

## **MALI AGRICULTURAL SECTOR ASSESSMENT, 2011**

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## EXECUTIVE SUMMARY

The Malian government has identified agricultural development as the main engine of the country's strategy to promote broad-based economic growth, poverty reduction, and food security. The country is at a critical juncture with respect to that strategy. The rapidly growing and urbanizing population of West Africa, combined with moderate per capita income growth, will create strong demand opportunities over the next 10 years for Malian agriculture. Mali has resources that could allow it to respond to that demand. These include, among others, a rural population that has proved responsive to economic incentives; the rich potential for irrigated agriculture, livestock production, and inland fisheries of the Niger River valley and interior delta; Mali's comparative advantage in coarse grains production; and a growing horticulture sector. Yet the country also faces major challenges created by increased population pressure on land and water resources, leading to resource degradation; uncertain land tenure conditions, particularly in irrigated areas; an educational system that does a poor job in preparing students for productive jobs in a growing agro-food economy; occasionally unpredictable agricultural policy actions that weaken private-sector incentives to invest in the agrifood system; weak structures for agricultural extension; and the need to adapt to climate change. How Mali responds to these challenges will determine the path of agricultural development in the coming years. Among the possible outcomes are: 1) an uncompetitive agriculture highly dependent on subsidies; 2) a bifurcated structure of large commercial farms and small subsistence farms, and 3) a mixed agricultural sector made up of small and medium-sized family farms and larger commercial operations. Clearly these possible outcomes imply very different levels of food security and poverty reduction.

Mali's growth performance has improved substantially since the economic reforms of the 1980s and 1990s. Over the past two decades, Mali's annual average growth rate in GDP has been in excess of 4% per year, in sharp contrast to the stagnation of the 1970s and 1980s. Agriculture (including forestry, fisheries, cropping, and livestock), which accounted for 35% of GDP in 2008, has been a major driver of this growth. Yet the year-to-year growth rates of both the overall economy and of agriculture have been highly variable, reflecting the vulnerability of the economy, and agriculture in particular, to the vagaries of weather, policy changes, and external shocks, such as the Ivorian crisis. In October, 2009, the Malian government, its development partners, the private sector, and civil society representatives endorsed the country's Comprehensive Africa Agricultural Development Program (CAADP) compact, which calls for Mali to accelerate its GDP growth to a sustained rate of over 6% per year and its agricultural growth to over 9% per year. These goals are inspired not only by the desire to meet the (modified) Millennium Development Goal of reducing poverty by half by 2020 but also to achieve the Malian government's political goals of making the country a regional agricultural powerhouse and ensuring the food security of all Malians.

Meeting these ambitious goals will be a daunting challenge, especially in light of Mali's rapid growth of population and urbanization. Achieving the targets for agriculture-led economic growth will require a much higher and more sustained rate of agricultural growth than the country has ever experienced. The danger is that by setting unrealistic goals, the government and its development partners may set equally unrealistic investment plans that will fall short of success and waste resources; the focus may be to be on achieving short-term, but unsustainable, output targets while failing to invest sufficiently in the building blocks for long-term success.

If accelerated agricultural growth is to substantially reduce poverty and improve food security, the growth strategy will need to focus not only on the overall growth of output, but also on who participates in that growth. Agriculture and the broader food system's role in generating productive employment for the burgeoning number of young people entering the labor force will be at least equally important to the country as the sector's capacity to produce food. All this needs to be done in the context of rapidly regionalizing and globalizing markets; climate and market uncertainty; changing roles of the private sector, the public sector and civil society; and increasing demands from the population for accountable performance at both the national and local levels.

This study examines the past performance of the Malian agricultural sector from the early 1990s to the present in order to assess where and how investments by USAID/Mali and others can best contribute to helping Mali meet its agricultural development goals. While the study identifies some key dynamic actors in particular value chains, it makes no attempt to "pick winners" in the private sector or among local organizations, in terms of particular individuals, organizations, or firms with which USAID/Mali could collaborate, for two reasons. First, we make no claim to have exhaustive knowledge about who all the emerging value-chain leaders are, and these will likely change over time in the types of competitive markets USAID is trying to promote. What USAID/Mali needs, therefore, are processes that help reveal who and where the most dynamic actors, including local "champions", are at a particular point in time (such as competitive bids among *cercles* to determine where USAID/Mali will place its projects). Second, the emergence of some of the new large-scale actors raises sensitive questions about their potential market power (e.g., the very concentrated fertilizer and rice import sectors) and political influence (e.g., the ability of politically well-connected firms to acquire development rights to large tracks of land in situations where land rights of farmers are not secure and current occupants of the land are likely to be displaced). Dealing with these issues involves developing a policy environment that encourages competitive markets and a more secure land tenure system, which are both discussed in this report.

A major focus of the report is on the performance, constraints, and potential contributions of individual value chains and on the cross-cutting challenges that affect the performance of all value chains in the country. A key conclusion of this study is that for Mali to have a realistic chance of meeting its agricultural development goals, the country and its development partners need an approach that focuses on the cross-cutting challenges as well as key value chains. In order to ensure sustainability of development partners' actions in the context of the country-led, sector-wide CAADP approach, it will be important to work through existing systems in Mali rather than creating parallel projects or structures that risk duplicating what the private sector, civil society or the Malian government can and should do. The aim should be to focus on key investments in policies, technologies, and institutions that catalyze and "crowd in" rather than "crowd out" Malian government and private-sector investments in these value chains. All programs need to be designed taking into account Mali's membership in the ECOWAS and WAEMU regional economic communities and the country's porous borders. The openness of the Malian economy offers important growth possibilities through expanded regional trade, and it also means that attempts to define programs (such as input subsidies or consumer price controls) that are inconsistent with conditions in neighboring countries will be very costly and difficult to implement. Agricultural policies and programs also need to take account of Mali's commitment to political decentralization; in practice, it is at the levels of the communes and the

circles that many of the key elements necessary to spur agricultural growth and improve food security, which involve bringing together many different government services, have to coalesce.

## **Policy Framework for Agricultural Development in Mali**

Four fundamental documents set the main parameters for agricultural development policy in Mali:

- the *Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté*, or CSCR, which provides the overall framework for all public investment planning aimed at promoting economic growth and poverty reduction;
- the *Loi d’Orientation Agricole*, or LOA, which establishes a long-term vision for the agricultural sector based on the promotion of a sustainable, modern and competitive agricultural sector based primarily on family farms;
- the *Stratégie Nationale de Sécurité Alimentaire*, or SNSA, which lays out a vision of long-term sustainable food security based on improved food availability, access, utilization and stability, and establishes a set of tools to deal with transitory food crises. The SNSA also lays out a strategy to move from just managing short-term crises to sustainable food security based on broad-based agriculture-led economic growth and the creation of market-compatible social safety nets; and
- the *Plan National d’Investissement du Secteur Agricole*, or PNISA, Mali’s CAADP investment plan, which is still in the process of elaboration through a highly participatory process, with completion expected in mid-2011. An interim 5-year CAADP priority investment plan, the *Plan National d’Investissement Prioritaire dans le Secteur Agricole* (PNIP-SA) was elaborated in 2010 and favorably reviewed by an ECOWAS/African Union team in October of that year. The PNIP-SA focuses on strategic investments in five value chains: rice, maize, millet and sorghum, inland fisheries, and livestock products (both meat and dairy). It also includes cross-cutting activities aimed at strengthening nutrition education throughout the country. The hope of the Malian government is to align various donor efforts initially around the priorities outlined in the interim PNIP-SA and, when completed, the entire PNISA, in order to move to a sector-wide approach. The current efforts of USAID/Mali to develop its Feed the Future program are aimed at supporting key elements of the PNIP-SA.

## **Performance of Key Value Chains and Opportunities for USAID/Mali Contributions**

**Cereals** The four most important cereal value chains in Mali are millet, sorghum, rice, and maize. Of these, rice and maize have shown the most dynamic growth over the past 20 years, with maize production growing at an annual rate of 7.6% over the period 1990-2009 and rice at an annual rate of 7.7%. This rapid growth reflects both area expansion and substantial yield increases (3.6% annual yield growth for rice and 2.6% for maize). In contrast, millet and sorghum growth has been more modest (3.3% annual rate of growth for millet and 2.2% for sorghum), with over 2/3 of the growth due to area expansion rather than yield growth. While millet and sorghum remain very important staples, particularly in rural areas, paddy production now equals, in total tonnage, that of millet; maize production is 78% that of sorghum.

**Rice** Given the importance of rice as an urban staple, and the ability to grow the crop under irrigation, which helps stabilize its production, the Malian government considers rice a key part of the country's food strategy. No other food crop is as "political" as rice. Although rice is produced under several different production systems, ranging from the full-water-control irrigation systems of the Office du Niger (ON) to rainfed and lowland (*bas-fonds*) systems in southern Mali, the spectacular increases in production over the past two decades have been fueled mainly by public-led investments in large-scale gravity fed irrigation infrastructure and by an improvement in the enabling environment, with a progressive withdrawal of the state from direct marketing and processing of rice. These large-scale investments in irrigation are continuing through a major government Rice Initiative, expansion of canals and infrastructure in the Alatona area under financing from the Millennium Challenge Corporation (MCC), and major leases to outside investors, such as Libya and WAEMU. Given the high investment of others in these ON systems, the question arises about whether additional investment might have higher payoffs in some of the other rice production systems in Mali. It may be more attractive for USAID/Mali to support value chain activities in the non-ON regions that are the focus of the rice program of the PNIP-SA. The attractiveness of this option is reinforced by the apparently lower per kg cost of production for rice in *bas-fonds* systems than in the full-water-control perimeters of the ON (although data on this issue need to be updated) and the importance of the *bas-fonds* systems for food security and women's incomes in southern Mali.

**Maize** For two decades, maize has experienced the fastest growth of the rainfed coarse grains cereals in Mali, with production increasing from about 200,000 tons in 1991 to close to 700,000 in 2009. Production has grown in response to growing domestic and export demand for both human consumption and livestock consumption (particularly for the burgeoning poultry industry), improved varieties that have increased yields, fertilizer subsidies that have encouraged fertilizer use, and farmers' attempts to diversify away from cotton in recent years as the cotton value chain has contracted sharply. Maize production involves a substantial proportion of the population in southern Mali, particularly in the southern CMDT region, where the crop has benefitted from prior investments in the cotton system; however, fewer people grow maize than millet or sorghum. Prospects for investments in the maize value chain need to be analyzed jointly with investments in the poultry value chain given the growing interdependencies between the two.

**Millet and sorghum** Millet and sorghum, when taken together, remain the most widely consumed cereals in Mali, particularly in the rural areas and among low-income Malians. Thus the performance of these value chains has important implications for the food security of a large number of poor Malians. Production and yields increased much more modestly than have rice and maize; between 1990/91 and 2008/09, production increased by 68% for millet and 42% for sorghum, compared to 224% for maize and 228% for rice. Annual growth rates for yields were 1.2% for millet and only 0.8% for sorghum, while area expansion averaged 2.1% for millet and 1.3% for sorghum. Thus, expansion of production of both grains was primarily through farmers extensifying rather than intensifying production, a pattern that will likely be unsustainable in the future. While some fertilizer-responsive, higher yielding sorghum varieties have been developed



(notably by ICRISAT and through INTSORMIL), their adoption remains limited. Based on past experience, the scope for widespread intensification of the production of millet and sorghum and their conversion into major cash crops seems much more limited than for maize or rice. Millet generally shows low fertilizer response, and while there are more productive new sorghum cultivars, less-than-vibrant market opportunities (as indicated by decreasing per capita consumption of sorghum) may constrain their widespread adoption. For these cereals, a two-pronged strategy may be desirable. The first prong would aim at stabilizing yields (for example, through varietal improvement and better soil and water conservation practices) that would reduce risk for rural populations dependent on these cereals, thereby allowing them more scope to diversify into other income-earning activities, such as production of small ruminants or poultry. The second prong would focus on (a) selected intensification of sorghum for certain emerging opportunities, such as its use in animal feed and in blended flours and (b) marketing improvements, such as the bonded warehouse receipt (*warrantage*) systems for both domestic cereal markets and facilitating regional export opportunities, where the prospects are strong for millet.

**Cotton** Mali's first green revolution, from the 1950s through the 1970s, was in cotton, when rapid area expansion and yield increases fueled spectacular increases in production and broad-based income growth in the cotton zone of southern Mali. Cotton became the country's largest earner of foreign exchange (now eclipsed by gold), and cotton revenue financed infrastructure development, capitalization of farms, functional literacy programs, and broader rural development throughout the cotton zone. Because cotton is grown in rotation with rainfed cereals and provides key inputs to cotton/coarse grain producers, the performance of the cotton sector also strongly influences the performance of the cereal value chains. However, since the 1990s, the cotton sector has been in profound crisis due to volatile world prices, yield stagnation, and management problems of CMDT—the Malian cotton company that currently operates as a monopsony. The government is in the process of privatizing the CMDT by creating four cotton companies that will operate as monopsonies within designated geographic zones. The delicate process began in early 2010. To date, no official announcements have been made concerning the outcome. Because of falling producer prices through 2009, delays in payments to farmers, and uncertainty about the restructuring, cotton production (in terms of fiber) fell from 260,000 tons in 2003/04 to 98,000 tons in 2009/10, with 2010/11 production tentatively estimated as having rebounded to 151,000 tons, in part in response to higher prices. Farmers in the cotton zone are seeking to diversify into other crops, including expanded cereal production, but limited access to inputs on credit (as was provided through the cotton system) constrains those efforts. While the recent increases in world cotton prices are increasing incentives for farmers to reconsider cotton, widespread expansion of production is unlikely until the uncertainty regarding the ongoing sector restructuring process is resolved. In terms of opportunities to increase farm-level production and quality, Mali may be at a disadvantage given its decision to stay with traditional cotton varieties rather than adopting Bt cotton as Burkina Faso has done. Although still a topic of debate, most indications are that Bt cotton is proving more productive and less costly than conventional cotton for smallholder farmers. Whether Mali can muster the productivity and quality improvements needed to get the sector back to its former position of West African leadership without adoption of Bt cotton is an open question.

