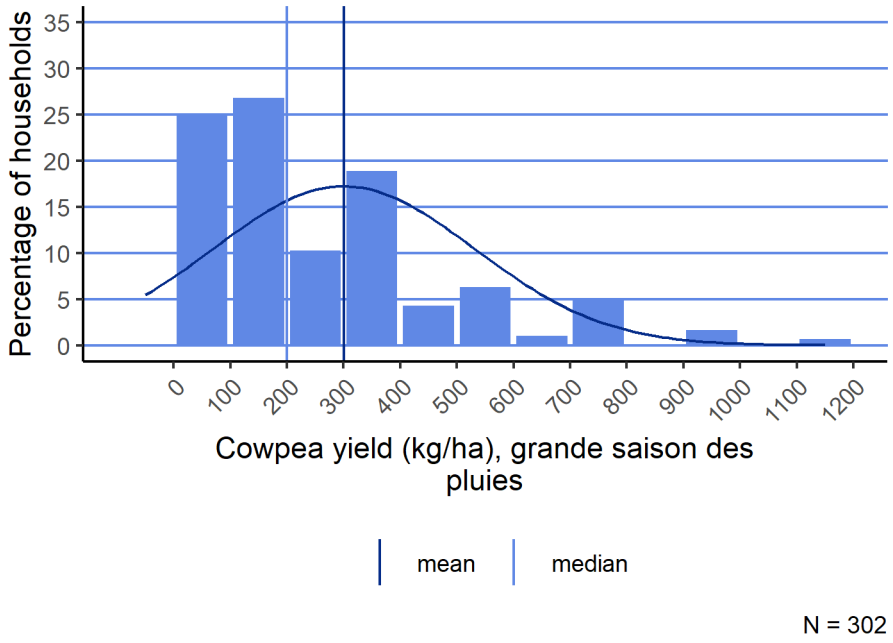

Figure 14: Distribution of average cowpea yield (kg/ha), main season

Most farm households (42%), perceive the harvest of the main season (2018) to be worse than usual, while 35% and 23% consider it normal and better than usual, respectively (see Table 65).

Table 65: Ranking of this season's cowpea harvest compared to other seasons (percentage of households per answer), main season

This season's harvest relative to other seasons	All	Male-headed	Female-headed	sig
Normal	35%	34%	43%	
Worse than usual	42%	42%	29%	
Better than usual	23%	23%	29%	
n	339	332	7	

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

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 66 shows that only 29% of farm households make use of improved cowpea varieties. These improved varieties are improved OPVs. In Mali, the varieties promoted by AGRA are Korobalen, Fakson and Wilibali. In 2018, only 4% of farm households used these endorsed varieties.

Table 66: Main indicators for the use of improved varieties, recycling, and planting practices

	All	Male-headed	Female-headed
3.1 Adoption of improved varieties (%)	29%	29%	38%*
3.2 Adoption of endorsed varieties (%)	4%	4%	0%*
3.3 Number of seasons variety is recycled	5.6	5.6	5.8*
3.4 Adoption of endorsed planting practice (%)	18%	18%	25%*
17. Average age of varieties used (years)	12.7	12.9	9.7*
Hectares under improved technologies or management practices (%)	39%	39%	39%*

Table 67 lists the varieties grown, which shows that a large share of farm households (33%) uses local varieties without specifying names, or varieties that were not listed in the seed catalogue (23%). A low percentage of farm households used the promoted variety Wilibali (3%) and Korobalen (1%). Female-headed households do not use local varieties, while they are more used to Choba and Dounan Fana than male-headed-households. This difference is significant.

Table 67: Cowpea varieties used (percentage of households per variety), main season

Varieties	All	Male-headed	Female-headed	sig
Local variety, unspecified	33%	33%	0%	**
Other	23%	23%	25%	
Don't know	12%	12%	12%	
Improved variety	9%	9%	0%	
DJEMANI	8%	8%	0%	
CINZANA TELIMANI	7%	6%	25%	**
Choba	4%	4%	25%	***
WILIBALI (promoted)	3%	3%	0%	
Horonkolo Fana	2%	2%	12%	**
ACAR 2	1%	1%	0%	
DOUNAN FANA	1%	0%	12%	***
KOROBALEN (promoted)	1%	1%	0%	
SANGARAKA	1%	1%	0%	
n	355	347	8	

*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 68 groups the varieties that are cultivated in the local variety or improved or OPV categories. However, the variety cultivated could not be determined for 38% of farm households. This is due to the large amount of farm households mentioning a general type of cowpea, as white cowpea or black cowpea, instead of the name of the variety.

Table 68: Type of main cowpea variety (percentage of households per type), main season

Type of main variety, ***grande saison des pluies***	All	Male-headed	Female-headed	sig
Not able to classify	38%	38%	62%	
Local variety	33%	33%	0%	
Pure Line	21%	20%	38%	
OPV	8%	8%	0%	
n	355	347	8	

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

For the varieties that could be classified, Table 68 shows that 33% of farmers sowed local varieties, 21% Pure Line and only 8% sowed improved OPVs.

The main motivation for selecting a certain variety is, by far, yields (72%). In addition, farm households select varieties based on taste (61%) and favourable maturing time (36%). Table 69 shows that yields, maturing time, and tolerance to diseases characteristics are significantly mentioned more often as appreciated traits for Pure Line.

