

MALI

Potentials and Possibilities for German Collaboration in Agriculture



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1 General background information of the agricultural and food sectors

Mali is a landlocked country, with dry land and desert covering 60% of the country. Poverty is a major challenge in the country, particularly in rural regions where most of the people reside. For the past ten years, the GDP of the country has increased at a higher rate than the population, but economic performance is poor and highly dependent upon cotton and gold, which generate over half of total export earnings (IFAD, 2008). Bulk of the agricultural production takes place in the southern part of the country. Millet and sorghum production occurs throughout the agricultural zone, with bulk of the market surplus being produced in the cotton area of the southeast, which has the monopoly of the cotton marketing rights in the country.

Although the agricultural sector contributes to less than half of Mali's GDP, it employs most of the active population. Agriculture still remains an important driver of the economy and the basis for poverty reduction initiatives. Only 12% of the country's large irrigation capacity has been developed and crop yields remain far below its potential. There has been an increase in cereal production over the past two decades, keeping pace with population growth. However, this has been driven by an increase in the area under cultivation, and soils have progressively been degraded as a result. Agriculture is extremely vulnerable to environmental risks and climatic shocks, such as drought, flood, erratic rainfall patterns and locust invasions. Most of Mali's agriculture is dominated by subsistence rainfed farming. The majority of rural inhabitants have limited access to land, and about 68% of farmers cultivate less than 5 hectares of land. Most farms are ill-equipped to adopt modern practices, and farmers do not have access to credit to make the necessary investments. The use of agricultural inputs and mechanization is very limited. Post-harvest handling of crops and livestock products is poor, and processing technologies are largely undeveloped (IFAD, 2008).

The government's Strategy Framework for Growth and Poverty Reduction 2007-2011 builds on the lessons learned from the first poverty reduction strategy paper 2002-2006. This second phase focuses on the following strategic pillars: (i) boosting economic growth, improving food security and raising the incomes of rural producers by increasing and diversifying food production, (ii) promoting the well-being of poor people by continuing reforms in the social sector. To attain these goals, the framework places emphasis on ensuring the sustainable Management of natural resources, modernizing family farms, and increasingly moving towards a sector-wide approach to agricultural development by expanding productive infrastructure and developing agro-processing. The third phase of the GPRSF covering the period 2012 to 2017 and it is currently under preparation and will focus on: (i) promoting accelerated, diversified and sustainable growth oriented towards the development of employment and income-generating opportunities, (ii) reinforcing long-term development strategies and equal access to quality social services, (iii) developing the capacity of institutions and promoting good governance.

As a response to the food price crisis in 2008, the government launched an ambitious initiative to double rice production, which has since been extended to other products, such as maize and wheat (IFAD, 2008). In October 2009, the government adopted a national agricultural sector investment program, with the targets of sustaining a 6% growth in agriculture and of stabilizing the output of food staples (cereals, coarse grains, livestock), to

be met by maintaining high yields in the short term, and diversifying agricultural exports in the long term.

The Government of Mali implemented a broad range of reforms aimed at transforming the economy by giving a greater role to the private sector and market processes in allocating the country's resources. The reforms involved the dismantling and sale of state enterprises, permitting the private sector (including independent farmer and trader organizations) to compete in areas formerly reserved for the state, and removal of many barriers to trade, both domestically and internationally.

As it relates to capacity for research as the bedrock for agricultural innovation, Mali has substantial human resources pool both nationally and internationally recruited. Many donor supported projects are contributing to the pool of experts working towards technology generation, dissemination and adoption.

The state of Mali agriculture offers immense opportunities for generating innovations; but interventions should give attention to improve food security and incomes by increasing and diversifying the output of smallholder farmers and agribusiness producers, while introducing and reinforcing sustainable land and water management practices. The interventions should target the smallholder agricultural and agribusiness producers to boost productivity in targeted production systems, including irrigated rice and vegetables, rainfed cereals, cowpea, fodder and livestock. This could be achieved by: (i) introducing improved agricultural technologies and agricultural services, (ii) modernizing smallholder farming systems and supply chains, (iii) promoting sustainable land and water management practices, (iv) investing in small and large-scale irrigation, (v) increasing arable land usage, (vi) building the capacity of stakeholders at all levels, especially women and young people, and in particular helping to develop the capacity of farmer organizations to deliver technical and economic services to producers and participate in local development processes, (vii) increasing access to rural financial services, the program will enable farmers to increase and diversify agricultural production in order to improve household food security and living conditions (IFAD, 2008).

1.1 Pan-African policies and strategies

Mali signed its Comprehensive African Agriculture Development Program (CAADP) Compact in October, 2009. Mali is one of the few West African countries that met the CAADP goal of allocating 10% of the national budget to agriculture. The country has also often surpassed the CAADP 6% agricultural GDP growth target.

1.2 National (and regional) policies and strategies

Key strategies and government priorities for agricultural and rural development:

The Government of Mali has sought to develop a model of redistributive growth and high added value, taking into account macroeconomic realities, in an evolutionary sequence of five-year frameworks.

a. Poverty Reduction Strategy Plan (PRSP)

The Poverty Reduction Strategy Plan (PRSP) was set up in 2002 for five years, and was replaced in 2007 by the Strategic Framework for Growth and Poverty Reduction (CSCR), which framed and supported the implementation of these broad strategic directions for the

period until 2011. The CSCRP describes the policies and programmes that the country intends to implement so as to "promote growth at an annual rate of 7% and reduce poverty" (Ministry of Agriculture, 2007), and accelerate progress towards achieving the Millennium Development Goals. One of the three pillars of CSCRP is to strengthen the productive sectors of the economy, with particular emphasis on the rural and agricultural sector (MSU, 2011). The specific focus areas of the CSCRP SRA include:

- Value addition, diversification and better marketing of rural products;
- Water availability and water control;
- Financing of agriculture;
- Access to inputs;
- Protection and preservation of the environment (urban and rural);
- Access to land;
- Plant protection;
- Technical supervision and accountability of rural producers (Ministry of Agriculture, 2007).