**Oilseeds** Mali has a large structural deficit in edible oils and in protein concentrates for livestock such as oilseed cake, so the scope for import substitution through expanded oilseed production is large. In Mali, the key oilseeds are peanuts, cottonseed, shea, and to a lesser extent, sesame and, more recently, sunflowers. There are also export opportunities, particularly for shea, and both shea and peanuts are important sources of income for women. But for all these oilseeds, quality control is a very big constraint. For *peanuts*, the problem is aflatoxin (a carcinogen), which eliminates any possibility of exporting raw or processed peanuts to Europe or the US, and raises major ethical issues for the development of the sector for domestic consumption until there are adequate aflatoxin controls in place. Once aflatoxin contamination can be properly addressed, the potential for further development of the sector seems good given the growing demand for edible oils. One missing element in the current assessment of the sector, however, is solid information on how competitive commercially produced peanut oil might be with domestically produced cotton oil or imported palm oil from Asia. For *cottonseed*, the major constraints relate to processing. The decline in cotton production has left industrial oil processors running well below capacity, raising their unit costs of production. This has created an opening for more “low-cost” artisanal oil producers to enter the market, but such units do not adequately refine the oil, leading to gossypol contamination that can result in serious health problems for consumers; these operations also raise environmental concerns (uncontrolled discharge of processing wastes). Complaints by some of the industrial processors about unsafe production methods used by artisanal processors have pressured authorities to shut down some crushing facilities in a given year, but the same facilities open up again the next, without adequate monitoring of quality. *Shea*, known as “Women’s Gold” because revenues from shea sales make an important contribution to rural women’s cash income, is sold into two distinct markets: a low-quality, low-price domestic market and a high-quality, high-price export market. In the domestic market, shea butter serves as cooking oil, key ingredient in soap, and use as a skin cream and salve. Export-quality shea goes into cosmetics and is used in Europe as a substitute for cocoa butter. Producing high-quality shea butter for the more remunerative export market requires a more labor-intensive processing method at the farm level to avoid contamination with potential carcinogens that arise in the traditional “roast and bury” technique. Information flow along the value-chain is generally poor and the current organization of the marketing system results in incentives within the value chain being poorly aligned; hence, rural women frequently lack incentives to produce a consistently high quality product. To address these quality control issues throughout the oilseed sector, value-chain stakeholder organizations, such as *interprofessions*, need to be strengthened, as they are critical to improving product quality in order to take advantage of the growing domestic and export demand.

**Ruminant Livestock** Livestock production accounts for approximately 30% of Mali’s agricultural GDP, and 85% of Mali’s agricultural households own some form of ruminant (cattle, goats, sheep, or camels). Cattle represent Mali’s third most important export commodity, after gold and cotton. Livestock are an extremely important form of rural savings account, and income is derived from livestock (especially milk sales) year-round, helping to relieve the cash-flow constraints that rural households would face if they relied solely on crop income. Small ruminants and milk production and marketing are frequently important sources of women’s income. Cattle are the main draft animals, and animal manures are an important contributor to soil fertility. Furthermore, because demand for livestock products typically increases rapidly as incomes increase, the demand outlook for Malian livestock production is strong, both

domestically and in the sub-region. Certain components of the livestock industry, such as dairy marketing, are labor-intensive, offering important opportunities for employment expansion.

**Beef** Mali's cattle population is estimated at approximately 8.8 million head in 2010, up from an estimated 5.2 million in 1992. While cattle numbers fell from the early 1980s through the early 1990s due to drought, they appear to have grown steadily since the 1990s. In part, this reflects the shift of the proportion of Mali's cattle population in the higher-rainfall mixed farming areas. The major constraints on production are poor nutrition seasonally (due to the seasonal variation in pasture quality and limited access to feed complements, such as oilseed cake); a low offtake rate (estimated at 11% per year), which is partly due to poor nutrition; and to a lesser degree, disease control. At current offtake rates, domestic and export demand will likely grow faster than supply over the next 10 years, leading to higher prices. Major emphases in improving the cattle value chain should focus on improving animal nutrition and health, and strengthening marketing systems, both in urban areas and regionally, where non-tariff trade barriers such as roadblocks and illicit charges add significant costs to Malian exporters. Strengthening the organizational links between butchers and tanning operations are also needed to improve the quality of hides and skins produced. Improved ruminant nutrition will require improved local pasture management (and hence support to producers' associations to develop and apply more adapted pasture management codes and practices) as well as building links to the value chains that produce critical inputs to the feed industry, such as oilseeds.

**Dairy** Most cattle are managed as dual-purpose animals in Mali, and dairy production is an important enterprise in rural areas, particularly for women. Peri-urban dairy production has also grown, particularly in the last 10 years, aimed at satisfying a growing urban demand for milk. Production in rural areas relies almost entirely on local breeds, which have very limited and variable production (typically between 0.5 and 3 liters/day for cows), and whose production is very seasonal, depending on local pasture resources. Most observers believe that in rural areas, lack of adequate nutrition, rather than genetic potential, is the binding constraint. Peri-urban milk production is more intensive, making greater use of purchased forage (groundnut and cowpea hay), crop residues, and feed concentrates to supplement natural pastures. Some peri-urban producers have developed crossbreeds with European breeds, using both artificial insemination and direct importation of breeding stock. The crossbreeds produce up to 20 liters/day.

Approximately 80% of milk processed in Bamako is reconstituted imported powdered milk, with the remaining 20% locally produced. The relatively high world prices for powdered milk since 2005 have resulted in some restructuring of the peri-urban dairy sector, characterized mainly by increased consumer interest in local milk. In order to meet local milk demand, networks of small-scale dairy producers and cooperatives have proliferated throughout the country's main production basins. These increasingly organized and professional organizations sell fresh and pasteurized dairy products through a variety of marketing channels. Demand for local milk is strong and growing, both in fresh and processed forms. If imported powdered milk prices remain high, the opening will be created for more robust growth of the sector. Apart from the price of imported powdered milk, the major constraints to expansion are seasonal feed constraints

for forage and concentrates, marketing challenges, and seasonal balancing of milk supplies. Building the skills of local cooperatives will be critical in addressing these challenges.

***Small Ruminants*** Mali has an estimated 11.3 million sheep and 15.7 million goats. In contrast to cattle, nearly half (48%) of the small ruminant population is located in the northern regions of Gao, Kidal, and Timbuktu, where these animals constitute a critical component of pastoral livelihoods. But small ruminants are also widely held in other regions of Mali and are important sources of income and stores of wealth for poorer households. Their ability (particularly of goats) to survive in harsh environments make them an important part of rural safety-net systems. Given their much shorter reproductive cycles than cattle, they offer the opportunity to expand production more quickly if feed resources are adequate. A higher proportion of small ruminant meat is consumed in rural areas compared to beef, which is more of an “urban meat.”

Seasonal fattening of sheep for Muslim feasts, particularly Tabaski, has long been an important enterprise in Mali, as prices for sheep can double or triple as the feast approaches. In recent years, this activity has increased in the Dogon plateau, offering an expanded source of non-crop income in that low-income area. Mali has also historically been a major exporter of small ruminants to its neighbors, particularly for the Muslim festivals. Like the cattle export trade, the Ivorian crisis has forced some diversification of exports, particularly to Senegal with the opening of the paved road to all the way to Dakar. Seasonal exports of live animals to Algeria and Libya have also grown.

Despite their importance and widespread ownership in Mali, small ruminants have received much less attention in terms of interventions than have cattle. While feed, is a major constraint, there is also significant room for improvement in animal health, perhaps through working with producer (including women’s) organizations. Research and extension on least-cost rations and on market research to expand exports to Mali’s northern neighbors and to the Gulf (e.g., for the Hadj) also should be explored.

**Poultry** The poultry sector, which produces both eggs and broilers, includes traditional free-range, semi-improved, and large-scale urban production, with the first two systems accounting for 95% of birds. The number of birds reported by technical services rose from 5.6 million in 1999 to 27 million in 2006; poultry accounted for 2.1% of agricultural GDP in 2008. Poultry are widely held in rural areas and are an important source of nutrition, income (especially for women), and savings for poorer Malians. The modern system, located primarily around Bamako, caters to a growing urban demand for eggs and meat. In the more traditional systems, disease remains a serious constraint to production, lowering productivity and increasing the riskiness of investing in poultry production. As Mali is on a major flyway for migratory birds, avian flu and other diseases remain serious threats. Production in the modern urban systems has been growing, and Mali has expanded its production of day-old chicks to respond to increased demand. Major constraints to production beyond disease control include developing reliable sources of feed (and hence the need to look at possibilities of contracting between poultry feed millers and maize producers, as maize constitutes 60% of the cost of poultry feed), limited access to credit by smaller producers due to the perceived riskiness of the sector, and the lack of strong

professional organizations in the sector, which constrains efforts at educating stakeholders about improved production and marketing techniques.

**Fish and Aquaculture** Inland fishery production including aquaculture account for an estimated 3.5% of GDP, most of it from capture rather than aquaculture. Dried fish, often in the form of ground fish heads, is a major source of protein included in the sauce that accompanies the daily cereal ration of poor households. There has been a steadily growing gap between demand and supply of fish protein over time due to over-exploitation and environmental degradation, resulting in the PNIP-SA calling for a large increase in aquaculture production to help fill the gap. Fishing is predominantly a small-scale enterprise, and fish marketing and processing (smoking) employs many women. Expanding inland fisheries will require dealing with management of common-pool resources, such as rivers, lakes, and ponds that are increasingly overfished. Expansion of aquaculture will require significant investment in training of farmers in aquaculture techniques. There is also need to work with associations of marketing agents to improve the hygiene of the marketing system, as the risk of food-borne illnesses in this value chain is high.

**Horticulture** Horticultural value chains, for the domestic, regional, and to a lesser extent, the international markets, appear to have been growing rapidly since the 1994 CFA Franc devaluation, which increased the competitiveness of Malian production. Yet statistics on horticultural production in Mali are very weak, making it difficult to quantify this growth accurately. Among the most important value chains for domestic and regional markets (whose size dwarfs current overseas exports from Mali) are onions/shallots, potatoes, tomatoes, and greens. Although not a priority in the PNIP-SA, many types of horticultural production (particularly those producing for the local, national and sub-regional markets) share some of the characteristics of animal products highlighted above: strong demand growth prospects as incomes increase, labor-intensive production and marketing systems that employ many women, and perishable products that need to be handled quickly and carefully to preserve product quality and avoid contamination. The systems also face a problem of inappropriate use of some pesticides, which threatens the health of farmers, marketing agents, and consumers. Fostering collective action by actors in these value chains through strengthened producer and trader associations and *interprofessions* will be important in addressing the quality and food safety issues.

**Agricultural Inputs** Although supply of agricultural inputs (seeds, fertilizer, and pesticides) has been liberalized since the early 1990s, the structure of input demand and supply are heavily influenced by the extent to which the Malian government remains involved in the management of the agricultural sub-sectors that use most of the purchased inputs (irrigated rice and cotton) and in subsidy programs.

**Fertilizers** There are approximately 20 firms that have been identified in various reports and surveys as having participated in fertilizer procurement in Mali during the past two decades. Over time, the actors have changed but the sector has not developed into a coherent, competitive national supply system. It remains compartmentalized into three procurement channels: organized rice farmers, organized cotton farmers, and unorganized farmers. At present, two fertilizer importers supply an estimated 97% of the Malian market (Toguna Agro-Industries and Yara Mali). The

distribution and wholesale sector comprises a small number of professional fertilizer distributors who stay in the market year after year and a larger number of actors who enter and exit the market when they see an opportunity for quick turnover. The types of vertically integrated import/distribution/retail systems that one sees in other countries have not developed. This lack of a more integrated system increases the number of times that a bag of fertilizer changes hands and another actor adds his other margin to the overall cost. There is little direct investment by distributors to set up retail networks and a tendency for producer organizations or government agents to perform retail functions.

The recurrent problem affecting both fertilizer supply and demand is credit. Farmers note that fertilizer costs represent as much as 35-40% of gross income per hectare, making credit essential. At the other end of the value chain, Toguna has identified access to credit as a major constraint to its further investment in the value chain.

Recent government subsidy programs launched in conjunction with major rice, maize, and wheat production initiatives have made the input situation more complex. Whether the subsidy programs represent a constraint or an incentive to investment in the fertilizer sector remains an open question. The subsidy has substantially increased fertilizer volumes and reduced uncertainty concerning quantities to order and letters of credit; on the other hand, it has increased costs due to government inefficiencies in the administration of the subsidy program such as late orders and late supplier payments.

The recent entry into the market of the Malian firm Toguna Agro-Industries, which imports and manufactures bulk blend fertilizers, is an important development. With only four years of operation to date and numerous “assists” from the government, it is too soon to tell how sustainable the effort will be. Also, there is always the danger that Toguna could develop into a fertilizer monopoly that does not serve its Malian clients well.

As the government of Mali moves forward on its subsidy program, there will be a need to ensure that adequate competition remains in the sector. At the retail level, some analysis of the costs and benefits of a private-sector retail distribution network compared to a system based on producer organizations handling the retailing functions could help Mali develop a better system and donors better direct their project support. Finally, to enhance results from the fertilizer subsidy and from investments being made by the private sector, increased investment in fertilizer research and extension, preferably in partnership with Toguna and Yara, should be promoted.

**Seed** An estimated 90-95% of seed for Mali’s traditional coarse grains comes from informal farmer-to-farmer and village market exchanges. The share of formal sector, improved seed is a bit higher for maize (20%) and much higher for rice (85%). A key characteristic of Mali’s formal seed sector for all crops is its dependence on government and donor projects for seed production and marketing.

At present, the formal seed value chain for millet and sorghum has almost no interface with village markets where farmers are active as sellers and buyers. There is no clear relationship between the formal seed chain and the formal grain marketing chain—a link

that is needed to transmit market-related signals to farmers, such as seed-to-grain price ratios.

The seed multiplication sector seems to be best positioned among the input sectors for generating local employment and incomes *if* effective demand for improved seeds can be increased. A major factor in developing this demand will be developing the value chains to increase the marketing of crops such as millet, sorghum, and maize. Improved markets alone, however, will not be adequate. Public-private partnerships that increase access to seed production credit, improve the marketing skills of seed producers and traders, and promote joint extension efforts similar to those that have been used in East and Southern Africa represent models for Mali to consider.