Table 69: Appreciated traits of the main cowpea variety used (percentage of households per trait), by type of variety, main season

Cowpea variety traits	All	Local variety	OPV	Pure Line	sig
Yields	72%	64%	59%	81%	**
Tolerance to droughts	5%	4%	7%	1%	
Tolerance to diseases	3%	1%	0%	5%	*
Taste	61%	67%	55%	53%	
Maturing time	36%	27%	21%	42%	**
Conservation (storage time)	5%	4%	0%	5%	
Processing	2%	1%	0%	3%	
Appreciated by buyers (market)	4%	3%	0%	3%	
Colour	5%	5%	0%	4%	
It was free	4%	3%	3%	7%	
Other	3%	2%	3%	3%	
n	355	116	29	74	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
Note: Categories smaller than 1% are combined in 'Other'

The average number of years since hybrid and OPV varieties were released is 13 and seeds are, on average, recycled for 5.6 seasons before they are renewed.

Farmers obtain their seeds from various sources.

Table 70 shows the source of seeds per type of variety, which shows that local varieties were most often obtained from recycling (26%) than OPV and Pure Line but this difference is not significant. While Pure Line is more often obtained from agro-dealers, this difference is not significant.

Table 70: Source of seed of main cowpea variety (percentage of households per source), by type of variety, main season

Source of the seed, *grande saison des pluies*	**All**	**Local variety**	**OPV**	**Pure Line**	**sig**
Recycled from the field of friend/family/neighbour… etc.	26%	65%	8%	26%	
Seed producer	2%	0%	4%	0%	
Seed company	3%	0%	20%	0%	
Agro-dealer	29%	22%	4%	35%	***
Market stall (not specifically for inputs)	3%	9%	4%	0%	
Farmer Organisation	2%	0%	8%	0%	
NGO distribution	35%	4%	52%	38%	
Other	0%	0%	0%	1%	
n	156	23	25	34	

*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'

Contrary to expectations, there is not a large yield difference between local varieties, OPVs and Pure Line. Table 71 shows that farm households cultivating local varieties have higher yields than farm households cultivating other varieties. But this difference is not statistically significant.

Table 71: Average cowpea yield (kg/ha), by type of variety, main season

Cowpea yield (kg/ha), *grande saison des pluies*	**All**	**Local variety**	**OPV**	**Pure Line**	**sig**
mean	300.3	321.1	278.8	268.1	
median	200.0	300.0	200.0	200.0	
n	302	91	23	70	

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

Planting practices

In Mali, AGRA promotes preparing ridges 60 to 75 cm apart and prepare planting holes within the ridges, 40 to 50 cm apart. Further, it promotes planting two seeds per hole. Table 72 shows that 75% of farmers plant using fixed spacing.

Table 72: Planting method for cowpea, main season

Planting method, *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
Broadcasting	15%	15%	25%	
Scattering	9%	10%	0%	
Planting with fixed spacing	75%	75%	75%	
n	348	340	8	

Planting method, *grande saison des pluies*	All	Male-headed	Female-headed	sig

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

Table 73 shows that, among the farm households that plant using fixed spacing, 50-75 cm, 60-40 are the most commonly used spacing cm (38%, 37%) and 40-50 cm, the promoted practice is applied by 24% of households using fixed-spacing. Eighty-six percent of said households used more than 1 seed per hole.

Table 73: Spacing between cowpea seeds, main season

Planting method, spacing, *grande saison des pluies*	All	Male-headed	Female-headed	sig
50-75 cm	38%	38%	17%	
60-40 cm	37%	37%	50%	
40-50 cm	24%	24%	33%	
Other	1%	1%	0%	
n	265	259	6	

*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'

Fertiliser use

Table 74 presents the main indicators on fertiliser use. About 36% of farm households applied inorganic fertiliser. This percentage is higher for female-headed households, but the difference is not significant. In total, almost 40% of cowpea land gets treated with inorganic fertiliser.

Table 74: Main indicators for the adoption and use of fertiliser

	All	Male-headed	Female-headed
3.5 Adoption of inorganic fertiliser (%)	36%	36%	50%*
3.6 Adoption of endorsed fertiliser (%)	0%	0%	0%*
3.7 Adoption of organic fertiliser (%)	16%	15%	62%*
3.15 Area under inorganic fertilizer (%)	39%	39%	39%*
5. Nitrogen application (kg/ha)	8.1	8.0	10.0*
5.1 Phosphorus application (kg/ha)	2.2	2.2	1.4*
5.2 Potassium application (kg/ha)	2.5	2.6	1.8*
Average fertiliser use (Total N + P + K, kg/ha)	12.5	12.5	12.7

In Mali, AGRA does not promote the use of NPK, but it promotes urea and DAP (18-46-0). None of the farm households interviewed used DAP, while urea is used by 97% of farm households.

Although not promoted, farmers still apply NPK. On average, NPK users applied 69.8 kg of NPK per ha. Urea application among users is, on average, 58 kg/ha. Despite the ability of

legume crops such as cowpea to fix nitrogen, overall, nitrogen is still the macronutrient applied in the largest quantity (8.1 kg/ha), followed by potassium (2.5 kg/ha) and phosphorus (2.2 kg/ha). There are no secondary macronutrients or micronutrients applied by cowpea farm households (see Table 75).

Table 75: Nutrients applied for cowpea (kg/ha), main season

	All	Male-headed	Female-headed	sig
Nitrogen application (kg/ha), *grande saison des pluies*	8.1	8.0	10.0	
Phosphorus application (kg/ha), *grande saison des pluies*	2.2	2.2	1.4	
Potassium application (kg/ha), *grande saison des pluies*	2.5	2.6	1.8	
Sulfur application (kg/ha), *grande saison des pluies*	0.0	0.0	0.0	
Calcium application (kg/ha), *grande saison des pluies*	0.0	0.0	0.0	NA
Magnesium application (kg/ha), *grande saison des pluies*	0.0	0.0	0.0	NA
Boron application (kg/ha), *grande saison des pluies*	0.0	0.0	0.0	
Zinc application (kg/ha, *grande saison des pluies*	0.0	0.0	0.0	NA
n	355	347	8	

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

The most common source of information on inorganic fertiliser is the observation in the community (52%), or self-learning (33%); only 3% of farm households received information on fertiliser from their VBA.