The CSCRP expired in 2011 and was replaced by the Strategic Framework for Growth, Employment and Poverty Reduction (CSCERP), planned for the period 2012-2017.

The policy guidelines specific to rural and agricultural development have been formulated in a more precise framework, the foundations of which were laid in 1991 at the Convention of the Countryside. These have resulted in the Master Plan for Rural Development (SDDR), adopted in 1992 and renewed for the period 2000-2010 (MAFAP, 2012). However, if the SDDR was formulating general objectives, priority action programmes and mechanisms to support planning for the sector, it was never translated into a budgeted action plan (Ministry of Agriculture, 2007).

b. Agricultural Orientation Law (LOA)

In 2006, the Malian Government adopted an Agricultural Orientation Law (LOA), with the objective to "determine and conduct the long-term policy of agricultural development in Mali" (GRET, 2005). The LOA covers all economic activities of the agricultural sector, rural and suburban, aiming to make this sector the engine of the national economy, and to promote "sustainable, diverse, modern and competitive agriculture, placing farmers in the centre of the process" (GRET, 2005). The LOA therefore advocates restructuring and modernization of agriculture and medium and large family farms, making them competitive and integrated into the sub-regional economy, and boosting employment in rural areas. This requires a distancing and disengagement of the state through decentralization and privatization, and greater consultation with stakeholders in the sector. The LOA has been implemented in accordance with the Common Agricultural Policy of ECOWAS and CAADP's recommendations. The strategic framework of the LOA, is the Agricultural Development Policy (PDA) from 2011 to 2020. The PDA is the subject of the first article of the LOA: the PDA translate its vision in a "concrete and quantified" way. The PDA is intended to be more unifying and more operational than the SDDR. This is why a tool for planning and monitoring/evaluation was developed: the National Agricultural Sector Investment Plan (PNISA), which will bring together all national investment plans, programs and projects and interventions in favor of the agriculture and food sector in Mali. Several other strategies and major programmes for different fields of activity (sanitation, energy, AIDS, rice, etc.), are also integrated within the PDA.

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c. Agricultural Competitiveness and Diversification Project (ACDP)

This program, which became effective in April 2006 and was launched by the Government of Mali and supported by the World Bank, aims to promote commercial agriculture as an alternative to subsistence agriculture. It provides an opportunity for professionals in the agricultural sectors to increase their yields and revenue.

d. Agricultural Diversification Project

This program aims to address the problems hampering the growth of the agro-industry, where Mali enjoys a comparative advantage. Mango is the most common product, however, the project also intends to promote papaya and shallot, among other crops, by developing and disseminating techniques that boost productivity and competitiveness of farms and rural processing companies (IFAD, 2008). For example, farmers learn conservation methods and irrigation techniques specific to each crop.

e. The West Africa Agricultural Productivity Program (WAAPP)

The WAAPP is key to the World Bank's support strategy for Mali and in its support for increased regional integration in West Africa. In addition, it is firmly anchored in the New Partnership for Africa's Development (NEPAD) and the ECOWAS agricultural policy. Achievements of the first phase of the WAAPP included that participating farmers were able to enhance their crop productivity by on average 30% and their revenues by 34%. The period between two harvests has also been shortened, a result which is already having a significant impact. With the support of the project, Mali is strengthening its seed systems as well as its research and technology transfer systems in order to provide comprehensive support for the implementation of the National Agricultural Investment Program and to boost the resilience of farming and pastoral communities. The integrated sub-regional aspect of the program, which constitutes one of the program's biggest strengths, also enables Mali to benefit from innovative technologies and techniques developed in the other WAAPP beneficiary countries.

One of these innovative techniques is the introduction of new, more resilient varieties of tomatoes which allow farmers to maintain production during the rainy season, when tomatoes are in short supply in the markets. Thus they can command a higher price. The second phase of the program will provide input kits, nucleus breeding programs, motor-pumps, and grafted jujube trees and date palm plants to communities in northern Mali who have been greatly affected by the crisis (Diarra, 2014).

1.3 Data on food and nutrition security

The following section includes information about important socio-economic indicators, production and trade data and data on consumption and nutrition status.

Table 1: Selected national economic and health-related data

Indicator	Data	Year
Population, total	15,768,227	2014
Population growth (annual %)	3.0	2014
Rural population (% of total population)	61	2014
GDP per capita, PPP (constant 2011 international \$)	1,653	2014
GNI per capita, PPP (constant 2011 international \$)	1,587	2011
Poverty headcount ratio at \$2 a day (PPP) (% of population)	79	2010
Poverty headcount ratio at \$1.25 a day (PPP) (% of population)	51	2010
Poverty headcount ratio at national poverty lines (% of population)	44	2010
Rural poverty headcount ratio at national poverty lines (% of rural population)	51	2010
Agricultural land (% of land area)	34	2012
Agricultural irrigated land (% of total agricultural land)	no data	
Agriculture value added per worker (constant 2005 US\$)	842	2012
Agriculture, value added (% of GDP)	42	2012
Access to electricity, rural (% of rural population)	12	2012
Employees, agriculture, female (% of female employment)	64	2006
Employees, agriculture, male (% of male employment)	68	2006
Employment in agriculture (% of total employment)	66	2006
Literacy rate, adult total (% of people ages 15 and above)	34	2011
Ratio of female to male secondary enrollment (%)	80	2013
Mortality rate, under-5 (per 1,000 live births)	123	2013
Malnutrition prevalence, weight for age (% of children under 5)	28	2006
Malnutrition prevalence, height for age (% of children under 5)	39	2006
Maternal mortality ratio (modelled estimate, per 100,000 live births)	550	2013

Source: World Bank, <http://data.worldbank.org/country>

1.4 Data on most relevant crops and value chains

The most relevant crops in Mali primarily include grains (rice, millet and sorghum, maize) and some vegetables. Groundnuts and Bambara nuts are also important. Production and consumption data are provided below.