### **Cross-cutting Issues and Potential USAID/Mali Contributions**

Key cross-cutting issues that will affect the performance of all value chains include the following:

- ***Agricultural policy reform, especially concerning input and output marketing.*** With the high food prices since 2007/08, there have been increasing calls from the public and some Malian political leaders to reengage the state in grain marketing through OPAM, expand financially unsustainable input subsidies, and restrict exports to hold down domestic prices. USAID/Mali needs to stay firmly engaged in the policy debates as it has in the past in order to help avoid the country slipping back into policies that proved detrimental to agricultural growth and food security in the past. This policy engagement should aim at improving the predictability of government actions with respect to: (a) buying and selling from the national security and national grain intervention stocks and (b) the imposition of trade restrictions in periods of high prices, as well as general improvements in the business climate and contract enforcement. But to be credible in this debate, USAID/Mali needs to (a) support analysis about alternatives open to the government to deal with the very real political-economic challenges facing it when food prices are volatile (e.g., design of sustainable social safety nets), and (b) invest in more than just policy dialogue. If USAID does not also invest in other concrete actions to support agricultural development in the country, it risks being perceived as only offering gratuitous advice.
- ***Developing improved rules and processes concerning land tenure and water rights.*** Land tenure and water rights are already the source of conflict in rural Mali, and such conflict is only likely to grow as demand for water and land increase with burgeoning population, increased desire by both Malians and foreigners to invest in irrigated agriculture, and climate change. Moreover, more secure and exchangeable rights to water and land are essential to stimulating rapid agricultural growth in Mali. Secure land tenure allows land to be used as collateral for loans, improving farmers' access to capital; while a reliable land registry allows national and/or local governments to use land taxes as a source for efficient financing of critical public services. Tradable rights to water and land also facilitate the access to these resources by those most able to use them efficiently, thereby spurring economic growth. At the same time, the design of land and water tenure rules need to protect the current rights of local populations so

that they are not disenfranchised by water or land “grabs” by powerful outside interests. The US has much experience from its own history, both positive and negative, on these issues, that it can contribute to the debate, while also supporting the processes (e.g., policy discussions, research, consultative forums, and institutional design and strengthening) to find Malian solutions to these issues in Mali.

- ***Strengthening technical research and outreach on improved soil and water management***, which are critical complements to tenure reforms in order to sustain and enhance the natural resource base that undergirds Malian agriculture. Such work needs to be guided in part by more detailed, disaggregated analysis of the projected impacts of climate change in different areas of Mali.
- ***Improving knowledge systems at all levels of the agri-food system, including agricultural statistics, market information, agricultural research and extension, and nutrition education***. Getting the right information to the right people in the right form at the right time will be essential to improved public and private decisions regarding investments, policies, production, marketing, and adaptation to climate change. Strengthening the quality of agricultural statistics (including the development of farm panel data sets to track changes over time) and protecting them from political manipulation are especially important, as reliable information on the sector is critical for guiding efficient private and public investment in agriculture and for the design of effective and consistent agricultural policies. Private sector actors see poor quality statistics as a major cause of erratic government policies regarding food markets (e.g., the imposition of periodic export bans), as in the absence of reliable information, government officials choose to assume the worst and shut down exports.
- ***Agricultural education at all levels***, from basic literacy through technical and managerial training to agricultural higher education. Supporting basic literacy programs is beyond the scope of USAID/Mali’s accelerated economic growth (AEG) program, but coordinating with the mission’s education program and with other donors is very important, as it will be very difficult and costly to bring about rapid transformation of agriculture when a large part of the rural population is illiterate. Strengthening agricultural vocational schools and technical institutes will help meet the anticipated increase in the demand for a new generation of agricultural technicians, while support of agricultural higher education is needed to produce a new generation of agricultural scientists and policy makers to replace the large cohort that is nearing retirement.
- ***Building the capacity of local governments***, which are currently very weak but where, in practice, many of the key elements necessary to spur agricultural growth and improve food security (which involve bringing together many different government services) have to coalesce.
- ***Building stronger cooperatives, farmer and trader organizations, and interprofessional organizations*** to help carry out some of the critical economic coordination functions necessary for broad-based agricultural growth. In the past, many of these coordination functions were handled (often poorly) by state agencies or parastatals. Failure to develop more effective civil-society and private-sector based



organizations to address these coordination functions may increase pressures to bring back the old, failed policies and structures of the past.

- ***Improving the ability of the financial system*** to serve farmers and other actors in agricultural value chains and attract the capital necessary for rapid agricultural growth. Key challenges will be to move beyond just a micro-finance approach to funding agricultural activities towards fuller integration of the commercial banking system into agricultural lending and rural savings mobilization and resisting pressures for large-scale interest-rate subsidies, which often lead to credit rationing and biasing of lending away from the poor.



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## LIST OF ACRONYMS

AEG	USAID Accelerated Economic Growth program
AFD	<i>Agence Française de Développement</i>
ANSSA	Malian National Agency of Food Sanitary Safety
APCAM	<i>Assemblée Permanent des Chambres d’Agriculture du Mali</i>
AV	<i>association villageoise</i>
BCEAO	Malian central bank
BMS	Malian Solidarity Bank
BNDA	<i>Banque Nationale de développement agricole Mali</i>
BRAMALI	<i>Société Brasseries du Mali</i> ; Malian Brewers’ Association.
C-4	Cotton-4; Cotton trade organization consisting of Benin, Burkina Faso, Chad and Mali.
CAADP	Comprehensive Africa Agricultural Development Program
CEDAW	Convention on the Elimination of All forms of Discrimination against Women
CIMMYT	International Maize and Wheat Improvement Center
CIRAD	<i>Centre de coopération internationale en recherche agronomique pour le développement</i>
CMDT	<i>Compagnie Malienne de Développement des Textiles</i>
CNRA	<i>Comité National de la Recherche Agricole</i>
CNU	<i>Commission Nationale des Utilisateurs</i>
CPI	<i>Conseil Présidentiel d'Investissement</i>
CPS	<i>Cellule de Planification et de Statistique</i>
CRSP	Collaborative Research Support Program; USAID program for agriculture research
CRU	<i>Commission Régionale des Utilisateurs des Résultats de la Recherche</i>
CSA	<i>Commissariat à la Sécurité Alimentaire</i>
CSCR	<i>Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté</i>
DFS	decentralized financial systems
DNAMR	<i>Direction Nationale de l’Appui au Monde Rural</i> ; National Directorate for Rural Development
DNSI	National Statistics and IT Directorate. Defunct, now INSTAT
EAC	<i>Enquête Agricole de Conjoncture</i> ; Agricultural Outlook Survey
ECOFIL	Subsector Economics Program of ECOWAS
ECOWAP	ECOWAS Agricultural Policy
ECOWAS	Economic Community of West African States

FCFA	<i>Franc Communauté Financière d'Afrique</i> ; West African CFA franc
FTF	Feed the Future; US Government global hunger and food security initiative
G&S	grades and standards
GAM	<i>Générale Alimentation Malienne</i>
GDI	Gender Development Index
GDP	Gross Domestic Product
GIE	<i>Groupement d'Intérêt Economique</i> ; a type of joint venture
GMO	genetically modified organisms
GREAT	<i>Groupe de recherche en économie appliquée et théorique</i> at the University of Bamako
GSTA	Global Sustainable Tourism Alliance
GTZ	German Society for Technical Cooperation
HDI	Human Development Index
ICAS	Investment Climate Advisory Services
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IER	<i>Institut d'Economie Rurale</i>
IICEM	Integrated Initiatives for Economic Growth in Mali; USAID program
INSTAT	<i>Institut National de la Statistique</i>
INTSORMIL	Sorghum, Millet and Other Grains CRSP
IPM	Integrated Pest Management
IPR/IFRA	<i>Institut Polytechnique Rural de Formation et de Recherche Appliqué de Katibougou</i>
ISFRA	<i>Institut Supérieur de Formation et de Recherche Appliquée</i>
LCV	Malian Central Veterinary Laboratory
LNS	<i>Laboratoire National de la Santé</i>
LOA	<i>Loi d'Orientation Agricole</i>
LT	long term (time horizon)
MBC	MaliBioCarburant
MCA	Millennium Challenge Account
MCC	Millennium Challenge Corporation
MEB	<i>Ministère de l'Education de Base</i>
MFP	multi functional platform
MIS	market information systems
MPWCF	Ministry of the Promotion of the Woman, the Child and the Family
MSU	Michigan State University

MT	medium term (time horizon)
NEPAD	New Partnership for Africa's Development
ODI	Overseas Development Institute; UK think tank
OHVN	<i>Office de la Haute Vallée du Niger</i>
OIE	World Organization for Animal Health
OMA	<i>Observatoire du Marché Agricole</i>
ON	<i>Office du Niger</i>
OPAM	<i>Office malien des produits agricoles</i>
ORD	<i>Opération de Développement Rural</i>
PAPAM	<i>Programme d'Appui à la Productivité Agricole au Mali</i>
PASAOP	<i>Programme d'Appui aux Services Agricoles et aux Organisations Paysannes</i>
PCDA	<i>Programme Compétitivité et Diversification Agricoles</i>
PDA	<i>Politique de Développement Agricole</i> ; Mali's new ag. Development policy under CAADP
PDAM	Mali Poultry Development Project
PGR	<i>Projet de Gestion Rurale</i>
PIV	<i>périmètre irriguée villageois</i>
PLAZA	<i>Périmètre Logistique Aménagé en Zone Agricole</i>
PNIP-SA	<i>Plan National d'Investissement Prioritaire dans le Secteur Agricole</i> ; Priority National Investment Plan from CAADP process
PNISA	<i>Plan National d'Investissement du Secteur Agricole</i>
PRBF	<i>Bas-Fonds</i> Rice projects
PRMC	Cereals Market Restructuring Program
PRODEPAM	Agricultural Productivity Initiative In Mali; USAID program
PROMISAM	The project to mobilize food security initiatives in Mali; USAID program
PSSA	Special Program for Food Security
RGA	<i>Recensement Générale de l'Agriculture</i> ; General Census of Agriculture
SAGE	Strategies for Advancing Girls' Education
SAP	<i>Système d'Alerte Précoce</i>
SBI	<i>system de blé intensif</i>
SCAER	Agricultural and Equipment Credit Service
SDDR	<i>Schéma Directeur de Développement Agricole</i>
SGS	<i>Société Générale de Surveillance</i> ; Private grades and standards company
SIGI	Social Institutions and Gender Index
SME	small to medium enterprise

SNRA	<i>Système Nationale de Recherche Agricole</i>
SNSA	<i>Stratégie Nationale de Sécurité Alimentaire</i>
SNV	Netherlands Development Organization
ST-EP	Sustainable Tourism–Eliminating Poverty
SWC	soil and water conservation
T&V	training and visit; defunct World Bank sponsored extension methodology
UEMOA	<i>Union Economique et Monétaire Ouest Africaine</i>
UNDP	United Nations Development Program
UNWTO	United Nations World Tourism Organization
VAT	Value Added Tax
WACIP	West Africa Cotton Improvement Program
WAEMU	West African Economic and Monetary Union
WASA	West African Seed Alliance
WHO	World Health Organization

## 1. INTRODUCTION

### 1.1. Study Objectives

This agricultural sector assessment aims at providing USAID/Mali's Accelerated Economic Growth (AEG) team background information to help shape its program under the Feed The Future initiative. The study updates the December 2001 Mali Agricultural Sector Assessment produced by Abt Associates that helped inform USAID/Mali's design of its 2003-2012 Country Strategic Plan. The present study draws on the large number of studies carried out over the past 10 years on Malian agriculture in order to reassess the potentials and challenges of Malian agriculture and to identify investment areas in which USAID/Mali has a comparative advantage in supporting the development of Malian agriculture.

The present study aims to:

- Assess the performance of Malian agriculture, both overall and for key value chains, during the period 1991-2009 with a particular emphasis on the period since 2000—i.e., the period since that covered in 2001 Sector Assessment, in terms of the sector's contribution to: (a) overall economic growth; (b) the pattern of that economic growth in terms of its distribution regionally, among income classes, and across genders; and (c) food and nutrition security.
- Identify, for key value chains, their growth potentials, opportunities and growth linkages, gender aspects, importance for poverty alleviation, and key constraints, risks, and vulnerabilities.
- Analyze critical issues that cut across different value chains that need to be addressed to create the building blocks of broad-based agricultural growth in Mali.
- Suggest areas where investments by USAID/Mali can be most productive over the next 10 years, with particular emphasis on actions over the next 5 years, in spurring broad-based agricultural-led growth in Mali, **taking into account what other actors** (e. g. the Malian government, other technical and financial partners, the private sector, and civil society) are likely to be doing over the next decade.

### 1.2. USAID Context: Feed The Future

USAID/Mali's programs to support Malian agricultural development over the period 2011-15 will be part of Feed the Future (FTF) initiative, the US government's global hunger and food security initiative. FTF aims at translating into action the commitments the United States made at the G8 summit in L'Aquila in 2009 to increased investment in agriculture and rural development as a lever for combating food insecurity and as an engine for broader economic growth, prosperity, and stability. The initiative has several key characteristics (for details, see [www.feedthefuture.gov](http://www.feedthefuture.gov)):

- It is a “whole-of-government” approach, involving coordination among USAID, MCC, USDA, the State Department, Peace Corps, and a range of other agencies. This whole-of-government approach reflects the decision of the Obama administration to elevate development to one of the 3 key “Ds” of US foreign policy (along with diplomacy and defense).

- It aims at concentrating USG agricultural development resources on a limited number of countries (around 20) which are judged to have the need, the potential, and the commitment to make significant progress in the next 10 years. Mali is currently included among those countries.
- As guided by the Rome Principles for Sustainable Food Security, FTF is committed to:
  - Invest in country-owned plans that support results-based programs and partnerships. In Sub-Saharan Africa, this means building programs around the objectives identified in the national Comprehensive Africa Agricultural Development Program (CAADP) plan.
  - Strengthen strategic coordination to mobilize and align the resources of diverse partners and stakeholders, including the private sector and civil society.
  - Ensure a comprehensive approach that accelerates inclusive agricultural-led growth and improves nutrition, while also bridging humanitarian relief and sustainable development efforts. Among the elements of inclusivity, FTF emphasizes the need for gender equity in the programs it supports.
  - Leverage the benefits of multilateral institutions so that priorities and approaches are aligned, investments are coordinated, and financial and technical assistance gaps are filled
  - Deliver on sustained and accountable commitments, with an emphasis on thorough monitoring and evaluation to help ensure strong results-based management and on accountability for achieving results.