Organic fertiliser was use by 16% of farm households, which most often consists of manure (86%) or crop residues (28%) (see Table 76). Compost is applied by 38% of farm households, though female-headed households use it significantly more. Information on organic fertilisers mainly comes from traditional knowledge. A large percentage of farm households obtain information on organic fertiliser from self-learning (52%) or a source within the community (33%). The large majority of farmers has used organic fertiliser for longer than four years.

Table 76: Types of organic fertiliser used for cowpea

Types of organic fertiliser	All	Male-headed	Female-headed	sig
Granular	2%	2%	0%	
Compost	38%	34%	80%	**
Manure	86%	87%	80%	
Crop residues	28%	26%	40%	
n	58	53	5	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
n = households that applied organic fertiliser

Surprisingly, there are no differences in productivity between farmers who apply fertiliser and farmers who do not (see Table 77), which might be due to the fact that fertiliser is applied in relatively low quantities, though there is no empirical evidence supporting this hypothesis.

Table 77: Average cowpea yield (kg/ha), by fertiliser use (yes/no), main season

Cowpea yield (kg/ha), *grande saison des pluies*	All	No	Yes	sig
mean	300.3	314.4	276.9	
median	200.0	200.0	200.0	
n	302	188	114	

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

Besides fertiliser, inoculants are promoted. However, only 1% of farm households in Mali uses inoculants (see Table 78).

Table 78: Inoculant use for cowpea, grande saison des pluies

Inoculant use, *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	1%	1%	0%	
n	355	347	8	

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

Pest management practices

Table 79 shows the percentage of farm households that have adopted pest management practices, which is defined as the percentage of households applying pesticides, herbicides and/or fungicides. The table shows that 32% of cowpea households used pest-management practices.

Table 79: Adoption of pest-management practices

	All	Male-headed	Female-headed
3.9 Adoption of pest-management practices (%)	66%	66%	75%*

Between the three types of agro-chemicals, herbicides are used most (46%), followed by pesticides (32%). Fungicides were only applied by 15% of cowpea households, (see Table 80). Female-headed households apply less pesticides than male-headed households. This difference is significant.

Table 80: Percentage of households applying agro-chemical inputs for cowpea, main season

	All	Male-headed	Female-headed	sig
Pesticide application, *grande saison des pluies*	32%	32%	62%	*
Herbicide application, *grande saison des pluies*	46%	46%	62%	
Fungicide application, *grande saison des pluies*	15%	15%	0%	
n	355	347	8	

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

In most cases, agro-chemicals are applied on almost half of the land area: 40% of the total land area was treated with herbicides and 32% was treated with pesticides (see Table 81). Fungicides were applied on only 14% of the total land area.

Table 81: Percentage of total land used for cowpea cultivation under agro-chemical inputs, main season

	All	Male-headed	Female-headed	sig
Percentage of total land area under pesticides, *grande saison des pluies*	32%	31%	62%	*
Percentage of total land area under herbicides, *grande saison des pluies*	44%	44%	62%	
Percentage of total land area under fungicides, *grande saison des pluies*	14%	14%	0%	
n	355	347	8	

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

In most cases, farm households apply herbicides post-emergence (63%), while 45% of farm households applied herbicides post-emergence (see Table 82). Both pre- and post-emergence application of herbicides are endorsed by AGRA. Information on herbicides is usually obtained from self-learning or within the community: 27% learned about herbicides from fellow community members, and 37% were self-taught. Around 4% received information on herbicides from their VBA. In addition to herbicide use, weeding is an important practice applied by 90% of farm households. Farm households weed their land, on average, 1.4 times per season.

Table 82: Timing of herbicide application for cowpea, main season

	All	Male-headed	Female-headed	sig
Pre-emergence	45%	45%	20%	
Post-emergence	63%	62%	80%	
n	164	159	5	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
n = households that applied herbicides

The large majority of pesticide users (65%) indicated having used other pesticides than those listed. The remaining farmers (19%) indicated using the pesticide (Lamdraf Super (see Table 83).

Table 83: Type of pesticides applied for cowpea (percentage of households per type), main season

Types of pesticides	All	Male-headed	Female-headed	sig
Lamdacyalothrin (LAMDRAF SUPER 2/K-Optimal)	19%	20%	0%	
Indoxarbe (VIPER 46 EC)	3%	4%	0%	
Lamdacyalothrin (K-Optimal)	3%	4%	0%	
Other	65%	64%	100%	*
n	115	110	5	

Types of pesticides	All	Male-headed	Female-headed	sig

*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 applied pesticides

Post-harvest practices

Table 84 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 cowpea processing (drying and threshing). The adoption of improved storage facilities (indicator 3.11) measures the percentage of farmers storing cowpea in silos or double-liner hermetic storage bags (such as PICS bags). Farm households store using designated storage facilities (indicator 3.12) at farmer's organisations, or they store through private storage facilities (indicator 3.13), or through the warehouse receipt systems.

Table 84: Main indicators for the adoption of improved post-harvest practices

	All	Male-headed	Female-headed
3.10 Adoption of endorsed post-harvest practices (%)	44%	44%	38%*
3.11 Adoption of improved storage (%)	3%	3%	0%*
3.12 Use of designated storage facilities (%)	0%	0%	0%*
3.13 Adoption of tablets to preserve quality of recycled seed (%)	48%	48%	25%*

The majority of farm households (44%) uses a tarpaulin at least once during processing. Table 85 shows that 38% of the farm households use a tarpaulin when drying cowpea. In most cases, farm households (74%) learned about tarpaulin use from themselves, or from observation in the community. The large share of farm households (78%) that use a tarpaulin have been doing so for more than four years.