1.4.1 Production

Table 2: Top 10 crops produced by area, volume and value

Area harvested (ha)		Production volume (tons)		Production value*	
Top 10	Share of Total	Top 10	Share of Total	Top 10	Share of Total
Millet	30.5	Rice, paddy	20.9	Rice, paddy	10.7
Sorghum	21.1	Maize	16.1	Meat indigenous, cattle	8.8
Maize	11.7	Millet	15.7	Meat, cattle	8.3
Rice, paddy	11.2	Sorghum	11.5	Watermelons	7.2
Seed cotton	8.1	Watermelons	5.4	Millet	6.0
Groundnuts, with shell	5.6	Sugar cane	3.9	Maize	4.4

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Cow peas, dry	4.1	Cottonseed	3.3	Meat indigenous, sheep	4.2
Bambara beans	1.4	Vegetables, fresh nes	2.9	Sorghum	4.2
Karite nuts (sheanuts)	1.3	Sweet potatoes	2.8	Meat, sheep	4.1
Sesame seed	0.9	Groundnuts, with shell	2.4	Milk, whole fresh cow	4.1
Rank 20: Potatoes	0.1	Rank 16: Potatoes	1.1	Rank 18: Potatoes	1.5
Rank 27: Mangoes, mangosteens, guavas	0.04	Rank 19: Mangoes, mangosteens, guavas	0.5	Rank 38: Mangoes, mangosteens, guavas	0.3
Vegetables (aggregate)	1.4	Vegetables (aggregate)	9.4	Vegetables (aggregate)	

* Gross Production Value (constant 2004-2006 million US\$)

Note: AIC value chains are marked in red: nes refers to Not elsewhere specified.

Data: average 2011-2013, FAOStat, accessed 9 July 2015

1.4.2 Consumption and nutrition status

Table 3: Food supply (crops)

Food supply quantity (tons)		Food supply quantity (kg/capita/yr)		Food supply (kcal/capita/day)	
Top 10	% of total	Top 10	kg	Top 10	kcl
Rice (Paddy Equivalent)	17.5	Rice (Paddy Equivalent)	86	Rice (Milled Equivalent)	569
Rice (Milled Equivalent)	11.7	Rice (Milled Equivalent)	57	Rice (Paddy Equivalent)	569
Millet and products	11.6	Millet and products	57	Millet and products	450
Vegetables, Other	11.3	Vegetables, Other	56	Sorghum and products	397
Sorghum and products	10.1	Sorghum and products	50	Maize and products	304
Maize and products	7.1	Maize and products	35	Sugar, Raw Equivalent	106
Sweet potatoes	3.3	Sweet potatoes	16	Sugar (Raw Equivalent)	106
Fruits, Other	2.9	Fruits, Other	14	Sugar, Refined Equiv	106
Bananas	2.5	Bananas	12	Pulses, Other and products	101
Wheat and products	2.3	Wheat and products	11	Wheat and products	90
Rank 16: Potatoes and products	1.3	Rank 16: Potatoes and products	7	Rank 22: Potatoes and products	13
Vegetables (aggregate)	12.7	Vegetables (aggregate)	62	Vegetables (aggregate)	34

Note: AIC value chains are marked in red.

Data: average 2009-2011, FAOStat, accessed 22 July 2015

Table 4: Food supply (livestock and fish)

Food supply quantity (tons)		Food supply quantity (kg/capita/yr)		Food supply (kcal/capita/day)	
Top 10	% of total	Top 10	kg	Top 10	kcal
Bovine Meat	19	Fish, Seafood	53	Eggs	440
Demersal Fish	15	Milk - Excluding Butter	42	Animal Products	137
Mutton & Goat Meat	14	Milk - Excluding Butter	42	Milk, Whole	88
Milk - Excluding Butter	14	Milk, Whole	42	Milk - Excluding Butter	87
Milk, Whole	13	Bovine Meat	22	Milk - Excluding Butter	87
Cephalopods	7	Mutton & Goat Meat	16	Cephalopods	69
Cheese	7	Demersal Fish	15	Bovine Meat	45
Crustaceans	5	Meat	9	Demersal Fish	43
Meat, Other	2	Cephalopods	7	Meat	41
Fats, Animals, Raw	2	Cheese	7	Mutton & Goat Meat	34

Note: AIC value chains are marked in red.

Data: average 2011-2013, FAOStat, accessed 10 July 2015

1.4.3 Trade

Table 5: Mali's imports

Import volume (tons)		Import value (US\$)	
Top 10	Share of Total	Top 10	Share of Total
Rice – total (Rice milled equivalent)	28.1	Food prep nes	13.1
Wheat	17.6	Rice – total (Rice milled equivalent)	12.4
Sugar refined	15.4	Wheat	9.2
Oil, palm	5.6	Sugar refined	9.1
Flour, wheat	3.7	Oil, palm	7.3
Food prep nes	3.3	Milk, whole dried	7.0
Fatty substance residues	3.1	Tea	6.0
Cottonseed	1.8	Cigarettes	5.9
Macaroni	1.8	Food preparations, flour, malt extract	4.2
Bananas	1.6	Flour, wheat	3.0
Potato	1.2	Potato	0.9

Data: average 2010-2012, FAOStat, accessed 31 Oct 2015

Note: AIC value chains marked in red: nes refers to Not elsewhere specified.