### **1.3. Overview of current USAID/Mali AEG Portfolio**

Table 1 and Figure 1 summarize the USAID/Mali AEG portfolio as of mid-2010. All projects have important capacity-building elements at various levels. The portfolio has a strong value-chain orientation, most prominently through the “anchor project”, Integrated Initiatives for Economic Growth in Mali (IICEM), but complemented by the Aquafish, INTSORMIL and Global Livestock CRSPs, the Sustainable Tourism Alliance, and the West African Seed Alliance. The program also supports cross-cutting activities in agricultural policy analysis (PROMISAM), strengthening intellectual property rights, integrated pest management (IPM CRSP), strengthening producer organizations (Farmer to Farmer, Winrock, and ACDI-VOCA), local food security capacity plan implementation (Peace Corps) and targeted activities in Northern Mali. One of the aims of this report is to analyze the pros and cons of shifting the relative balance of activities between individual value-chain oriented programs and those that address more cross-cutting issues. .

**Table 1. Description of USAID/Mali Accelerated Economic Growth portfolio**

Project Name	Project Objectives/ Goals	Current Project activities
Integrated Initiatives for Economic Growth in Mali (IICEM)	As the anchor of AEG programming, its aim is to increase agricultural productivity, improve linkages to markets, and facilitate rural finance in Mali, in particular by developing local capacity. Adopts a value chain approach to promote economic growth and to improve efficiency in rice, potatoes, mango, tomatoes, shallots, millet/sorghum and other value chains with significant implications for food security. Has a special focus on promoting equality between men and women in project activities and building capacity in local institutions to ensure sustainability.	<ul style="list-style-type: none"><li>• Expansion/ Rehabilitation of irrigated agriculture and intensification of agricultural production in target areas</li><li>• Enhancing access to finance</li><li>• Enhancing access to markets and trade</li><li>• Introducing, transferring, and applying improved technologies</li><li>• Increasing control of village associations over natural resources and the environment</li><li>• Enhancing the enabling environment for agriculture, trade, and investment</li><li>• Ensuring better coordination among programs and partners</li></ul>
AquaFish CRSP	Improve the productivity and income of Mali fish producers: facilitating their access to technologies: and achieving efficiency through quality management.	<ul style="list-style-type: none"><li>• Make available aquaculture and fisheries technologies to farmers and fishers</li><li>• Conduct short-courses and field trials in basic aquaculture and fisheries technologies</li></ul>
INTSORMIL CRSP	Facilitate the adoption of production and marketing technologies for sorghum and millet to increase incomes and improve the productivity of farmers.	<ul style="list-style-type: none"><li>• Develop and move sorghum and millet production technologies onto farmers' fields</li><li>• Link farmers' organizations to food and feed processors; and facilitate development in food and feed processing activities to expand the markets</li><li>• Institutional capacity building</li><li>• Improving the quality of seed production</li></ul>

Project Name	Project Objectives/ Goals	Current Project activities
PROMISAM (The project to mobilize food security initiatives in Mali)	Carry out applied research, training, and outreach to strengthen the capacity of the Malian government to develop sustainable, market-compatible food security programs.	<ul style="list-style-type: none"> <li>• Enhance and develop the technical and analytical skills of the CSA and related support agencies</li> <li>• Assist Mali in implementing food security plans country-wide by developing and testing of methods for monitoring plan implementation</li> <li>• Help Mali's faculty of agriculture at IPR/IFRA in Katibougou to develop and launch a program in agricultural economics and food policy analysis</li> <li>• Provide technical support to Mali's national team developing Mali's NEPAD/CAADP report and national compact</li> </ul>
West African Seed Alliance (WASA)	Create a sustainable commercial seed industry that can ensure that small-scale farmers have affordable, timely, and reliable access to high quality seeds and planting materials.	<ul style="list-style-type: none"> <li>• Develop viable seed and agricultural inputs systems</li> <li>• Training to increase the skills of small agro dealers to offer better advise to farmers about agricultural inputs</li> <li>• Provide technical support in seed production, business development services, and marketing. It focuses on seed commercialization</li> </ul>
Peace Corps Market Based Food Security	Enable Volunteers to build grassroots capacity to address food insecurity in Mali through an integrated response to specific, locally identified organizational, technical, financial, and communication needs.	<ul style="list-style-type: none"> <li>• Volunteers assist in managing development projects</li> <li>• Volunteers assist local community members in assessing local resources, identifying needs, and then planning and implementing development projects</li> </ul>
Intellectual Property Rights (IPR)	Improve the business and regulatory environment for private sector-led trade and investment by providing technical assistance to support the strengthening of the trade and investment enabling environment.	<ul style="list-style-type: none"> <li>• Develop and adopt policy guidelines, harmonized legislation, and other instruments with which to strengthen the protection of intellectual property rights in their regions</li> </ul>

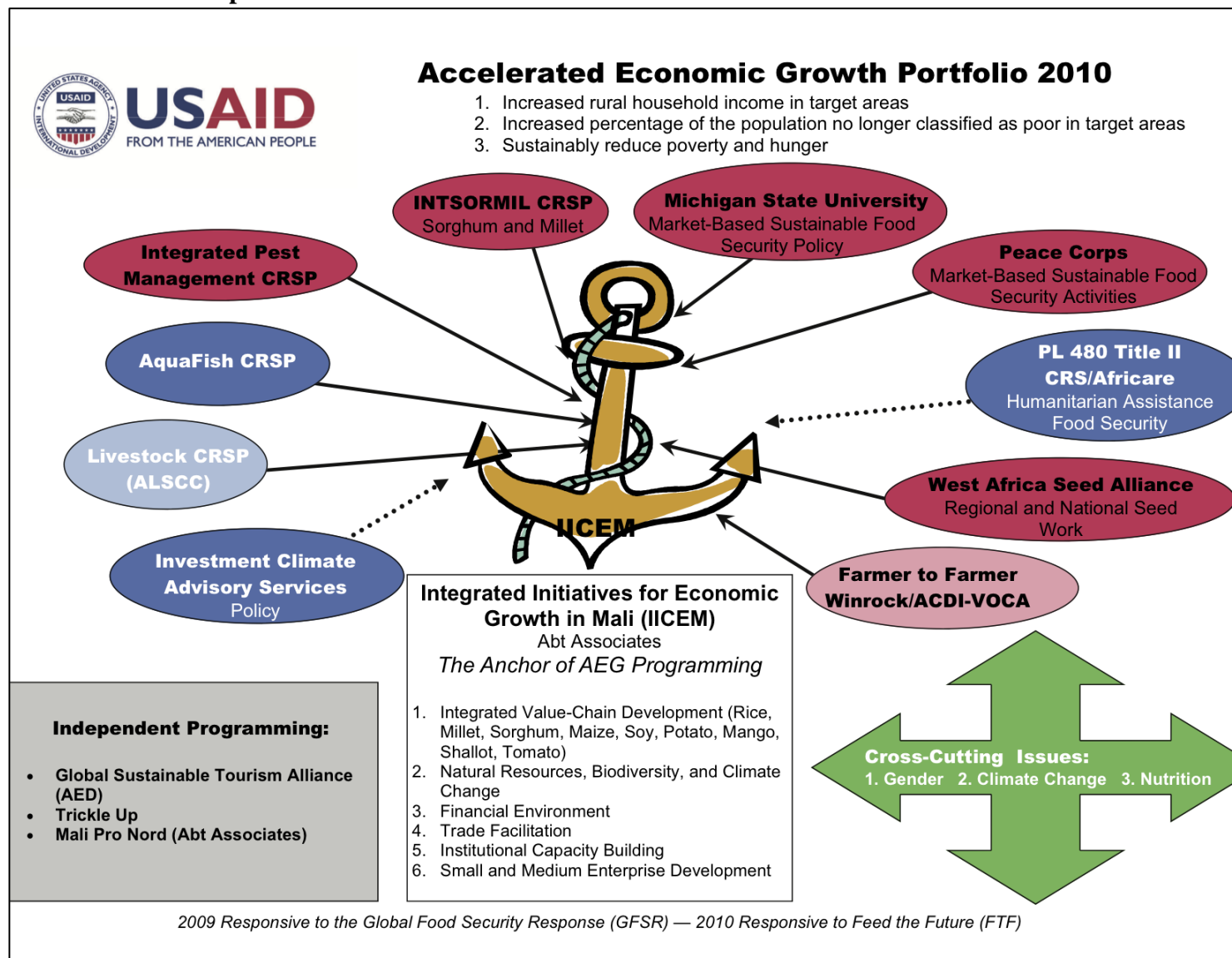


Project Name	Project Objectives/ Goals	Current Project activities
Food for Peace PL 480	Reduce food insecurity in Northern Mali by increasing agriculture production and productivity, promoting improved nutrition and infant health, and supporting adult literacy. Programs executed by Africare, CRS, Helen Keller International and Save the Children US	<ul style="list-style-type: none"> <li>• Creation and strengthening of community organizations to manage local food security in partnership with early warning system (SAP)</li> <li>• Training cooperatives in managing agricultural production and marketing activities</li> <li>• Introduction of intensive production systems for rice (SRI) and wheat (SBI)</li> <li>• Establishment of local savings and loan associations</li> <li>• Nutrition education</li> <li>• Food for work programs to strengthen agro-pastoral infrastructure</li> <li>• Strengthening of social safety net programs</li> </ul>
Farmer-To-Farmer (FtF).Winrock/ ACDI-VOCA	Increase the productivity and profitability of the Malian private agricultural sector by supplying American volunteer expertise	<ul style="list-style-type: none"> <li>• Provide direct technical assistance and training to agricultural entrepreneurs in order to improve the quality of their production, its processing and commercialization</li> <li>• Facilitate the access to micro finance, improving product quality and its market competitiveness</li> <li>• Improve access to export markets</li> </ul>
Integrated Pest Management (IPM) CRSP	Develop and diffuse new pest management technologies/methods for gardening and staple crops.	<ul style="list-style-type: none"> <li>• Improve tomato production in rice-based cropping systems</li> <li>• Promote quality assurance among small farmers and build sustainable national capacity for pesticide residue analysis</li> <li>• Provide pesticide safety training to Ministry of Agriculture personnel, extension agents and farmers</li> </ul>

Project Name	Project Objectives/ Goals	Current Project activities
Global Livestock CRSP	Support the development of the extensive livestock sector and empowering pastoralists to improve their capacity for risk management	<ul style="list-style-type: none"> <li>• Develop a livestock market information system</li> <li>• Examine strategies for reducing risk and improving livestock marketing options for the enhancement of pastoral livelihoods in Mali.</li> </ul>
Investment Climate Advisory Services (ICAS)	Help the government to adopt reforms that facilitate business and encourage investments. Supports competition in markets, economic growth & job creation.	<ul style="list-style-type: none"> <li>• Promoting reforms to simplify procedures and reduce time for business start-ups, imports and exports, obtaining construction permits and registering property</li> <li>• Support reforms to civil procedures code to improve contract enforcement</li> <li>• Support development of legal and institutional framework to create special economic zones in Mali</li> </ul>
Trickle Up	Reducing poverty via micro enterprise development with a focus on women, people with disabilities and youth.	<ul style="list-style-type: none"> <li>• Business training</li> <li>• Conditional seed capital grants</li> <li>• Access to savings via savings group creation and support</li> </ul>
Sustainable Tourism Alliance (GSTA)	Stimulating income generation, promoting the equitable distribution of benefits & supporting environmental conservation in Dogon Country.	<ul style="list-style-type: none"> <li>• Strengthening linkages between tourism development activities and natural resource stewardship</li> <li>• Fostering business development and investment Strengthening Linkages and Local Capacity</li> <li>• Improving the enabling conditions for sustainable tourism development</li> <li>• Increasing visitor and community awareness and cultural sensitivities while reducing adverse impacts of tourism</li> </ul>

Project Name	Project Objectives/ Goals	Current Project activities
ProMali Nord	Increasing economic opportunities in Northern Mali (Timbuktu, Gao, and Kidal) through support for sustainable small and micro-enterprises.	<ul style="list-style-type: none"> <li>• Provide training in business development services and business improvement management techniques.</li> <li>• Develop bankable business plans</li> <li>• Accompany enterprises in approaching micro-finance institution and help emerging and existing enterprises apply for business loans.</li> <li>• Training businesses in financial management in order to pay pre-existing debts</li> <li>• Provide advisory services and follow-up to promising enterprises (existing and new)</li> <li>• Aid entrepreneurs in capitalizing on new market opportunities and to expand</li> </ul>

Figure 1. USAID/Mali AEG portfolio



## 1.4. Methods

This document aims to update an agricultural sector assessment carried out for USAID/Mali in 2001 by Abt Associates. That study was prepared at USAID/Mali's last major strategic planning effort to establish its prior 10-year strategy to help support economic growth in Mali. The current document was developed over a period of several months by a team of faculty members and graduate students from Michigan State University (MSU). The team benefitted particularly from work over the past two years by Malian and expatriate analysts involved in developing Mali's "transition to a sector-wide approach" to agricultural development as part of the broader CAADP process. This analysis was complemented with additional analysis of data from various sources (primarily INSTAT and the OMA) to examine recent trends and possible future trajectories in production and prices, as well as targeted interviews with key actors to fill in gaps not covered by the other information at the team's disposal.

A word about statistics: One of the major constraints faced by the review team was the inconsistency among the statistics cited by various authors regarding production levels in many value chains. For production statistics, we have relied on the figures available from the *Cellule de Planification et de Statistique* (CPS) for Rural Development, and have used national accounts data from INSTAT (formerly DNSI) throughout when reporting the share of GDP of a particular commodity or value chain. Despite these efforts, we recognize that there may be a large margin of error in production statistics for certain value chains that we believe have strong growth potential, such as horticulture and poultry. As noted below in section 4.23, improving the quality of agricultural statistics in Mali is critical to improved planning and analysis by both the private and public sector.