Table 85: Use of sheeting for drying cowpea (percentage of households), main season

Usage of sheet/tarpaulin for drying, ***grande saison des pluies***	All	Male-headed	Female-headed	sig
mean	38%	38%	38%	
n	354	346	8	

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

In Mali, the uptake of multifunctional threshers is not widespread. The majority (89%) of farm households manually threshes their cowpea. Amongst these people, 40% have used a tarpaulin (see Table 86). Again, household's main source of information on tarpaulin use is self-learning (74%). The large share of farm households (75%) that use tarpaulins for threshing have been doing so for more than four years.

Table 86: Use of sheeting when threshing cowpea, main season

Usage of sheet/tarpaulin for threshing, *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	40%	40%	33%	
n	316	310	6	

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

When it comes to improved storage facilities, PICS bags (which are specifically designed for the storage of bean crops), are promoted by AGRA in Mali. However, only 3% of farm households stored their cowpea in improved bags (see Table 87). It was also asked about storing maize in silos, but nobody indicated having made use of this practice.

Table 87: Percentage of households using PICS bags for storage of cowpea, main season

Usage of PICS bags, *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	3%	3%	0%	
n	355	347	8	

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

Another indicator on post-harvest practices concerns the use of preservative tablets to preserve seed stocks. Table 88 shows that 48% of farm households recycling seeds made use of preservative tablets to secure the quality of their recycled seed stock.

Table 88: Use of preservative tablets for cowpea seeds, main season

Usage of preservative tablets on cowpea seeds, *grande saison des pluies*	All	Male-headed	Female-headed	sig
mean	48%	48%	25%	
n	199	195	4	

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

Almost no household indicated having stored cowpea; only four farm households stored their cowpea harvest in 2018. All four households made use of their own storage facilities (see Table 89).

Table 89: Type of storage for cowpea, main season

	All	Male-headed	Female-headed	sig
Own storage	100%	100%	NA%	
Farmer organisation storage	0%	0%	NA%	
Warehouse receipt system	0%	0%	NA%	
Private storage rental	0%	0%	NA%	
n	4	4	0	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%

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 twelve months. During these months, 43% of farm households were visited by an agricultural extension officer (see Table 90). On average, farm households that met with an extension officer were visited four times per year. The number of visits was higher for female-headed households than for male-headed households. This difference is significant. Seed packs were not distributed for cowpea in Mali, so no data is presented on seed packs.

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

	All	Male-headed	Female-headed
4. Access to agricultural advisory extension support services	43%	44%	25%*
4.1 Avg. no. of visits per year by agri. advisory extension support services	3.8	3.6	15.5*
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 (km)	8.0	8.0	6.8
4.4 Distance to nearest agro dealer (minutes conversion 5.5 km/hour)	*87*	*87*	*74**

Table 91 shows that extension officers were most often VBAs (38%) and government (33%). Female-headed households were more often visited by VBAs than male-headed households.

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

Type	All	Male-headed	Female-headed	sig
Government	33%	33%	0%	
Company	1%	1%	0%	
NGO	37%	38%	0%	
Farmer promoter/VBA	38%	37%	100%	*
Cooperative	5%	5%	0%	
Other	1%	1%	0%	
n	153	151	2	

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

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

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

About 69% of farm households did not mention any precise extension method. In general, the most common extension method is the transfer of knowledge through farmer organisation or training (see Table 92). Farmer field schools, demonstration plots and

technology packages were mentioned by 4%, 9% and 1% of the farm households, respectively.

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

Method	All	Male-headed	Female-headed	sig
None	69%	69%	62%	
Farmer Field Schools	4%	4%	0%	
Demonstration plot	9%	10%	0%	
Technology packages	1%	1%	0%	
Mentoring by lead farmers	8%	8%	12%	
Transfer of knowledge within farmer organisation/Training of trainers	14%	13%	25%	
Support by farmer promoter	8%	7%	12%	
Other	1%	1%	12%	***
n	355	347	8	

*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'

Access to agricultural extension services also includes distance to the nearest agro-dealer. Distance to agro-dealers is usually based on travel time but, in the case of Mali, farmers knew the distance in miles or kilometres. As can be seen in Table 93, the average distance to the agro-dealer is 8 km. When visiting the agro-dealer, farm household most often go by motorbike or cart (indicated by 48% and 25%, respectively). A small percentage (14%) travels by foot. Using a 5.5 km/hour rate, this would mean 87 minutes distance.

Table 93: Average distance to agro-dealer (kilometres)

Distance to agro-dealer in km	All	Male-headed	Female-headed	sig
mean	8.0	8.0	6.8	
median	6.0	6.0	5.0	
n	244	238	6	

*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 29% of the farm households have access to formal financial services. In particular, 25% of farm households has access to at least one bank account, 13% to a formal agricultural loan, and 1% to an agricultural insurance. These indicators thus only include access to formal financial services, provided by formal financial institutions and excludes access to informal financial services, such as from village money lenders, relatives, or saving groups.

Table 94: Main indicators for access to formal financial services

	All	Male-headed	Female-headed
13. Access to formal financial services (%)	29%	29%	12%*

13.1 Bank account (%)	25%	26%	12%*
13.2 Agricultural loan (%)	13%	13%	12%*
13.3 Agricultural insurance (%)	1%	1%	0%*

In this sample, 13% of farm households took a loan through a formal arrangement (bank, SACCO of MFI). In total, 18% of the sample took a loan. Of all loans, 31% were provided by an informal source (family or friends and village money lenders and informal saving groups) in 2018 (Table 95).