Table 6: Mali's exports

Export volume (tons)		Export value (US\$)	
Top 10	Share of Total	Top 10	Share of Total
Cotton, carded, combed	55.3	Cotton, carded, combed	70.6
Cotton lint	18.9	Cotton lint	19.9
Fruit, tropical fresh nes	7.7	Sesame seed	3.8
Sesame seed	7.1	Fruit, tropical fresh nes	2.5
Cashew nuts, with shell	1.7	Mangoes, mangosteens, guavas	0.4
Groundnuts, shelled	1.3	Oil, groundnut	0.4
Beverages, non alcoholic	1.0	Beverages, non alcoholic	0.3
Nuts, nes	0.8	Cashew nuts, with shell	0.3
Mangoes, mangosteens, guavas	0.7	Groundnuts, shelled	0.3
Oil, groundnut	0.6	Milk, skimmed dried	0.2

Data: average 2010-2012, FaoStat, accessed 31 Oct 2015

Note: AIC value chains marked in red; nes refers to Not elsewhere specified.

Rice, wheat and sugar as well as prepared food are the most important goods in import trade. Cotton is the most important export good and accounts for more than 70% of the export volume and nearly 90% of the export value. The export of tropical fruit accounts for more than 7% of the export volume, but only little for the export value (under 3%).

1.5 National (and regional) innovation system

1.5.1 Research system and organizations

The research system is currently incoherent arising from the dispersion of the research institutions throughout the technical ministries and the diversity of their legal state (central services, personalized services with financial autonomy, etc).

Each ministerial department considers itself solely responsible for the research activities conducted by the institutions relevant to its mandate. The research structures planned and carried out their programs independently of each other, without referring either to the National Centre of Scientific & Technological Research (CNRST) or the Ministry for Secondary and Higher Education and Scientific Research (MSHESR), i.e. to the official institutions supposed to coordinate and control research activities at national level.

Research in Mali is 90% externally financed and this constitutes a major handicap in the execution of national research programs in cases where these do not coincide with the priorities of the fund donors.

1.5.1.1 International

Agricultural research activities in Mali has attracted the presence a number of international research organization. Most of these organizations work in partnerships with the IER on various thematic issues. The prominent organizations include the Sahel Institute (INSAH), Winrock International, the International Institute of Tropical Agriculture (IITA), the World Agroforestry Center (ICRAF), the West Africa Rice Development Association (WARDA), the International Livestock Research Institute (ILRI), the Royal Tropical Institute (KIT) of the

Netherlands, the Center of International Agricultural Research Cooperation for Development (CIRAD), and the Institute of Research for Development (IRD), the latter two from France.

Example of Mali and Development partners partnership: Mali Feed the Future Strategy.

The USAID/Mali Feed the Future Strategy draws upon expertise gained from a deep, long-term involvement in the agricultural sector that provides a base for transformational change.

The USAID/Mali Feed the Future strategy:

- Is aligned with and supports the PNIP-SA. It is a government-driven, donor-coordinated process. USAID/Mali will catalyze public and private agricultural sector donor groups by coordinating and complementing their work;
- Is a market-based strategy, which leverages market structures to extend reach and impact of investments. It builds capacity of producer organizations and links them with traders and processors to ensure consistent supply and quality standards. It supports value-added processors to diversify their offerings, expand markets for products, and ensure price stability for raw materials;
- Focuses only on strategic interventions with a high economic and food security impact. It builds small-scale irrigation systems that have a great potential for success due to investments of local communities and it complements MCC work in the rice sector by concentrating on small-scale irrigation systems;
- Builds on past USAID/Mali experience with value chain development by making use of the long-standing relationships with Cellule de Planification et de Statistique (CPS) and the Institut d'Economie Rurale du Mali (IER) / University of Bamako.

1.5.1.2 National

The national institutional arrangement for science and technology Mali revolves around three major organization viz., Ministry of Livestock and Fisheries, National Centre of Scientific & Technological Research (CNRST) and the Ministry for Secondary and Higher Education and Scientific Research (MSHESR). Under the direct auspices of the ministry of livestock and fisheries, there is the Central Veterinary Laboratory and the Malian livestock Agency. The University of Mali, Bamako, is under the auspices of CNRST, while six research organizations viz., (i) National Directorship for Metrology, (ii) National Centre for Fruit Research, (iii) National Centre for Zoo Technical Research, (iv) National Centre for Mineral Research & Mining, (v) Malian Cotton Company, (vi), Tropical Agronomy Research Center, are under CNRST.

Currently the National Agricultural Research System (NARS) is composed of the following institutions:

- *National Agricultural Research Council (CNRA)*: It is responsible for preparing and supervising the implementation of the national agricultural research policy and strategy.
- The *National Agricultural Research Institute (IER)*: It is responsible for all agricultural research sectors, except rural engineering, mechanization and animal health. The IER operates seven major research programmes under its strategic plan. These are:
 - cereals and food legumes;
 - industrial crops;
 - horticulture crops;
 - forestry and fisheries productions;

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- animal production;
- economics of the commodities;
- and farming systems and the management of natural resources.

The IER also works closely with the Malian Cotton Company (CMDT), and conducts its applied cotton research on a contractual basis and the two agencies work together on technology transfer to cotton producers.