## 2. CONTEXT

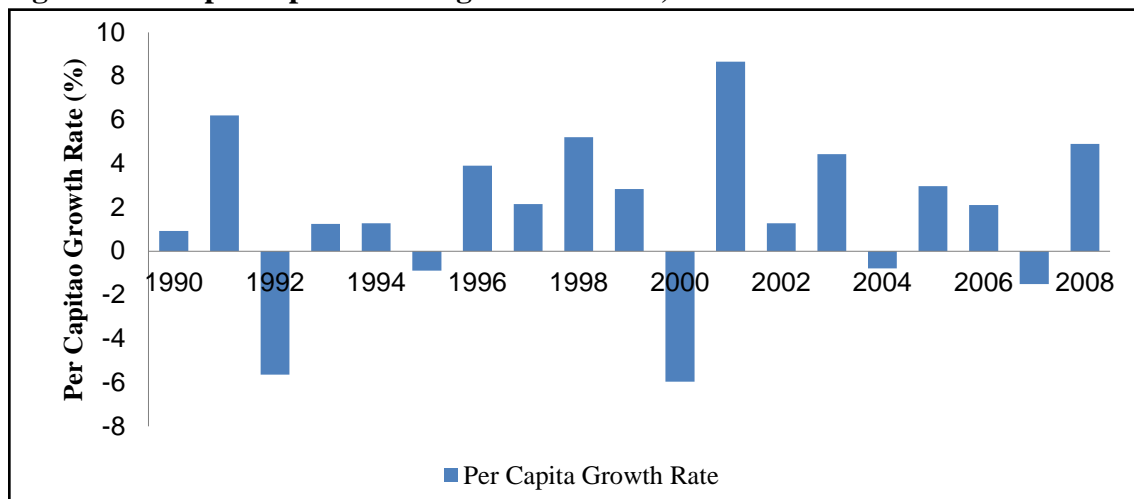
### 2.1. Mali's Economic Performance since 1991 and Agriculture's Contribution to it —with particular emphasis on the performance since 2000

Over the period 1991-2008, Mali experienced an average annual growth rate of real GDP of approximately 4.1%, which translated into an average annual real per capita growth rate of slightly over 1.1%. While the average real growth rate was positive, what is striking is how variable the growth has been from year to year (Figure 2), reflecting periodic weather, political, and external economic shocks, such as the 1992 post-revolution economic downturn, the 2000 and 2007 cotton crises, and the effects of the Ivorian civil war beginning in 2002-04.

Agriculture (including forestry, fisheries, cropping, and livestock) is a dominant sector in the economy, accounting for 35% of GDP in 2008, down from 42% in 1991. The declining share of agriculture in GDP over time reflects several factors: the rise of the gold sector since the mid-1990s, demographic shifts towards urban areas, the normal process of structural transformation of the economy as the non-agricultural sectors have grown, and changes in national accounting practices. Prior to 2002, processing activities in the rice and cotton sectors were counted as part of agriculture; they are now counted under the manufacturing sector.

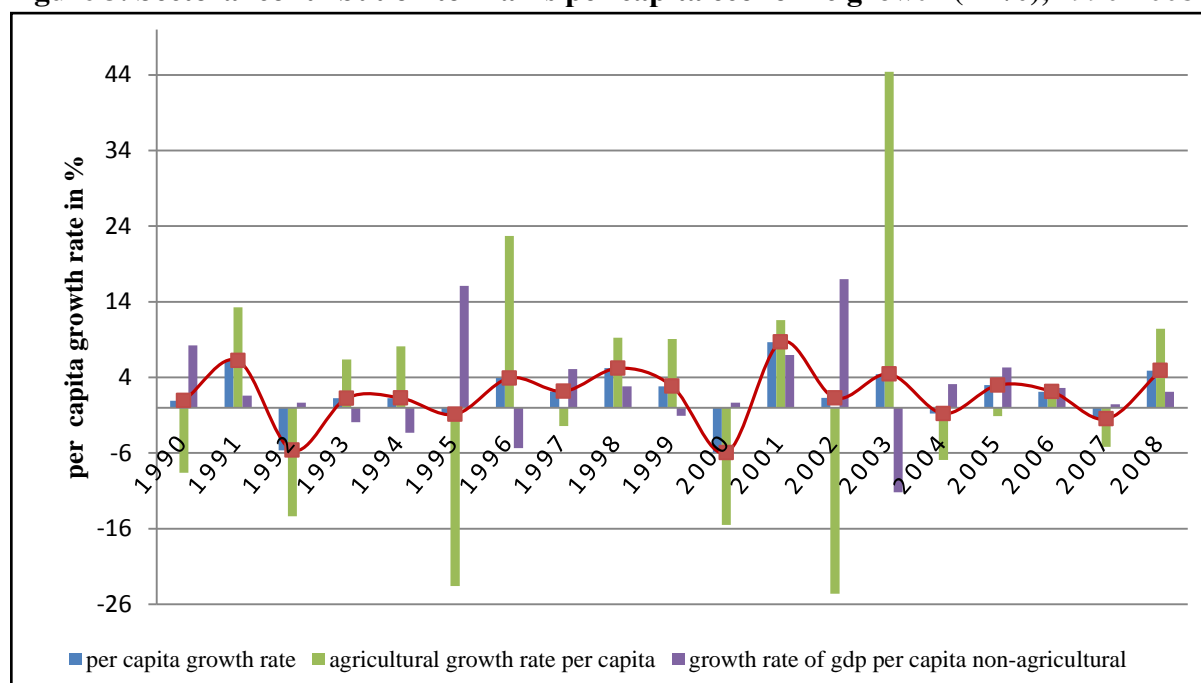
The economy remains highly dependent on agriculture, as shown by the high correlation of agricultural and overall growth rates (Figure 3). The central role that agriculture plays in the Malian economy is understood by policy makers. Agriculture is at the core of Mali's development strategy and is recognized in all strategic documents as the motor of and the priority for economic growth and poverty reduction. Yet agriculture's variable performance, in part because of its predominantly rainfed nature, remains problematic. This performance is in stark contrast to the targets of Mali's CAADP Priority National Investment Plan, which calls for a *sustained* annual growth rate in excess of 9%—clearly performance beyond any Mali has achieved in the past. The quest for increased stability in food production and markets has driven the agricultural and food policy of all Malian governments, including current efforts to greatly expand irrigated agriculture.

**Figure 2. Real per capita income growth in Mali, 1991-2008**



Source: INSTAT data.

**Figure 3. Sectoral contribution to Mali's per capita economic growth (in %), 1990-2008**



Source: INSTAT Data

## 2.2. Trends in Food Consumption and Malnutrition

Food consumption represents the largest component of household expenditures in Mali. Because food is essential, and food prices can vary greatly from one year to another depending on growing conditions, the share of food in total expenditure also varies greatly, ranging from 40% to 70% over the past decade. Within the food component of household expenditure, cereal consumption (which provides the main source of calories), accounts for between 30% and 50% of food expenditures depending on year and location (rural or urban; proximity to production zones). Budget shares devoted to non-cereal items like meats, eggs, fruits and vegetables, and fats generally increase as incomes increase, implying strong growth potential for these non-cereal items if per capita incomes increase. In contrast, the budget share (but not necessarily the absolute amount) devoted to coarse grains falls as incomes increase. This expected transition in expenditures between cereals and non-cereals is only occurring for the top quintile (top 20%) of households in terms of consumption expenditure. For the vast majority of households, in both rural and urban areas, cereal consumption expenses remain high as a proportion of total food expenditure. Reductions in the cost of cereals can therefore be expected to have a strong poverty reduction effect.

**Table 2. Food expenditure shares by food product and region 2006**

Product	KAYES	KOULIKORO	SIKASSO	SÉGOU	MOPTI	TOMBOUCTOU	GAO	KIDAL	BAMAKO	NATIONAL
Sorghum	7.7	9.2	7.3	5.8	4.0	2.1	2.2	0.0	2.8	5.7
Rice	12.6	13.4	11.2	19.7	24.0	35.3	35.9	27.2	18.9	18.6
Millet	10.2	15.5	8.0	13.9	18.3	10.4	13.0	4.9	5.3	11.8
Maize	4.6	4.0	15.3	1.3	1.0	0.4	0.9	0.3	1.6	3.9
Wheat	0.2	0.1	0.1	0.1	0.0	1.0	0.1	7.3	0.3	0.2
Roots and tubers	1.1	1.6	1.8	1.3	1.4	1.1	0.2	0.9	4.4	1.9
Fruits and vegetables	9.9	8.9	8.4	5.8	6.8	3.0	1.1	0.9	6.8	7.2
Pulses	5.8	6.4	5.5	7.0	4.3	3.9	4.4	3.0	8.9	6.2
Fats and oils	4.2	4.2	4.4	5.4	3.0	4.1	4.1	5.5	4.5	4.3
Meat/poultry	11.7	9.5	8.2	8.8	7.5	11.5	4.5	12.4	13.4	9.8
Fish	3.3	4.4	4.6	5.9	7.3	5.9	6.6	1.4	6.3	5.4
Dairy products and eggs	4.7	3.4	3.1	3.5	4.8	4.5	5.9	6.9	4.9	4.2
Sugar and sugar products	6.8	6.1	7.5	6.6	5.7	5.4	5.5	8.0	6.0	6.3
Other foods	17.2	13.3	14.5	14.8	11.9	11.5	15.6	21.3	15.9	14.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: INSTAT data, EBC89; ELIM2006.



Based on previous studies, Malian food balance sheets are based on an estimated per capita cereal consumption of 214 kg/person/year, with 70% of this amount being supplied by coarse grains and the remainder by rice. As might be expected, the composition of cereal consumption varies spatially. Table 2 presents expenditure shares by all food products and region in 2006. Rice occupies a higher proportion of cereal expenditures in the northern regions, while maize and sorghum represent a higher proportion in the south and west of the country. After cereals, meats and poultry account for next largest food budget share on a national level, followed by fruits and vegetables, sugar, pulses, and fish.

**Table 3. Food expenditure shares in urban and rural areas by food product in 1989 and 2006**

Product	1989		2006	
	Urban	Rural	Urban	Rural
Sorghum	5.4	11.4	3.2	7.6
Rice	16.0	9.2	20.3	17.3
Millet	6.4	17.8	6.7	15.6
Maize	1.6	4.2	2.6	4.9
Wheat	1.9	0.5	0.3	0.2
Roots and tubers	1.7	0.9	3.0	1.0
Fruits and vegetables	12.8	11.6	5.8	8.2
Pulses	4.7	8.5	8.4	4.4
Fats and oils	4.4	2.7	4.9	3.8
Meat and Poultry	15.1	6.9	13.0	7.5
Fish	6.0	5.6	5.3	5.5
Milk Products and Eggs	3.1	3.3	4.5	4.0
Sugar and Sugar Products	5.0	2.3	6.4	6.3
Other Foods	15.9	15.0	15.6	13.7
Total	100%	100%	100%	100%

Source: INSTAT data ; EBC89; ELIM2006

Although cereal consumption per head has increased only slightly over the past decade (no small accomplishment given Mali's very high population growth rate), there have been important shifts in the aggregate cereal consumption mix driven by both rapid urbanization and changing rural consumption preferences. Table 3 presents data on expenditure shares by product for urban and rural areas, and how these have shifted over a 15 year period. The total share of food expenditures allocated to cereals does not appear to have changed significantly over the 15-year period, at a little over 30% in urban areas and a little over 40% in rural areas. But there have been significant shifts in expenditure allocation among cereals. In both rural and urban areas, food expenditures on rice have increased, indicating that the growing importance of rice is not just an urban phenomenon. Among coarse grains, the share of expenditure on sorghum has declined in both urban and rural areas, while for maize it has increased.

To give an indication of what these changes in expenditure shares mean in quantity terms, national consumption of rice, for example, increased from 34 kg per person in 1989 to 53 kg per person in 1998 and to an estimated 57 kg per person in 2007 (USAID 2009). Average grain maize consumption increased from 13kg in 1989 to 27kg in 1994 and 43.1kg in 2001 (Diallo, 2011). Trends in per capita consumption of the major coarse grains can be approximated by per capita production estimates since exports are a small proportion of production in most years. Individual coarse grain trends can be visualized in Figure 4.

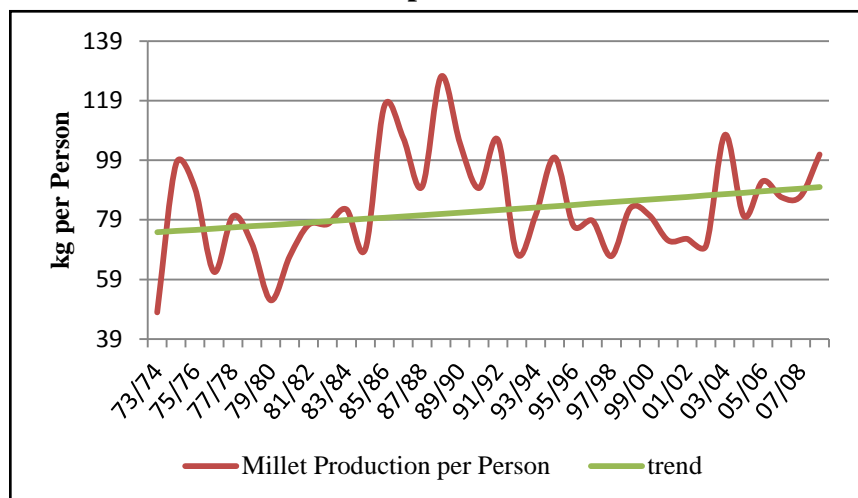
Millet, the most important coarse grain, shows a very gradual linear trend, with a high degree of inter-annual volatility. Sorghum increased rapidly from the mid-1970s to the mid-1990s, with lower levels of volatility (being grown in more humid zones than millet for the most part), but production per capita has leveled off during the past 15 years. Maize has increased at a more rapid rate than any of the coarse grains, exhibiting strong inter-annual volatility. While most maize is still consumed in the form of processed grain (flour, grits), a significant and growing share is being used for poultry and egg production (Diallo, 2011). Finally, fonio consumption per capita manifests a secular decline, as production levels have remained static despite population growth.