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

Loan providers	All	Male-headed	Female-headed	sig
Family or friends	17%	17%	0%	
Village money lender	5%	5%	0%	
VSLA/ISLC/VICOBA (Informal savings and loans group)	3%	3%	0%	
Savings and Credit Cooperative (SACCO)/Credit Union	16%	16%	0%	
Microfinance institution (MFI)	45%	44%	100%	
Bank	11%	11%	0%	
Trader	2%	2%	0%	
Company	2%	2%	0%	
Other	2%	2%	0%	
n	64	63	1	

*Note: significance from a one-way ANOVA statistical test. ***, **, * indicate significance levels of 1%, 5% and 10% respectively*
Note: Multiple choices possible, therefore total does not need to add to 100%
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 cowpea 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 (%)	4%	4%	0%*

Table 96 shows that post-harvest losses as share of total production are 4%m which is relatively high. However, the majority of the sample (86%) did not report any loss. Sample-wide, farmers lost, on average, 7.4 kg of cowpea. However, when excluding the farmers that did not lose any cowpea, this average is higher. Farmers who did lose cowpea post-harvest lost, on average, 54 kg; the maximum that was lost was about 400 kg. While interpreting this data, it should, however, be kept in mind that post-harvest losses are typically difficult to estimate for farmers, as losses are typically not measured.

8.10 Access to market information (indicator 37)

Only 1% of cowpea farmers access formal channels of market information, such as information through SMS, radio, television, internet and the farmer's organisation (see Table 97).

Table 97: Main indicator for access to market information

	All	Male-headed	Female-headed
37. Access to market information through formal channel (%)	1%	0%	12%*

Farmers do, however, use informal channels to collect market information. Table 98 shows that, amongst farmers that sell their cowpea, market information mainly comes from buyers (59%), market (37%) and other farmers (4%).

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	59%	58%	67%	
Farmer to farmer	4%	4%	0%	
Market	37%	37%	33%	
Farmer organisation	2%	2%	0%	
Other	0%	0%	0%	NA
n	109	106	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'

8.11 Sales channels (indicator 33)

Table 99 shows 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 (%)	12%	12%	0%*
33.2 Selling to consumers (%)	15%	14%	33%*
33.3 Selling to friends/neighbours (%)	7%	8%	0%*
33.4 Selling to aggregation centre (%)	NA	NA	NA*
33.5 Selling to farmer organisation (%)	2%	2%	0%*
33.6 Selling to wholesalers (%)	34%	35%	0%*

	All	Male-headed	Female-headed
33.7 Selling to processors (%)	0%	0%	0%*
33.8 Selling to retailers (%)	36%	34%	100%*
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. None of the farm households sell their harvest under a formal contract.

Table 100 shows that farmers' clients are mainly retailers (36%) or wholesalers (34%), In general, selling though retailers is more in use in female-headed households than in male-headed households; this difference is significant.

Table 100: Buyers (% of households selling to different types of buyers) – KIT additional indicator 3

Buyer	All	Male-headed	Female-headed	sig
Trader	12%	12%	0%	
Selling to wholesalers (%)	34%	35%	0%	
Friends/Neighbours	7%	8%	0%	
Farmer organisation	2%	2%	0%	
Retailers	36%	34%	100%	**
Consumers	15%	14%	33%	
Other	0%	0%	0%	NA
n	109	106	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'
n = households that sold cowpea

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 cowpea sales are reported as a baseline value. These values of sales were calculated by multiplying the quantity sold (kg) by the common price received per kg. Values were converted to kilogrammes in case quantities were reported in different units.

Table 101: 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$)	16.7	16.8	7.8*

On average, the revenue from selling cowpea is US$17 per household (see Table 101).[14] Total revenues from cowpea sales in West African Francs are CFA9,288 (see Table 102).

Table 102: Sales value (total revenue) of cowpea sold, main season – calculated variable (IO5.3 – 36) – KIT indicator 10

Revenue from sales of cowpea, *grande saison des pluies* (XOF)	**All**	**Male-headed**	**Female-headed**	**sig**
mean	9288.3	9389.1	4333.3	
median	0.0	0.0	0.0	
n	301	295	6	

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

Farm households, on average, receive CFA270 per kg. There is no significant difference in price received by male-headed and female-headed households (see Table 103).

Table 103: Price received for cowpea (XOF)

Common price received for cowpea (XOF/kg), *grande saison des pluies*	**All**	**Male-headed**	**Female-headed**	**sig**
mean	270.3	273.9	147.5	
median	250.0	250.0	147.5	
n	71	69	2	

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

The shares of cowpea allocated to different purposes (including the share of cowpea sold) are similar for male-headed and female-headed households (see Table 104). Although small differences seem to be present; none of these differences is statistically significant. Most cowpea (70%) is used for consumption, 16% is, on average, sold.

Table 104: Allocation of cowpea harvest (%)

	All	**Male-headed**	**Female-headed**	**sig**
Cowpea used for consumption (% of harvest), *grande saison des pluies*	70%	70%	69%	
Cowpea kept for seed (% of harvest), *grande saison des pluies*	6%	6%	5%	
Cowpea given away (% of harvest), *grande saison des pluies*	3%	3%	3%	
Cowpea used as payment for inputs (% of harvest), *grande saison des pluies*	0%	0%	0%	
Cowpea bartered or exchanged for goods (% of harvest), *grande saison des pluies*	0%	0%	0%	NA
Cowpea sold (% of harvest), *grande saison des pluies*	16%	16%	23%	
Post-harvest losses of cowpea (% of total harvest), *grande saison des pluies*	4%	4%	0%	
n	310	303	7	

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

[14] This value is converted from XOF to US$ by using the 2018 average exchange rate of 1US$ = 557.248 XOF

The average value of cowpea production per household, calculated by multiplying the quantity produced (kg) by the common price received per kg, is CFA79,372 CFA (US$142) for household selling cowpea (Table 105,Table 106).