In addition, IER is a member of various regional networks such as the West and Central African Sorghum Research Network (ROCARS) and the West and Central African Millet Research Network (ROCAFREMI) (IER, 2000; Lozano, 2002). Twelve of IER's 16 research programs are now executed in collaboration with regional and international partners, which has seriously enhanced research quality (World Bank, 2002). The nature of these exchanges ranges from on-demand research contracts to exchanges of research results.

1.5.2 Innovation platforms

- *pending further information* -

1.5.3 Extension system and organizations

Governmental and parastatal extension services provide most of the agricultural extension and advisory services in Mali because of the number of field officers (841), the extent of geographic coverage and the range of technical areas. A number of non-governmental organizations (NGOs) and projects as well as a few private organizations also provide occasional extension and advisory services (<http://www.worldwide-extension.org/africa/mali/s-mali>).

Public Sector

Ministère de l'Agriculture de l'Élevage et de la Pêche - Ministry of Agriculture, Livestock and Fisheries

Key governmental units that provide extension and advisory services related to crop production, livestock production, forestry, fisheries and rural infrastructure development include:

- ***Direction Nationale d'Agriculture, DNA.***
 - ***Division d'Enseignement Agricole et Animation Rurale (DEAAR)*** - has a training staff of ten, based in Bamako, as well as representation at each of the regional Direction Régionale d'Agriculture offices. The DEAAR works through four *Centre d'Apprentissage Agricole (CAA)*, based at Dioro, M'Pesoba, Samé, and Samanko. There is a network of Centre d'Animateur Rurale (CAR) in all of Mali's administrative units (the plan is to equip these as training centers for young farmers);
 - ***Division Vulgarisation et Conseil Agricole (DVCA)***, is organized into two sections, research-extension liaison, and extension.
- ***Direction Nationale des Productions et des Industries Animales, DNPIA.*** The DNPIA has the mandate to develop national policy and programs concerning animal production and industries. The DNPIA is organized into four divisions:
 - Pastoral water management (e.g., development of watering points);
 - Animal product *filiales* (milk, meat, skins and hides, poultry);

- Animal industries (e.g., abattoir management; monitoring of livestock markets);
- Training and documentation.
- ***Direction Nationale du Genie Rural;***
- ***Direction Nationale des Services Vétérinaires***
- ***Direction Nationale des Eaux et Forets***

Non-Governmental Organizations

Several major NGOs and donor-funded projects provide some extension and advisory services, including:

- AMASSA–AFRIQUE VERTE MALI (Association Malienne pour la Sécurité et la Souveraineté Alimentaires);
- ENDA Mali;
- ICD, Initiatives-Conseils-Developpement ;
- Institut Polytechnique Rural De Formation Et De Recherche Appliquee De Katibougou;
- Intercooperation Suisse–Sahel;
- Near East Foundation;
- Nyeta Conseils.

In-Service Training for Extension Staff

- SAFE, Sasakawa Africa Fund for Extension Education, Programs in Mali: Rural Polytechnic Institute for Training and Applied Research;
- Centre d'Apprentissage Agricole, Samanko;
- Office de Protection des Vegetaux (OPV).

Public Research Institutions with Extension Unit

- Institut d'Economie Rurale.

University-based Extension

Key educational/research institutions with extension training programs or an extension mandate include:

- Centre d'Apprentissage Agricole, Samanko;
- Université du Bamako, Institut Polytechnique Rural / Institut Formation et Recherche Appliquée, Katibougou ;
- Institut Polytechnique Rural de Formation et de Recherche Appliquée–IPR-IFRA. Maîtrise en Vulgarisation Agricole/Master in Agricultural Extension.

Semi-autonomous Governmental Extension Organizations

Additional key governmental entities and parastatal organizations with geographically or technically limited EAS functions include:

- Compagnie Malienne pour le Développement des Textiles;
- Office du Développement Rural de Sélingué;
- Office de la Haute Vallée du Niger;
- Office du Niger;
- Office Riz Mopti;
- Office de Protection Végétaux, OPV.
- Office du Perimeter Irrigue du Baguineda;
- Office Riz Ségou.

Private Sector Organizations or Firms

Several private sector companies provide some extension and advisory services, including the Bureau d'Etude et d'Appuis Conseils aux Initiatives Locale, BEACIL-SARL/ Sènè Kunda.

Farmer Based Organizations and Cooperatives

Smallholder farmers are organized into producer groups and chambers at the regional level. Each chamber functions as an independent body that represents farmers in the region. All chambers from the nine region form a representative body that serves as the interface between the government and the rural population. Expanded role of these groups or associations is to identify farmers' problems, defend their interests, collect and exchange information, and speak on farmers' behalf in improving their welfare. These producer groups include:

- Assemblée Permanente des Chambres d'Agriculture du Mali - Permanent Assembly of Agricultural Chambers (APCAM);
- Association des Organisations Professionnelles Paysannes;
- Federation of Farmers and Producer Organizations-Coordination Nationale Des Organisations Paysannes Du Mali (<http://www.worldwide-extension.org/africa/mali/s-mali>).

1.5.4 Private R&D activities

- pending further information -

1.6 Key challenges, emerging needs and potentials in the agricultural sector

Major constraints to Agricultural Development in Mali

Although Mali has an enormous agricultural potential, current low yields and high post-harvest losses limit the net quantity of food available to feed a quickly growing population. Improper feeding practices, high disease burden, poor sanitation and access to clean water and low health service utilization leads to significant health problems, including stunting and wasting. Low household incomes, particularly among women, limit peoples' ability to purchase nutritious food. In addition it is difficult for smallholder farmers to obtain credit as most of the financial institutions regard agriculture as a high-risk endeavour due to smallholder-based systems dependent on irregular rainfall. The country's weak agricultural policy environment also restricts investment and competitiveness in the sector.