Although average grain consumption per capita has been increasing, Mali still has a high incidence of malnutrition. The fourth Demographic and Health survey reports that in 2006 the incidence of wasting, stunting and underweight children under 5 years of age was 13.8%, 37.9% and 24.5% respectively in rural areas, and 12%, 24% and 25% respectively in urban areas. While malnutrition is found in all regions of Mali, the regions of Timbuktu and Sikasso have higher than average levels for all three indicators, while the region of Kidal has high levels of wasting. For a detailed analysis of nutrition indicators see Ward (2010).

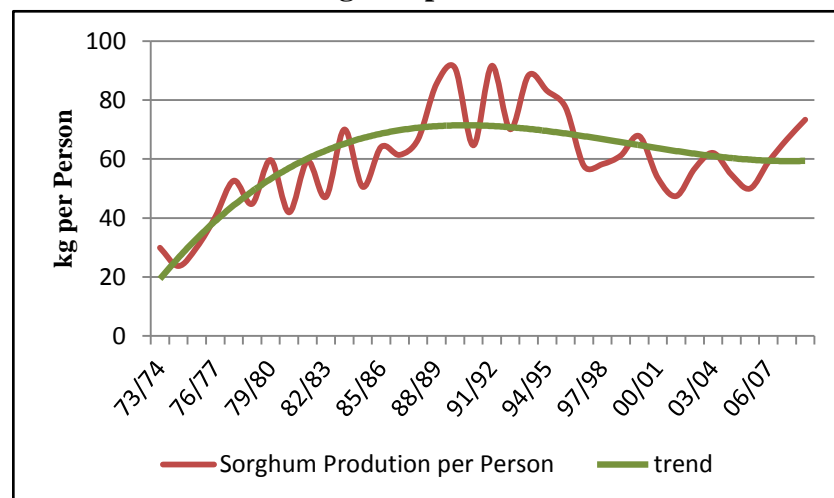
What lies behind the apparent paradox of increasing average cereal consumption per capita and persistent high levels of calorie-protein malnutrition, as indicated by stunting, wasting and underweight children? The distribution of household income, including own-produced cereals, indicates that a high proportion of poor households, even in rural areas, are net buyers. They often buy cereals during the lean season when prices are high. In addition to intra-seasonal price variations that limit cereal consumption by net buyer households, there is significant variation in production of rainfed cereals between years. In years of short supply, prices tend to be higher at the same time as net buyer households need to procure a larger share of their cereal consumption. The additional share of household budgets that must be devoted to cereal purchases inevitably comes at the expense of both quantity and quality of diet as dietary diversity is reduced, as well as expenditures on health and children's education (Camara 2004). Hence another contributing factor to the paradox is that diet quality as well as quantity matter for malnutrition. Low intakes of key micronutrients because of a lack of diet diversity (fruits, vegetables, etc.) can lead to poor health, which reduces the ability of the body to absorb calories. As a result, individuals (especially children) may display signs not only of micronutrient deficiencies but also calorie-protein malnutrition, as manifested in stunting and wasting. Thus, efforts to stabilize rainfed cereal production are important to improved nutrition, as are farm and non-farm cash income sources for net buyer households (in both rural and urban areas) to enable them to buy adequate quantities of cereals and non-cereal foods year round.

**Figure 4. Grain production per person, Mali 1973 - 2009**

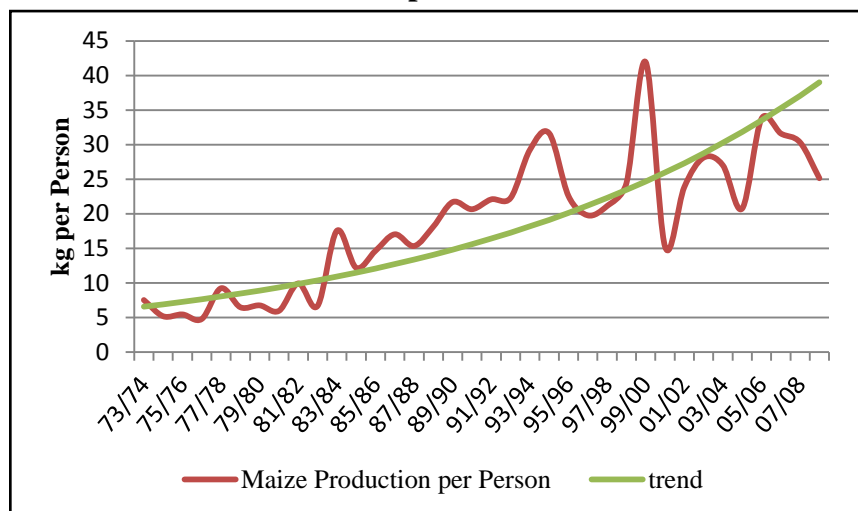
**Millet per Person**



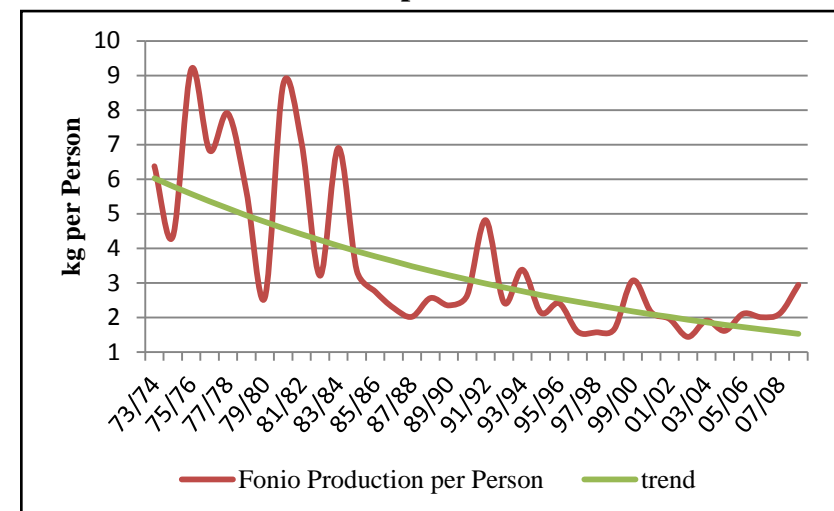
**Sorghum per Person**



**Maize per Person**



**Fonio per Person**



Source: INSTAT production data;

## 2.3. Mali's Comparative Advantages and Possible Future Growth Paths

While a detailed analysis of Mali's comparative advantages vis à vis its neighbors is beyond the scope of this study, it is clear that the country is endowed with resources that give it the potential to excel in certain agricultural and rural activities. The strategies Mali develops to exploit these resources will determine how fast the agrifood system grows and who will benefit from that growth. This section briefly discusses Mali's comparative advantages and disadvantages and then outlines three possible scenarios for future agricultural growth in the country.

### 2.3.1. *Mali's Comparative Advantages and Disadvantages*

Mali's comparative advantages derive from the evolving nature of the national, regional, and international demand for agricultural products and from Mali's endowment of key resources and the institutional rules governing their exploitation.

The rapidly growing and increasingly urbanized population in Mali and the broader West Africa subregion is leading to burgeoning demand for agricultural products, offering Malian agriculture strong market prospects. With even modest per capita income growth, demand for livestock products (and hence feedgrains), horticultural products, and more processed agricultural products can be expected to grow rapidly. For bulky products, such as staples, Mali's landlocked position and high overland transport costs gives it some natural protection against overseas competition both in its domestic markets and in those portions of neighboring countries that are not near the coast.

What resources can Mali exploit to respond to these growing demand opportunities? Among Mali's key resources that offer it comparative advantages in certain value chains are the following:

- A rural population responsive to economic incentives. Malian farmers have shown in the past that they respond to market incentives when major supply constraints are removed. Examples include rice yield response in Office du Niger after the rice marketing reforms, the growth of potato exports to Ivory Coast following the FCFA devaluation in 1995, and the cotton supply collapse when prices fell well below production cost. Major supply constraints that limit Malian farmers' productivity include a short cropping season (meaning that they are underemployed part of the year), a degrading natural resource base, weak technology transfer systems, low levels of education, and inadequate health care. If these constraints can be relieved, supply response will be forthcoming to take advantage of evolving markets opportunities.
- The Niger River and its interior delta give Mali the greatest potential of the Sahelian countries for irrigated agriculture—for rice and increasingly for horticultural products—as well as for dry-season grazing for ruminant livestock and an extensive inland fisheries subsector. Mali has a strong comparative advantage in ruminant production relative to the countries along the humid West African coast, such as Côte d'Ivoire and Ghana, due to a lower incidence of livestock diseases, particularly trypanosomiasis. It also has more extensive inland fisheries resources than any of its neighbors. How well Mali exploits the potential of the Niger and its interior delta in the future will depend on the rules (and enforcement of those rules) governing access to

land and water in the delta and between users in the delta and other upstream and downstream users (including those outside of Mali) of the river's water. As detailed later in this report, demand for land and water in the area has increased sharply and is increasingly subject to disputes.

- A semi-arid climate that is suitable for production of millet and sorghum and, in slightly higher rainfall areas, maize. These crops are tradable within the West Africa region, and Mali is well-placed to respond to export demand for them in Senegal, Côte d'Ivoire, and Niger.
- Historically, Mali has enjoyed a comparative advantage in producing cotton, having for many years been West Africa's leading exporter and earning a premium for the quality of its hand-picked crop. As outlined in section 3.1, this value chain has been in crisis for several years and is in the midst of restructuring. How competitive Mali will be in the future will depend heavily on the institutional structure that emerges from this restructuring.
- Since the 1994 devaluation of the CFA franc, Mali has also been very competitive in the West African regional market for certain horticultural products, such as potatoes and onions, and a broader array of horticultural products for domestic consumption, as Malians increasingly diversify their diets. Mali has also had success in exporting mangoes to the international market. (See section 3.8.) Mali's capacity to exploit its comparative advantages in the future for these perishable products will depend very much on marketing costs, requiring improvements in infrastructure, strengthening quality control, and continuing to improve the general "ease of doing business."
- Given Mali's large structural deficit in edible oils, it is likely that Mali has scope for significant expansion of oilseed production for import substitution, particularly if problems of aflatoxin contamination in peanuts can be addressed (see section 3.7).
- Mali also has extraordinary, unique rural tourism resources, which, while not strictly agriculture can have, as explained in section 3.12, strong linkages to agriculture and rural development.

Mali also faces certain comparative disadvantages relative to its neighbors and to international competitors, which are particularly constraining as Mali attempts to exploit more of the higher-value-added, off-farm portions of its agricultural value chains and more technologically sophisticated farm-level production strategies:

- A short growing season for rainfed agriculture means that farming fully occupies the rural labor force only part of the year. Even in irrigated systems, double and triple cropping (common in Asia) is very rare—due largely to problems of water availability and management in these system, driving up unit costs of production.
- As detailed in section 2.4.5, the country's low levels of education—even compared with its immediate neighbors—from basic literacy through technical/vocational education and higher education in agriculture and food sciences, slow the spread of technical innovation, lead to poorer agricultural and food policies, and raise the costs of product promotion.

- The high cost of energy in the country and its very limited availability near many main agricultural production areas strongly discourages investment in agroprocessing and rural small-scale industry.
- Some major areas with high agronomic potential in the Western part of the country along the Guinean border lack the basic feeder road infrastructure to link them to potential markets.
- In spite of improvements resulting from policy reforms in recent years, many Malians still complain of the high costs of establishing and conducting business in the country due to slow bureaucratic procedures, petty corruption, lack of transparent contract enforcement mechanisms, weakly enforced food safety and quality standards, and ambiguity about the rules one needs to follow to be “legal” in certain businesses. There is a widespread feeling that to succeed in business, one needs to know the right people in the system to get favored treatment.
- Increasing insecurity in the North that is spreading to the major tourist attractions in Mopti and Ségou is a major constraint to a thriving tourism industry.
- Ambiguous rules governing land tenure, particularly in irrigated areas and in seasonally flooded lowlands (e.g., *bas fonds*) discourage private capital from investing in on-farm improvements and lead to disputes among various claimants (e.g., herders and farmers; large agro-investors and small farmers).

All of these constraints tend to hinder Mali as it attempts to move from being just a raw materials supplier to participating in more lucrative portions of the value chain.

### 2.3.2. *Possible Scenarios of Future Growth*

Since the mid-1990s, the government of Mali has moved agricultural and rural development higher on its political agenda, and President Touré has made increased food security, and the transformation of Mali into a regional agricultural powerhouse, central elements of the stated objectives of his administration. Mali has been heavily engaged in the NEPAD/Comprehensive Africa Agriculture Development Program (CAADP), which aims to move Mali’s agricultural strategy from a project-by-project approach to a sector-wide approach and to coordinate national strategy with that of the broader ECOWAS region. This increased focus on agricultural and rural development by the Malian government has been matched by renewed support to these efforts from Mali’s technical and financial partners in recent years. How the rhetoric of this renewed commitment to Malian agricultural and rural development gets translated into practice will determine how rapidly Mali’s agrifood system will grow and who will benefit from that process. At least three paths are possible: a protectionist path, a latifundia-minifundia path, and a commercial/family farm path.

*A Protectionist Path.* Given the food crises of 2007/08 and 2010/11, the Malian government, with support of most of its development partners, has launched a number of initiatives to stimulate domestic agricultural production and to cut food prices to consumers. These initiatives have involved, among other things, attempts to reduce prices to consumers through tax exonerations on imported food, to negotiate (with little success) price ceilings with merchants and farmers, and to restrict cereal exports; and heavy subsidies on agricultural inputs

and equipment. While such subsidies may palliate short-term crises, they are fiscally very costly to maintain in the long run. The trade bans also discourage private investment in production and marketing. A key problem with the tax exonerations are that they are generalized subsidies covering all consumers purchasing the imported products, and hence have a high cost, in contrast to safety nets that are targeted to the most needy. In addition, by holding down product prices to domestic producers, they reduce domestic production incentives for Malian farmers.