Table 105: Crop value (CFA) of cowpea produced

	All	Male-headed	Female-headed
Average value of production in CFA	79,371	81,110	23,750*
n = households that sold cowpea			

Table 106: Crop value (US$) of cowpea produced

	All	Male-headed	Female-headed
Average value of production in US$	142	145	42*
n = households that sold cowpea			

Part III: Small & medium enterprise survey

9 SME performance

9.1 Introduction

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

An important pathway for change in 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 all these demands, KIT has developed a simple SME performance scorecard.

9.2 Methodology

Performance dimensions

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

- Business resilience indicates the ability of the SME to adapt to disruptions while maintaining business operations, employment and assets. The variables used to determine business reliance are:
  - Years in business
  - Number of services offered
  - Diversity of clients
- Financial stability indicates the financial health and access to financial services of an SME. The variables used to determine financial stability are:
  - Estimated total annual 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 as the desired state of the SME for the particular variable. The average of the scores gives the total score for each dimension.

Performance scorecards are presented in Annex 3: SME Performance scorecard. An overview of all SME indicators and associated descriptive statistics is presented in Annex 4: SMEs descriptive statistics.

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 Mali, 18 SMEs participated in the survey:

- eight seed companies;
- two input suppliers or agro-dealers;
- eight agri-value chain actors (processors and aggregators).

Due to incomplete information in the SMEs list, it was difficult to distinguish between input supply agro-dealers and input companies. More information about SMEs participating in the interviews are in Annex 5: SMEs interviewed.

9.3 Performance dashboards

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

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

Seed companies

The sample of SMEs interviewed contains eight seed companies (see Figure 15). The score for business resilience is 'average', signalling that there is room for improvement. These SMEs are new enterprises, which have been in business for three years on average. They offer an 'average' variety (three services on average) of services and show a relatively high degree of market diversification ('good').

The score for financial stability is 'good', signalling good performance. These SMEs have an average an annual turnover of around US$180.056. They have good access to formal credit: around 50% of SMEs get more than 90% of their credit from formal financial institutions, and all other SMEs get more than 50% from these formal sources. They declared one investment, on average, in the last three years.

The score for human capital is 'average', indicating that there is room for improvement. The percentage of permanent workers over the total work force is not considered because of lack of reliable information about the number of casual workers employed. The score for employing female staff is 'poor'. It may be beneficial for these SMEs to recruit more female employees.

The average score for technology is 'poor'. The scores assigned to the sub-indicators on investments in R&D, buildings/storage and equipment ('poor'), underscore the need to invest in new technologies.

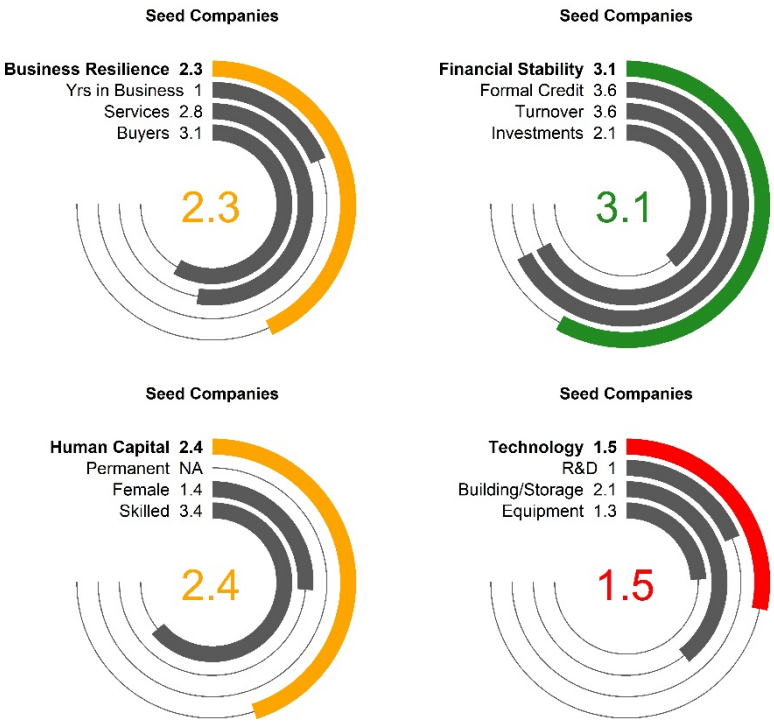

Figure 15: Seed companies' performance scorecard

Input supply or agro-dealers

There are only two input suppliers/agro-dealers in the sample, which requires being cautious with generalising the scores obtained (see Figure 16).

The score for business resilience is 'poor' to 'average', signalling that there is room for improvement. This score is low because these SMEs are new enterprises, which have been in business for three years on average. They offer three services, on average, mainly retail and advisory services. They deal with two types of buyers, individual producers or associations.

The score for financial stability is 'good'. These SMEs have an average annual turnover of around US$59.244. They have good access to formal credit; 50% of SMEs indicated that they get more than 90% of their credit from formal financial institutions, and 50% gets between 75-90% from these institutions. However, these SMEs invest little; i.e. they declared one investment in the last three years, mainly represented by equipment purchases.

The score for human capital is also 'good'. The percentage of permanent workers over the total worker force is not considered because of lack of reliable information. The scores assigned to the percentages of female and skilled employees are 'average' to 'good'. Although, these SMEs should enrol more female employees.