Strategic Solutions to Agricultural Development issues in Mali

A number of strategic solutions are suggested, related to agronomic practices, financial support and capacity building at all levels. In particular it is suggested to:

- Increase yields by encouraging the adoption of improved seeds, fertilizer, and best agricultural production practices, including water management systems;
- Improve post-harvest practices, including storage;
- Expand access to short- and medium-term credit and improve market information systems;
- Increase household incomes by boosting production and developing value-added processing, focusing on creating gender equity;
- Increase access to and the consumption of nutritious foods through value-added processing and by promoting healthy behaviors;

- Improve the government's capacity to collect data, strategically plan, monitor, evaluate, and analyze agricultural programs (USAID, 2010).

Investment potential in the agricultural and food sector in Mali

Based on the general approach (see Africa-wide study Chapter 4) and in pursuit of efficiency and effectiveness, investment by Germany into the agricultural and food sector are suggested in those African countries, which:

- Show actual progress in sustainable agricultural productivity driven by related innovations, as indicated by comprehensive productivity measurement and innovation actions on the ground;
- Have a track record of political commitment to foster sustainable agricultural growth, as indicated by performance under CAADP, and
- Prioritize actions for hunger and malnutrition reduction and show progress, but where agricultural and rural development and nutrition interventions are likely to make a significant difference, as indicated by public policy and civil society actions.

Based on this approach, investments into the agricultural and food sector of Mali can be expected to have modest effects on food and nutrition security improvement in the country.

Table 7: Country level Performance Indicators

Indicators	Index	Performance (%)
1. Number of Years with more than 6% agricultural growth (2005 to 2014)	4	40
2. Percentage point change in TFP index between 2001 and 2008	10	60
3. Number of years with more than 10% government expenditure (2005 to 2014)	6	60
4. Average share of agricultural GDP spent on R&D (2005 to 2011) in %	0.6	61
5. Steps in CAADP completed	5	63
6. Percentage point improvement in undernourishment between 2001 and 2011	7.6	60
7. Global hunger index (2014)	13	30
Total score (weighted)		52

Source: Own computation based on World Bank (2015), FAO (2015), ASTI database and von Grebmer (2014)

Note: the % performance (rounded) is defined as follows for the respective indexes: 1. % out of 10 years; 2. classes: if <1, or negative= 0; 1 – 7= 30, 8-15= 60, > 15= 100; 3. % out of 10 years; 4. % of the AU target value of 1% spent on R&D; 5. % of the desired 8 steps; 6. classes: if < 2 = 0; if 3-5= 30; if 6-10=60, if>10=100; 7. classes: if < 12= 0; 12-16: = 60; 17-20: = 60; > 20= 100.

Total score (weighted) performance and need to invest: (sum of (1.+2.)/2 (expected growth performance); + sum of (3.+4.+5.)/3 (expected government commitment); + sum of (6.+7.)/2 (performance in food and nutrition security and need)) divided by 3.

Results of assessment (Table 7):

Expected agricultural growth performance:

- Mali has achieved an annual agricultural growth of more than the envisaged 6% in only four years between 2005 and 2014 (www.resakss.org).

Program of Accompanying Research for Agricultural Innovation (PARI)

- Total agricultural factor productivity in Mali, however, has improved by 10% between 2001 and 2008 (Fuglie and Rada, 2011), indicating a modest innovation record.

Government commitment:

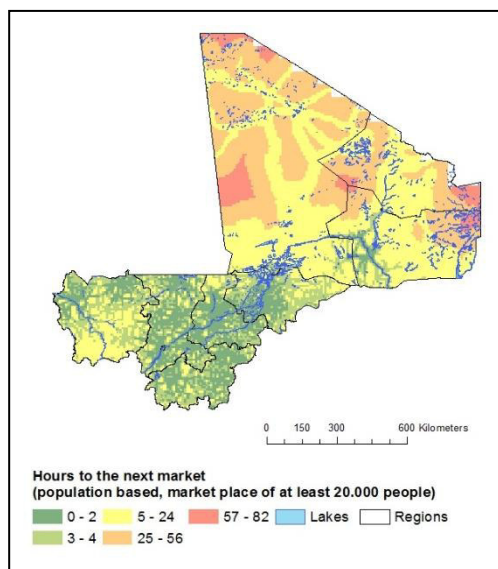
- Mali has a modest track record of political commitment to foster sustainable agricultural growth by being active in the CAADP process and having completed five of the eight steps in the CAADP process (www.resakss.org).
- Likewise, the Mali government has shown a certain willingness to invest in agricultural sector by surpassing the CAADP 10% agricultural expenditure target in six years between 2005 and 2014 (www.resakss.org).
- However, Mali spends only 0.6% of its agricultural GDP on agricultural research and development, which is lower than the Sub-Saharan Africa average (www.asti.cgiar.org) and the AU target value of 1% spent on R&D. This indicates that Mali's investment on agricultural innovation is not yet sufficient.

Food and nutrition security progress and need:

- Mali is only modestly prioritizing actions for hunger and malnutrition reduction and show less than 8% improvement in undernourishment between 2001 and 2011, which is lower than the 10% threshold level (FAO, 2014).
- In addition, Mali has a GHI score value of 13 reflecting a serious level of hunger (von Grebmer *et al.*, 2014)¹. This makes investments into the agricultural and food sector in Mali very urgent to reduce the high number of food insecure people.

Transport intensive products should be promoted in areas that are well connected to markets, whereas the remote areas should focus on low volume and livestock value chain segments.