Input subsidies to farmers may help reduce risk, offset lower product prices due to import subsidies and trade restrictions, and induce adoption of new, more purchased-input-dependent technologies that reduce unit costs of production. But they can also induce farmers simply to expand production, at higher marginal costs to the country as a whole, using existing technologies or to substitute fertilizer for less economically costly ways of enhancing soil fertility through natural resource management (NRM) techniques such as composting and improved soil and water conservation. In reality, fertilizer use may be highly complementary to NRM practices, so if the subsidies were more carefully targeted to farmers using these techniques, they could be more effective. More generally, unless subsidies are carefully targeted to areas where improved, cost-reducing technologies are available and to farmers who are ready to use those technologies, the subsidies simply represent a transfer of income within the country from taxpayers (or donors) to farmers without addressing the underlying need to increase productivity and reduce unit costs of production. Indeed, there is often a tendency for the least efficient farmers (or farmers operating in the regions with the highest costs of production) to argue for the highest subsidies, which, if acceded to, leads to a very inefficient geographical distribution of production. With porous borders, subsidized inputs often are also exported, with the net effect that Malian taxpayers end up subsidizing farmers in neighboring countries. Subsidies on labor-displacing capital equipment such as large tractors and harvesters raise the risk that there will be a substitution of expensive (to the country) machinery for relatively cheap rural labor, thus limiting the creation of badly needed jobs.

Another fundamental problem with subsidies and the import tax exonerations is that they must be financed by some other sector of the economy. High-income countries that have industrial and service sectors that generate most of their GDP and employ most of their workers, can “afford” heavy subsidies to their relatively small number of farmers, however foolish such subsidies are from an economic point of view. For a strongly agrarian country like Mali, generalized input subsidies for all farmers and all regions and generalized subsidies for all consumers are not sustainable. Rather, the input subsidies need to be targeted to higher potential areas where a quick supply response is more likely, and consumer subsidies need to be targeted to the most in need. Also, targeting the input subsidies as a complementary measure for those farmers adopting NRM policies can be a win-win option in southern and western Mali as well as in portions of the Office du Niger. The resources that go into subsidies have high opportunity cost—for example in foregone investments in health, education, and expansion of other sectors of the economy. The danger is that once generalized subsidies to consumers and farmers are in place, they become very difficult to remove politically, as consumer and farmer organizations lobby for their continuation, perhaps under the banner of protecting Mali’s “food sovereignty.” Given Mali’s vibrant civil society, such groups cannot be ignored by politicians.

The net result of following this path of generalized subsidies would be a high-cost agriculture, focused mainly on serving the domestic market, lacking economic competitiveness in regional

and international markets, and facing recurrent problems of how to finance the subsidies and to deal with the outflow of subsidized products and inputs to neighboring countries. While some input subsidies will remain for a long time, they need to be much more targeted to ensure fiscal sustainability and a high return on the resources invested in them.

*A Latifundia-Minifundia Path.*

Mali's renewed commitment to agricultural development and a series of reforms described later in this report that have facilitated private investment in the economy have led to an important influx of private Malian and foreign investment into the agrifood sector, particularly in the last five years. This investment has involved:

- Foreign governments investing in land development in Mali in order to seek secure sources of food in light of the disruptions of international food markets (including export bans) that accompanied the 2007/08 world food crisis. Examples of this type of investment include that of the Libyan government in the 100,000 ha Malibya irrigation expansion in the *Office du Niger* (ON) and the opening of 10,000 ha in the ON to investors from the West Africa Economic and Monetary Union (WAEMU).
- Foreign and Malian joint ventures aimed at meeting growing domestic and regional demand for currently imported goods, such as the 14,000 ha Illovo sugar complex near Markala (see section 3.9).
- Private Malian agro-processors integrating backward into farm-level production in order to ensure adequate throughput to their newly installed or expanded processing facilities, targeted primarily at serving the domestic market. Examples include the acquisition of land near Macina by the Tomota Group to supply oilseeds to its HUICOMA processing plants (see section 3.7) and the GDCM-SA's acquisition of land in the ON for wheat, rice, maize and potato production (see sections 3.2.3 and 3.2.7).

These investors bring much-needed capital and technology to Malian agriculture. But if not guided with an appropriate policy environment, there is a danger that they could lead to a structure of a few very large-scale, mechanized farms—particularly in the higher-productivity irrigated areas—surrounded by a mass of small, subsistence farms populated by poor farm laborers—similar to the latifundia/minifundia structure of agriculture that characterized many Latin American countries in the 1960s-80s. The shortcomings of such a model for Mali's future development are the following:

- The large-farm approach often focuses on agriculture primarily as a source of supply of food and fiber but pays little attention to its equally important role as a generator of income and employment for the country's burgeoning labor force. Often, employment on large-scale farms in low-income countries involves primarily low-skilled, low-paying jobs. When such a farm structure is combined with subsidies for farm equipment, labor-saving equipment often displaces workers—a situation sometimes favored by the managers of the large farms, as it reduces the problems associated with managing a large labor force.
- In the context of insecure land-tenure rights, the acquisition of land for such large enterprises is often contentious, leading to the risk of dispossessing those currently



cultivating the land and raising charges of land-grabbing. As discussed later in this report, some of the large land acquisitions mentioned above have experienced these problems. The political costs of such disruption and the loss of indigenous rights can be substantial.

- The presence of the large enterprises on the tax base for local government and on local politics can be problematic. In principle, major investments in a commune or cercle should increase the tax base, providing for the provision of greater local services. But experience from around the world suggests that a single dominant enterprise in a locality can come to dominate local politics, skew local regulations its favor, and minimize its tax burden.
- The income that accrues from farming in this model is very concentrated, and the resulting consumption linkages that derive from the re-spending of that income tend to be weak in the local economy, as the high-income owners of the large farms consume mainly goods produced in urban areas or overseas. To the extent that farming is integrated with agricultural processing, however, there is some potential for job creation in the processing industries.
- In its more extreme versions, the latifundia/minifundia model leads to a highly bifurcated agriculture, with very little transfer of technology between the large and small farms. The large farms are oriented towards a market outside of their home locality and many of the growth linkages from the large enterprises are generated either in other parts of the country or overseas, particularly if the farms rely on large amounts of imported farm equipment and inputs.

We are not arguing that large farms have no future in Malian agriculture. It is clear that over time average farm size will need to grow and that many small farmers will not be able to “farm themselves out of poverty” (Staatz and Dembélé, 2007). The most efficient size of farm will vary by region and product produced, and this size will vary over time. The key point is that “modern agriculture” is not necessarily synonymous with large-scale, highly mechanized farming, especially in a context of abundant labor resources. A recent World Bank study (World Bank 2009b) points out that except areas of labor scarcity, large-scale mechanized farming in Sub-Saharan Africa has usually been less economically efficient than smaller family farms, and the study argues that smaller, commercially-oriented family farms offer stronger possibilities for both growth of output and employment than a large-farm approach such as that followed in Northeastern Brazil.

The end result of focusing primarily on large mechanized farms as the main engine of Malian agricultural growth is likely to be a rapid growth in output, but accompanied by increasing social stratification, limited poverty alleviation, political strife, and subsequent pressures for land reform.

*A Commercial/Family Farm Path.* A path combining some larger-scale commercial farms with modernizing smaller- and medium-scale family farms is consistent with the vision laid out in Mali’s *Loi d’Orientation Agricole* (see section 2.5.3) and offers the strongest options for combining growth and poverty alleviation. It is, however, probably the most difficult of the three paths for Mali to achieve. The model involves improving the market access to

smallholders, improving the functioning of land, labor, and rural financial markets so that more successful farm enterprises can grow and that those leaving farming can obtain the skills to find employment elsewhere in the economy (including on the larger-scale commercial farms and in off-farm parts of the agricultural value chains); linking larger farms and processing enterprises to smaller farms through subcontracting and outgrower schemes as has been done, for example, in horticultural and sugar production in Kenya; and strengthening the human capital involved in farming, processing, and marketing through improvement in education at all levels, from basic literacy to agricultural higher education. The system does not eschew some large farms, but links them with smaller farms through various outgrower and subcontracting systems so that the larger farms serve an agricultural extension, quality-control, and marketing function as well as undertaking farm-level production. Such a system has the advantages of generating a broader distribution of income that may generate stronger local growth linkages (although further research is needed on the strength of such linkages in Mali), strengthening the tax base of local governments, and generating remunerative employment in farming and agribusiness for the growing labor force.

For such a system to succeed, however, requires a strong enabling environment, including transparent policies governing land tenure and financial markets, contract enforcement, support to local governments, and investments in education throughout the system. In short, this approach requires attention not only to value-chain-specific investments, but also investments in many of the cross-cutting issues discussed in section 0 of this report. Such an approach has the potential to help Mali achieve the vision laid out in the *Loi d'Orientation Agricole*, of a vibrant, poverty-reducing, efficient agriculture. Subsequent sections of this report address the challenges that need to be addressed in order to translate this vision into reality.

## **2.4. Major Determining Forces**

### *2.4.1. Demographic Changes and the Challenge of Employment Generation*

The Malian government estimates the current population growth rate at 3.6% per year, which is one of the fastest growth rates in the world. Estimated to have a total population of 14.5 million in 2009, one in three of whom live in urban areas, projections of total population growth range from more than doubling by 2035 to as much as trebling (to 33.9 million) depending on assumptions about the fertility rate (World Bank, 2010c). The high population growth rate in Mali is due to a rapid decrease in infant mortality and increases in life expectancy in the general population that have not been accompanied yet by a demographic transition to lower birth rates. Only 7% of women use a modern method of contraception. Urban population growth rates are even higher due to outmigration from rural areas.

The urban population growth rate, at 4.8% in 2005, is much higher still than the national growth rate (World Bank, 2010c). By 2035 the rural and urban shares of the population will be approximately equal. Estimated to have 1.5 million inhabitants in 2007, the population of Bamako is expected to more than double to 3.2 million inhabitants by as early as 2025.

Due to the wide base of the age pyramid (with half the population under the age of 15), population growth rates of this scale will place unprecedented demands on education and health budgets, on the food system and the need to generate productive employment. Agriculture and

the broader food system will thus face an immense challenge over the next 20 years to create the jobs, the food, and the resources to finance the education and social services required by the burgeoning population.

The task of generating productive employment for Malian youth, given the high population growth rate and levels of unemployment and underemployment, looms large and is one of the fundamental challenges Mali must face if it is to remain politically stable. Agriculture and related value chains must make major contributions to addressing this challenge, but doing so will require the following (discussed in more detail later in this report):

- Farming must be transformed from what is widely perceived of as a “hand-hoe path to poverty” into a more commercial venture that offers Malian youth the opportunity to achieve an attractive income. Many discussions of the authors over the years with Malian farmers indicate that most do not want their children to continue in farming, as they do not see farming as a pathway out of poverty. Transforming farming to a business as well as a way of life will require a whole series of technological and institutional changes discussed in more detail below in this report.
- This transformation of agriculture is unlikely to absorb large numbers of youth if a large-scale, highly mechanized model of farming is pursued. A recent World Bank study (World Bank 2009b) argues that such large-scale approaches in Guinea-Savanna areas of Africa (which include much of Mali’s agricultural zones) are less desirable from an employment-generation and growth perspective than smaller family farms. Subsidizing labor-displacing capital equipment (e.g., tractors and combines) tends to encourage such large-scale approaches and should be avoided. The issue of farm size is also intimately linked to questions of land tenure, discussed later in this report.
- The capacity for labor absorption in farming is greater in the higher rainfall areas (roughly, those areas below the 15<sup>th</sup> parallel). Demographic pressures and combined with environmental degradation and more erratic weather associated with climate change will likely lead to increased outflows of labor from more ecologically fragile areas in the north. Unless employment opportunities are created, either on-farm or in off-farm parts of the value chains for these migrants, such flows are likely to lead to increased land disputes in the south and continued growth of urban slums. While investments to help stabilize the natural resource base in northern areas and improve livestock production resources may help to slow this migration and hold some potential migrants in their home areas (giving them or their children time to develop other skills to help them in the labor market), the scope for greatly expanded, productive employment in agriculture in these areas is limited.
- Off-farm portions of agricultural value chains (marketing, processing, input provision) have the potential to absorb a substantial number of employees, but only if such downstream activities are profitable. Ensuring the profitability of these enterprises will require addressing the high cost of energy in Mali relative to its neighbors, continuing to pursue regulatory reforms such as those championed by the USAID/Mali-World Bank-supported Investment Climate Advisory Services (ICAS) project, and improving quality control throughout the value chain through promotion of improved grades and standards and actions of interprofessional organizations that bring together actors from throughout the value chain.

- Improving education is fundamental to expanding productive employment throughout agricultural value chains in Mali. Such improvements will require strengthened basic education to ensure the literacy and numeracy needed to learn improved production and marketing practices efficiently (Mali's adult literacy rate is the lowest in the world), greatly improved technical and vocational education to produce the skilled mid-level technicians required by a more modern and commercial agriculture and related value chains, and improved higher education in agriculture.

#### 2.4.2. *Economic and Political Changes in the Sub-Region; Economic Integration*

Mali preceded most of its neighbors with economic reform in the 1980s and 90s, but now most countries in West Africa have much more open trade and marketing regimes than in the 1990s, in spite of the persistence of non-tariff trade barriers. For example, grain wholesalers from neighboring countries are now regularly present in many Malian markets at harvest, sourcing grain directly from Malian assemblers and farmers. This regional market integration has opened new or expanded outlets for Malian agricultural products (e.g., expanded livestock shipments to Senegal and Guinea and greater cereals exports to Côte d'Ivoire, Niger and Nigeria), thus offering new potential sources of income for Malian farmers and traders.