The overall score for technology is (very) 'poor'. None of these SMEs made any investment in technology during the last three years.

Figure 16: Input supply or agro-dealers' performance scorecard

Agri-value chain actors

The sample of SMEs interviewed comprises eight enterprises that are operating in agricultural value chains as aggregators, processors or traders (see Figure 17).

The score for business resilience is 'poor', signalling low resilience. This score is low because these SMEs have been in business for four years, on average, offer limited services, around one services, on average, mainly the aggregation of farmers' production, and deal with two buyers, on average, principally individual producers and associations.

The score for financial stability is 'average'. These SMEs have an average annual turnover of around US$61.109. They have access to formal credit; 62.50% of SMEs gets around 50% of their credit from formal credit institutions. They made one investment, on average, in the last three years, mainly in equipment or expansion of buildings and storage.

The score for human capital is 'poor', indicating that there is ample room for improvement. The scores assigned to the percentages of female and skilled employees are overall 'poor'.

The score for technology however is 'average', mainly because of investments in R&D, investment in buildings and storage capacity.

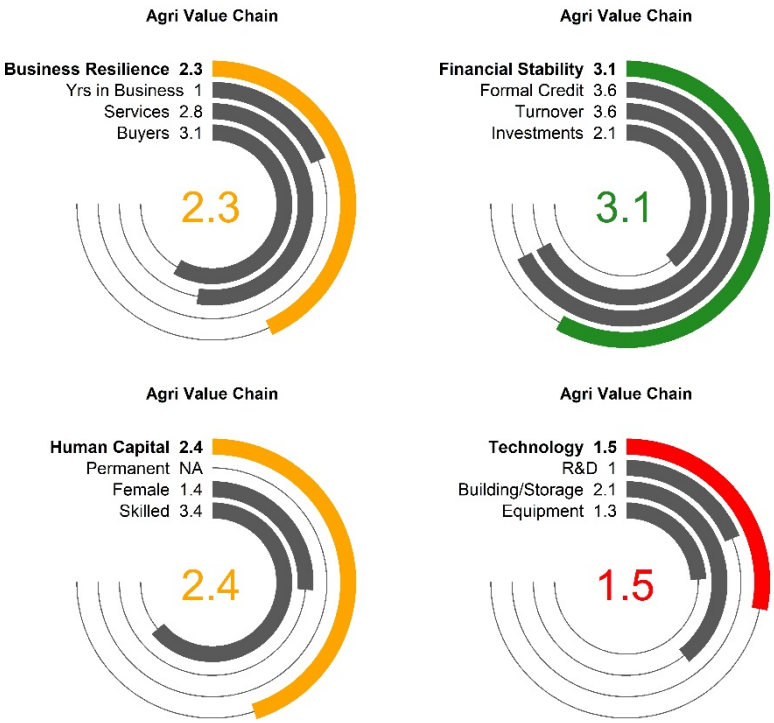

Figure 17: Agri-value chain actors' performance scorecard

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Annex 1: List of key informants for system analysis

Organisation	Respondent	Function	Date (2019)	Relation to AGRA
AGRA Mali	Sami Traore	Programme officer	04-11	AGRA Mali team member
	Badji Karambe	Associated programme officer	04-11	AGRA Mali team member
DNA Mali	Amadou Cheick Traore	General director	05-11	Supported through AGRA
	Amadou Kone	Focal point AGRA	05-11	Supported through AGRA
CPS/SDR	Amadou Fofana	Agent M&E	05-11	Grantee
	Abdoulaye Arby	Agent planning	05-11	Grantee
Ministry of Agriculture	Seydou Keita	Focal point AGRA	05-11	Liaison with AGRA Mali
	Amadou Dembele	Assistant focal point AGRA	05-11	
NGO AMDD	Oumou Traoré	Director	01-11	Grantee
	Lambert Amoule	Coordinator	01-11	Grantee
	Moustapha Thiam	Supervisor	01-11	Grantee
	Famakan Keita	Supervisor	01-11	Grantee
	Yacouba Traoré	Supervisor	01-11	Grantee
	Lassina Diabaté	Agent M&E	01-11	Grantee
	Néné Keita	Accountant	01-11	Grantee
	Alzaouza	Assistant administrator	01-11	Grantee
NGO EUCORD	Karomoko Sacko	Director	04-11	Grantee
	Alima Diallo	Agent M&E	04-11	Grantee
	Kalif Goita	Agent Sikasso	06-11	Grantee
NGO MaliMark	Aminata Coulibaly	Director	01-11	Grantee
	Mohamed Diawara	Agent agriculture	01-11	Grantee
	Ramatoulaye Coulibaly	Coordinator KICAMS	01-11	Grantee
	Kassim Bengaly	Accountant	01-11	Grantee

	Marie Jeanne Mutajogire	Consultant	01-11	Grantee
NGO Mission Sahel	Tiécoura Diarra	Director	01-11	Grantee
	Maramin Simpara	Supervisor	01-11	Grantee
	Boubacar Traore	Assistant accountant	01-11	Grantee
	Fanta Kone Diallo	Assistant administrator	01-11	Grantee
NGO AMED	Fatimata Kone	Agent Sikasso	06-11	Grantee
Faso Kaba	Tchi Coulibaly	Director	01-11	Consortium member
VBA	Amadou Thiam	VBA Massala village (Koulikoro)	02-11	AGRA VBA
	Barakisa Kone	VBA Yerelombougou village (Sikasso)	07-11	AGRA VBA
Farmers	FGD – 3 male & 4 female farmers	Massala village (Koulikoro)	02-11	Supported through AGRA
	Kadare Traore	Aggregation center Lofogue village (Sikasso)	06-11	Supported through AGRA
	Pierre Diabate	Aggregation center Lofogue village (Sikasso)	06-11	Supported through AGRA
	FGD – 5 male and 1 female farmers	Yerelombougou village (Sikasso)	07-11	Supported through AGRA
DRA Sikasso	Moussa Dembele	Agent M&E	06-11	Consortium member
	Hervé Dakouo	Accountant	06-11	Consortium member
DRA sector Sikasso	Oumar Toure	Agent M&E	06-11	Consortium member
CIRAD Mali	Michel Havard	Researcher seconded to IER	08-11	-