Figure 1: Distance to markets



Data sources: Hours to next market - HarvestChoice, 2015;

Administrative areas: <http://www.gadm.org/>, accessed 20.9.2015

Inland water bodies: <http://www.diva-gis.org/gData> (water bodies), accessed 20.9.2015

¹ GHI score Values less than 5.0 reflect low hunger, values from 5.0 to 9.9 reflect “moderate” hunger, values from 10.0 to 19.9 indicate a “serious” level of hunger, values from 20.0 to 29.9 are “alarming,” and values of 30.0 or greater are “extremely alarming”(von Grebmer *et al.*,2014).

2 Most relevant value chains in Mali

2.1 AIC value chains

2.1.1 Rice Value Chain

Rice is the dominant commercial food crop in Mali, accounting for 12.3% of agricultural value. This success has been fueled mainly by public-led investments in large-scale, gravity-fed irrigation infrastructure and some positive policy shifts, such as the liberalization of marketing and processing in the main production zone of the Office du Niger (ON) during the late 1990s and early 2000s. Malian rice production is competitive and can be profitable, benefiting from higher global prices and an increase in the demand for local rice. However, despite this underlying competitiveness, there is little private investment flowing to rice production or processing. Rice processing is inefficient, with high proportions of broken rice. Improved mills would add value and increase the size of the market, and this represents a notable investment opportunity, given proper conditions. The second phase of the Alatona Irrigation Project provides a unique opportunity to develop a public private partnership to invest in large scale rice production. However, the government must take ownership of this commercial vision (Kline and Gordon, 2014).

The opportunities for further development of the value chain include:

- There is a high potential for rural poverty reduction by focusing on smallholders and small scale irrigation schemes;
- Income diversification is possible with fish intercropping and horticulture production in the off-season;
- Demand is expected to grow as urbanization continues in Mali and in the region;
- Proposed USAID/Mali investments would complement MCC work in the rice sector by focusing on small-scale irrigation systems.

2.1.2 Irish Potato

2.1.3 Vegetable

Mali produces ample amount of vegetables mainly from the inland valley, however the value chain for these vegetable crops are poorly developed and it results in low returns to the different stakeholders along the value nodes.

The input supply is poorly organized in Mali; the recommended inputs are substituted by cotton inappropriate which is dangerous for human health and the environment. The supply of improved seeds is low, the certified seed sector for vegetables is very limited, resulting in a heterogeneous and non-use of controlled varieties. Seeds of vegetable crop are not available and when available they are very costly for producers. Other constraints are high costs of transport, post-harvest losses and poor conservation of fresh vegetables.

2.1.4 Fruit (Mango)

The mango value chain is an important export earning commodity in Mali, following cotton. With cotton stagnating as the country's main export, the government of Mali is promoting the cultivation of other agricultural produce, as a means of helping to overcome poverty in one of the poorest countries in Africa. The value chain of mango is largely undeveloped in Mali limiting the commodity to few local handling. The value chain however needs to be

optimized from the smallholders' cooperatives and the fruit-pickers and local intermediaries to the international buyers and the consumer.

2.1.5 Fish

Cooperatives of women fish processors and traders in Mali:

Traditionally in Mali, men do the fishing. Women are in charge of processing, conservation and marketing. A group of 14 women from the village of Baco Djicoroni – mainly the wives of fishermen—created the cooperative “Femmes en Action” to collectively market fish. One of the constraints they faced was competition from outside traders who would come into the villages and buy the fish directly from fishermen.

In order to overcome this challenge and guarantee the supply of fresh fish to its members, the cooperative negotiated a higher purchase price with the fishermen. For example, if the traders would buy the fish at 500 FCFA (US\$ 1.09), the cooperative would offer 750 FCFA (US\$ 1.64). The additional 250 FCFA (US\$ 0.54) would go to the woman member of the cooperative (i.e. the fisherman’s wife) and 500 FCFA (US\$ 1.09) would go to the fisherman. With this financial incentive, it did not take much effort to convince the fishermen to sell their fresh fish to the cooperative. Eventually, fishermen knew that the income from the sale of fish by the cooperative represented additional income for their households. As a result of this additional household income, women saved 100 FCFA (US\$ 0.22) per day, which they reinvested in the cooperative to start alternative income-generating activities, such as livestock and horticultural production. Apart from fish processing and marketing, the members of the cooperative cultivate and process cereals, and practise microgardening.

This contractual arrangement between the fishermen and the cooperative was also instrumental in guaranteeing a steady supply of fish to markets in the high season. The fish are transported to the market by public transport after women buy them at the landing sites. These transport conditions over long distances—from 180 to 500 km—involve a high risk of post-harvest losses. The cooperative developed multiple marketing strategies in order to mitigate these risks. Fresh fish (la “peche du jour”) is delivered to a single sales location in the market. A part of it is sold on the spot and another part is delivered to homes on a motorcycle. What is not sold at the end of the day goes back to the village to be processed into smoked fish, dried fish and fish cubes. The processing unit in Bamako employs 50 women who are not cooperative members. It processes 1,000 kg of fish per month as well as cereals, fruits and vegetables produced by the cooperative members (Elbehri and Lee, 2011).

2.2 Other relevant value chains

- pending further information -

3 Innovations in value chains in the past 20 years

3.1 The most crucial limiting factors in Mali / AIC-region / in AIC-VCs

- pending further information -

3.2 The most important / beneficial innovations in the relevant VCs of Mali

3.2.1 AIC value chains

3.2.1.1 Rice

Innovation in terms of improved productivity, quality and cost-effectiveness: Improving productivity involves developing and distributing effective, productive and disease-resistant varieties of rice and introducing technology to support these varieties (crop systems: pricking out, preparation of the soil, fertility management, fight against disease and pests, etc.) (Zoundi *et al.*, 2005).