Annex 2: Data dictionary of main indicators

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

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

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

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

Annex 3: SME Performance scorecard

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: SMEs descriptive statistics

Table 111: General SME characteristics

General SME Characteristics	Seed Companies	Input Supply Agro-Dealers	Agri Value Chain
Years of business	3.25 (0.8)	3 1.41	4.5 (0.92)
Average number of commodities			
Commercialized/traded	4 (1.5)	-	1.78 (1.90)
Processed	-	-	2.10 (1.82)
Transported	-	-	0.21 (0.91)
Commodities commercialized/traded			
Maize	75%	-	37.50%
Sorghum	12.50%	-	50%
Millet		-	12.50%
Rice	12.50%	-	
Permanent staff	8.6 (6.61)	6 (2.8)	7.12 (13.31)
Casual staff	NA	NA	NA
Total annual turnover (USD)	180056 (97528)	59244 (.)	61109 (93357)
Observations	**8**	**2**	**8**

Standard Deviation in parenthesis. The number of casual staff has been reported as NA since numbers reported seem unrealisic.Incomplete information for Total Annual Turnover (USD). Detailed information reported below. Seed companies obs.62%; Input Supply Agro-dealers obs 50%; Agri-Value chain actors obs 87%.

Table 112: SME employees

Employees	Seed Companies	Input Supply Agro-Dealers	Agri Value Chain
Permanent Staff	8.6 (6.61)	6 (2.8)	7.12 (13.31)
Casual Staff	NA	NA	NA
% Female(over total permanent staff)	5%	31%	4%
% Skilled(over total permanent staff)	68%	68%	34%
*Annual Salary Permanent (USD)**	17635 (9339)	11374 (1149)	13941 (14585)
*Annual Salary Casual (USD)**	5892 (6350)	1061 (868)	21493 (34163)
*Daily Wage Casual (USD)**	1.95 (2.70)	3.05 (0.73)	7.09 (3.94)
Observations	**8**	**2**	**8**

*Standard Deviation in parenthesis. *Incomplete information for Annual Salary and Daily wage. Detailed information reported below.*
Agri-Value Chain: Obs salary permanent workers: 75%; Obs salary casual workers 100%; Obs daily wage 100%; Seed Companies: Obs salary permanent workers 87%; Obs salary casual workers 37%; Obs daily wage 37%; Input Supply agro dealers: Obs salary permanent workers: 100%; Obs salary casual workers 100%; Obs daily wage 100%.

Table 113: SME buyers

Buyers	Seed Companies	Input Supply Agro-Dealers	Agri Value Chain
Projects, programs and government	75%		37%
Farmer organizations, coops, associations	75%	100%	75%
Individual buyers / producers	100%	100%	75%
Traders, input suppliers, wholesalers	62%		50%
Average number of buyers	3.12 (0.83)	2 (0)	2.37 (0.91)
Observations	**8**	**2**	**8**

Standard Deviation in parenthesis

Table 114: SME services

SME Services	Seed companies
Variety development	25%
Breeder seed production	75%
Production of early generation seed / foundation seed	0%
Production of improved / certified seed	87%
Production of noncertified seed	0%
Sales of improved / certified seed	100%
Sales of early generation seed / foundation seed	13%
Average number of services	2.87 (0.99)
Observations	**8**

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

SME Services	Agri Value Chain
Aggregation of farmer produce (for example: transport, bulking	100%
Agri-food processing (transformation of produce)	12.5%
Transport	12.5%
Mechanization	
Financial services: provision of credit to farmers	
Financial services: provision of credit and loans to SMEs	
Average number of services	1.25 (0.46)
Observations	**8**

Table 115: SME investments

Investments	Seed Companies	Input Supply Agro-Dealers	Agri Value Chain
Expansion of land area	25%		
Expansion of buildings and/or storage	37%		75%
Upgrading of equipment	12%		12.5%
Research & Development			
Training of staff	25%		
Increase / injection for working capital			
Other (Veichle)		50%	
No Investment	37%	50%	12.5%
Average number of investments	1.12 (0.35)	0.50 (0.70)	1.25 (0.88)
Observations	**8**	**2**	**8**

Table 116: Percentage of credit from formal sources

Access to formal credit	Seed Companies	Input Supply Agro-Dealers	Agri Value Chain
0%			
<10%			
10-25%			
25-50%	25%		37.50%
50-75%	12.50%		50%
75%-90%	12.50%	50%	
>90%	50%	50%	12.50%
Observations	**8**	**2**	**8**

Annex 5: SMEs interviewed

Seed companies	Input supply/Agro dealers	Agri Value Chain
Agri Plus	Camara	Boureima Coulibaly
Camara Semences	Diarra	Dandougoula et frere
Comptoir 2000 SA		Union locale de producteurs de cereales
Doun Kafa		Scoop – Se2A
Faso Kaba		Sylla e freres
Soprosek		Societe Doubouya et fils
Soproza		Compagnie Badenya
Faso-Djiguifa		Enterprise Nouhoum Sangaré Koutiala