Innovation in terms of creating opportunities for capitalisation on local rice: Technology research on the processing or adding value to broken rice is a relevant alternative that could encourage innovation. AfricaRice has carried out a range of initiatives to use broken rice, traditionally considered to be worthless, as a type of flour for pastries (cakes, croissants, pancakes, etc.), partially or totally replacing wheat flour. Estimates show that the development of appropriate processing technologies can upgrade broken rice with a commercial value of 50- 60 FCFA per kg to a more competitive product (50% rice flour and 50% wheat flour) for use in pastries for a saving of almost 125 FCFA per kg (around 275 FCFA per kg for this mixture as opposed to 400 FCFA per kg for pure wheat flour). 100% transformed rice products also have the advantage of being gluten-free (certain consumers being gluten-intolerant)" (Zoundi *et al.*, 2005).

3.2.2 Other value chains and cross-cutting innovations

- pending further information -

3.3 Most promising approaches for farmer and small business related value chain innovations

- pending further information -

4 Suggestions for Collaboration

4.1 Promising agricultural products and value chains

Besides assessing the returns of investments into institutional innovations in Mali, analysis to choose the most promising value chains in the country is also undertaken. In compliance with the availability of data and the purpose of the study four criteria that focus on poverty and market potential are used to select the five most promising agricultural products from the long list of agricultural products the country produces and sells. The first indicator, the trade potential (revealed comparative advantage (RCA) index), is computed to identify value chains over which the country has revealed (but not potential) comparative advantage. In the present case, the RCA index compares the share of a given agricultural product in Mali's export basket with that of the same product in total world exports. The second indicator, yield gap, is used to assess the expected return of the envisaged Germany investment on the given AIC country value chains. A third indicator, average yield growth, is used to examine the Potential of the product for poverty reduction. The production share of total supply is also used to assess the present integration of the poor in the market (relevance).

The summary of the five most promising value chains based on Revealed Comparative Advantage (RCA) index, average yield growth and relative yield gap is reported in Table 8 below. The production share, RCA index, actual yield growth and relative yield gap for the GIZ selected value chain(s) is also reported at the bottom of the table, when they are not included in the list of the first five most promising value chains.

Table 8: Selection of the most promising agricultural product /value chain

Rank by RCA			Rank by Yield progress***		Rank by yield gap		Rank by relevance of crop	
Rank	Name of agricultural product	RCA index (2011)	Name of the crop	Average annual yield growth (2005 to 2012)	Name of staple crop (rain fed)	Relative yield gap (%)**	Name of agricultural product	Production share of supply (2011)*
1	Animals live	108	Maize	21	Maize	87	Sorghum products	114
2	Sesame seed	54	Rice, paddy	12	Rice	73	Maize products	102
3	Goats	32	Cow peas, dry	12	Sorghum	89	Millet products	101
4	Oil, groundnut	30	Sweet potatoes	8	Millet	84	Cassava products	100
5	Cotton lint	30	Yams	6			Sweet potatoes	100
GIZ selected value chains	Fruit, fresh	0.06	Vegetables, fresh	4			Vegetables	99
	Vegetables	0.05	potatoes	1			Freshwater Fish	98
	potato	0.01					Potatoes	93
	fish	0.00					Rice	81

Source: * Own computation based on FAO 2015 data, ** from Van Bussel *et al.* (2015)

Note: *** a minimum of 0.5% production (volume) share threshold is used as a screening (crop relevance) criteria.

Results of assessment (Table 8):

- The trade potential (revealed comparative advantage (RCA) index) is very high for live animals, sesame seed, goats, groundnut oil and cotton lint. This indicates that Mali has a comparative advantage (in the export) of these commodities. The RCA value for all the GIZ selected crop, fruit, vegetable, potatoes and fish is much lower than 1 indicating that Mali has a comparative disadvantage in the export of the GIZ selected crops;
- The yield performance indicating progress suggests that over the CAADP period (2005 to 2012) maize, rice (the GIZ selected value chain), cow peas, sweet potatoes, and yams are the five most promising crops. The other GIZ selected crops, vegetables and potatoes, show a positive but small growth performance over the CAADP period;
- Yield gaps indicate potentials from another angle, and are observed to be high for rain-fed maize, rice, sorghum, and millet indicating the high potential return of investing in these value chains.
- In terms of relevance (production share of supply) sorghum, maize, millet, cassava and sweet potatoes are the leading value chains. The total production of the first three value chains exceeds the total supply. The supply of most of the GIZ selected value chains are also fully produced in the country.

4.2 A systematic assessment of promising partnerships for each promising innovation area

The German collaboration for scaling agricultural innovation will necessarily need to align with existing initiative in the country that addresses the pertinent issues limiting the productivity of the agricultural sector. Issues around the nutrient depletion and degradation of soils, forests and water, as a result of overgrazing and the pressures of a growing population, continue to pose serious challenges to medium- and long-term food security in the country. In addition, low and erratic rainfall has reduced production levels and increased the vulnerability of rural population (IFAD, 2008). The combination of climate change and degraded resources intensifies the urgency of introducing new approaches and technologies to agricultural development strategies. Thus, sustainable management of land and water resources is of crucial importance for the future.

4.3 Some potential partners for the German collaboration: in science and research, private sector and NGOs and governmental organizations

The entry point for effective partnership lies within the existing structure for agricultural research and innovation within Mali. The partnership should consider the Rural Economy Institute (IER) with its 16 research programs and the entry point into the research system. Good consideration should also be giving to the government department viz., the Ministry of Livestock and Fisheries, National Centre of Scientific & Technological Research (CNRST) and the Ministry for Secondary and Higher Education and Scientific Research (MSHER). The network with the governmental system will provide both technical and political support to obtain good results from activities.

4.4 Needed implementation research

- pending further information -

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