The increased regional integration, however, has also posed challenges to both the Malian government and to its development partners. One challenge is to develop policies to protect low-income Malian consumers from high food prices and still not interfere with regional trade; a second is to develop appropriate tools for food security planning in the context of an open economy. For example:

- Many policy makers still implicitly think in terms of a closed economy, where good harvests in Mali should inevitably lead to lower consumer prices. This is no longer the case in a regionally integrated market, where shortfalls in nearby markets (particularly in Nigeria, which accounts for over 50% of all West African cereal production) can lead to a large export demand, boosting domestic prices. Cereal balance sheets, the traditional tools for assessing "surplus" or "deficit" positions of countries in the Sahel, typically capture regional trade very poorly, as they are done on a country-by-country basis without reference to relative prices, and hence induced trade flows.
- Agricultural subsidy policies become very costly in the presence of porous borders. Input subsidies, given with the aim of reducing domestic (financial) costs of production and hence lowering consumer prices, can result in inputs flowing to neighboring countries when prices in those countries are higher. Even if the subsidized inputs are used in Mali, there is no guarantee that the resulting lower financial costs of production will lead to lower prices for Malian consumers. Given porous borders, output will flow to neighboring countries if output prices in those countries are higher than those in Mali. The 2009 experience with the *Initiative Riz* illustrates this phenomenon. These outflows often leaves national authorities frustrated, as they had intended that the input subsidies would contribute to lower consumer prices. As a result, national authorities have (as in the 2009 case of the *Initiative Riz*) pursued two counter-measures, neither of which is easy to enforce: (a) attempting to negotiate agreements with farmers who have received the subsidies to sell their output at below-market rates

or (b) restricting exports, in contravention of Mali's treaty obligations under ECOWAS and WAEMU.

- There is an ongoing fear, not entirely unjustified, that during periods of peak regional demand, low-income Malian consumers will be priced out of the market, as Malian cereals and animal products are exported to meet the demands of richer consumers in neighboring countries who are willing to pay more for them.
- The more integrated regional markets become, the more economic and political shocks in neighboring countries will spill over to Mali, as is currently the case with the Ivorian crisis. This is particularly a concern in a landlocked country like Mali, whose access to world markets depends on the stability of neighboring countries (e.g., Côte d'Ivoire, Guinea, Senegal and Mauritania) that have the main ports on which Mali relies.

Designing effective food policies in this more open-economy setting requires strong analytic skills and good information not only on national agricultural markets, but on regional and world markets and how these different markets interact as well. One particularly important missing piece of information is grain inventory levels in private hands, including at the level of farmers, local communities, and traders. There is also a lack of reliable information on agricultural trade flows between Mali and the regional market.

ECOWAS has a mandate to promote economic integration in the West African sub-region, and the ECOWAS agricultural policy, known as ECOWAP, aims to do this for the agricultural sector. ECOWAP is synonymous with the regional CAADP plan, which was endorsed in Abuja in November 2009 by heads of state, development partners (including the US), and representatives of the private sector and civil society. The plan puts major emphasis on joint action across member states to promote key value chains (including maize, rice, roots and tubers, and animal products), improve the overall policy environment for agricultural growth and trade within the region, and develop innovative tools to deal with food social safety nets for both urban and rural areas as well as improved tools for food crisis prevention and mitigation (ECOWAS, 2010).

#### *2.4.3. Climate Risk and Climate Change*

Mali's climate is characterized by high spatial and temporal rainfall variability. High evapotranspiration rates mean that soil moisture is a key constraint for both rangeland productivity and rainfed crop production. Since the majority of Mali's cultivated area is rainfed, notably coarse grain production, rainfall variability can create significant and unpredictable shifts in grain availability and price. Climate change will be an increasingly important factor in the future, as areas at the interface between arid and humid zones will be the most seriously affected. Strategies to enable adaptation to climate change for crop and livestock sectors are discussed in section 4.4.

#### *2.4.4. Disease Environment (malaria, HIV)*

Malian households are exposed to a wide range of life-threatening and debilitating diseases, many of which interact with food utilization to aggravate malnutrition. Infant mortality is considerably higher in Mali than for Sub-Saharan Africa as a whole, at 118 deaths per 1000 live

births. Although accurate statistics on the frequency of occurrence are difficult to come by, the main diseases affecting young children are well known: gastro-intestinal infections, resulting in diarrhea and frequent cholera epidemics, and malaria. Despite significant progress in regard to water access and sanitation improvement still only 35% of the rural population have access to drinking water in 2007 (World Bank, 2010). The incidence of HIV/AIDS is relatively low in Mali, although rapid urbanization and improved transport links are increasing the potential for transmission, as is the return of immigrants fleeing unrest in Côte d'Ivoire, where the HIV incidence is much higher.

#### 2.4.5. *Mali's Educational Crisis*

Developing a vibrant agriculture requires an educated workforce at many different levels—literate farmers who can access written material on recommended agricultural technologies and practices; skilled mechanics and technicians to operate and repair equipment; agro-entrepreneurs who can effectively market agricultural products and inputs; and researchers and policy analysts to create the technological and policy environment for agriculture to flourish. Mali's educational system is currently ill-suited to produce such a workforce. Although access to primary education has expanded hugely over the past 20 years, from a gross primary school attendance rate of 28% in 1990 to 80% in 2008 (World Bank 2010a; World Bank 2010b), the system faces several challenges (World Bank 2010b; République du Mali, 2010; Pearce et al. 2009):

- Demographic pressure on the system is such that the population between 7-15 years of age will increase by 43% between 2008 and 2020, requiring a doubling in the intake capacity of the already strained primary education system if the goal of universal primary education is to be achieved.
- Even with the increase in enrollment, and special efforts made to improve girls' access to education, a gender imbalance remains, and girls make up 60% of the primary-school aged children who do not attend school.
- Quality is a huge concern at all levels of the system:
  - At the primary school level, the average class size in state primary schools is 64 students, and low teacher salaries at the primary and secondary level discourage talented young people from entering the profession;
  - Fewer than half of Malian teachers have received training in teaching techniques (Pearce et al. 2009), and over half the children in primary school test below grade level in major subjects. There are frequent allegations of corruption in the system (e.g., grades being sold), leading to serious concerns about quality control;
  - Completion rates remain low even for primary education. In primary schools, only 56% of students complete the cycle (48% for girls and 65% for boys), and only 43% of those entering lower-secondary education (through grade 9) complete the cycle (République du Mali 2010a; World Bank 2010b);
  - The net result of the poor quality of primary education is that as of 2006, only 26% of adult Malians could read or write—the lowest adult literacy rate in the world. Among young adults, aged 15-24, the overall rate was 39%--31% for women 47% for men World Bank, 2010a, Pearce et al. 2009). This very low

literacy rate slows economic growth, as new technologies and institutional arrangements have to be diffused largely through oral communication rather than in written form.

- At higher levels of education, many more young people want to pursue school than the system is designed to accommodate. In addition, there is a large mismatch between the skills taught by the higher education system and the demands of the labor market. For example, in 2008, only about 60,000 students were enrolled in technical and vocational education throughout the country, while enrollment in the University of Bamako was over 70,000 and growing by approximately 20% per year. Yet the expanding Malian economy (including agribusiness) has need for a large number of skilled technicians, while only 41% of graduates from the tertiary education system obtain modern-sector employment because their skills do not match those demanded by employers.
- The university system has also been plagued over the past 10 years by frequent strikes of faculty and students, disrupting students' progress and reducing the overall quality of university education. The university system, still predominantly public, is highly dependent on public funding; students and their parents pay a smaller percentage of university students' costs of education (10%) than do parents of students in primary school (20%). This model of funding is not likely to be economically sustainable.
- Ironically, for a country that is still predominantly rural and for which agriculture plays a central role in the economy, Mali's only university-level faculty of agriculture – the *Institut Polytechnique Rural et de Recherche Appliqué (IPR/IFRA) de Katibougou*, has seen falling enrollments over the past 20 years—from a high of around 5000 students in the 1990s to around 600 in 2008. In part, this decline reflects a perception among potential students that agriculture is not a promising career (this perception seems to be changing in the last few years) and that the training at IPR/IFRA does not line up with the demands of the job market—particularly the need for a more private-sector, business orientation. Like much of the public university system in Mali, IPR/IFRA's curriculum historically trained students to work in the public sector.

Most of the challenges discussed above apply to the public education system. Private-sector educational institutions are present at different levels of educational system (primary, secondary, technical, and higher), and they often offer higher quality services than in the public sector. However, the private sector system is also highly differentiated, where the higher the quality, the higher the fees. The high fees of the better schools exclude the majority of Malians from accessing an education of acceptable quality. In addition, training abroad is also a component of the higher education system, with the Government of Mali offering “scholarships of excellence” to the outstanding students to study abroad and train as professors if they commit to return to Mali to become leaders in the university system.

In part to deal with the problems of the current university system, in March, 2009, the government of Mali officially endorsed creation of the University of Ségou, which began implementation in 2010. The aims of this new public university are to decentralize university education in Mali (relieving pressure on the University of Bamako) and to test a new model of University education and governance, with much greater administrative autonomy, greater reliance on own-generated funds, greater selectivity in admission, a curriculum more closely

attuned to the needs of the Malian labor market, opening recruitment of faculty to non-Malians, and more links with Mali's small, fledgling private universities. Because the university will be located near the Office du Niger, it is anticipated that the school will try to develop strong programs in agriculture and agribusiness, most likely in collaboration with IPR/IFRA de Katibougou.

#### 2.4.6. *Gender Equity*

Evidence of gender equity in Mali shows some positive changes over the last 20 years. Nonetheless, Mali ranks very low on most indices of gender equity. The Global Gender Gap Index<sup>1</sup> ranks Mali 127th out of 134 countries. The Social Institutions and Gender Index<sup>2</sup> (SIGI), ranks Mali 99th out of 102. Mali's Gender Development Index<sup>3</sup> (GDI) value is 0.353, which is 95.1% of its Human Development Index<sup>4</sup> (HDI) value (0.371). The greater the gender disparity in basic human development, the lower is a country's GDI relative to its HDI. Out of 155 countries with both HDI and GDI values, 149 countries have a better ratio than Mali.

Women and youth have been identified as the most vulnerable of Mali's population (Feed the Future, 2010). Socio-cultural factors still weigh on the status of women, however, contributing to disparities in the areas of health, education, productive resources, public decision-making, governance, employment and housework, thus limiting their capacities to participate in the socio-economic life of the community. Furthermore, the experiences of women vary by household type (female or male headed) and with the rank of a woman in a male-headed polygamous household. A wife's rank (1st, 2<sup>nd</sup>, 3<sup>rd</sup>, etc.) in a polygamous marriage is an important determinant of her status and has implications for her ability to earn income and own productive resources. McGlinchy (2006) showed that among Malian women covered by a study of agricultural-nutrition linkages in three areas of rural Mali (CMDT zone, Office du Niger zone, and the Bandiagara plateau) there is a negative relationship between wife order and access to resources. For youth, the scarcity of educational and employment opportunities leaves young Malians with difficult choices about their future and their role in their communities. Limited opportunities in Mali's rural areas and the low returns to agriculture cause young people to migrate to urban areas and to destinations outside of Mali in search of non-agricultural employment (ILO, 2007).

Mali has signed a series of national and international laws favoring non-discrimination of all citizens and promoting the status of women overall. The Mali Constitution of the Third Republic of 1992 stipulates same rights for women and men. In 1993, a "Commissionership for the Promotion of Women" was placed under the authority of the Prime Minister. In 1997, the Ministry of the Promotion of the Woman, the Child and the Family (MPWCF) was created with main objective to create a national policy for the promotion of the woman, the child and the family. Due to weak leadership and shortage of money, however, MPWCF has not been able to

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<sup>1</sup> Measures the relative position of women to men in terms of outcomes in economic participation and opportunity, educational attainment, political empowerment, and health and survival

<sup>2</sup> Based on measures of gender inequality in five areas: the family code, physical integrity, son preference, civil liberties, and ownership rights

<sup>3</sup> Measures achievement in the same dimension as HDI except that it captures inequalities between men and women

<sup>4</sup> provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and gross enrollment in education) and having a decent standard of living (measured by purchasing power parity, income)



achieve many of its goals. The Convention on the Elimination of All forms of Discrimination against Women (CEDAW) was ratified by Mali in 1986. However, the government has had difficulty incorporating its provisions into domestic law. Mali also ratified the Optional Protocol to CEDAW in 2000 and the Protocol to the Africa Charter on Human and People's rights on the Rights of Women in Africa (the Maputo Protocol) in 2005, but the provisions of these instruments continue to be violated, and the application of these laws is still a big problem. Women's legal status is characterized by the co-existence of modern and customary law or rules, with the latter, although based on an idea of inequality between the sexes, provide the basis for some national statutory laws (Rosander, 2004). In general women are still faced with several handicaps in the economic, legal, institutional, socio-cultural and technical spheres.

In practice, women's rights are very limited in Mali, where tradition dominates daily life. Nearly all Malian women have been subjected to female genital mutilation, violence against women is widespread, and the incidence of early marriage is extremely high in spite of the legal minimum age for women to marry being 15 years. The percentage of marriages before the age of 19 is decreasing very slowly in some areas, but customary and religious laws continue to take precedence over the formal legal system. Polygamy is legal according to Mali's Marriage Code and under the teachings of Islam, the religion practiced by 90% of the population<sup>5</sup>. In the 2006 United Nations Women's Anti-Discrimination Committee meeting, the report of Mali presented by the country's Minister for Advancement of Women, Children and Family, received several questions related to the proposed amendments of the country's family code, with the speakers insisting on the need to overcome resistance to change and eliminate discriminatory provisions from the Marriage and Guardianship Code (United Nations, 2006). In July 2009, the National Assembly adopted the new Family Code, under preparation since 1996. However, following demonstrations by the country's most conservative forces, the President of the Republic sent the Code back to the National Assembly in August 2009 for a second reading, which up to now has still not occurred<sup>6</sup>. Husbands are the heads of families and the Civil Code grants them sole family and parental authority (Social Institutions & Gender Index, 2010).

Donor investment in girls' education in Mali is of relatively long duration. The Basic Education Expansion Project was initiated in 1989 as part of a larger educational reform program designed by the World Bank. A girl's schooling component began with the establishment of a committee within the Ministère de l'Éducation de Base (MEB) with representation from different MEB divisions and offices. As part of the National Directorate of Fundamental Education within the MEB, the National and regional Cells for Girls' Schooling were created in 1992. The Strategies for Advancing Girls' Education (SAGE) project funded by the Office of Women in Development at USAID was initiated in Mali in 1999 and extended until 2004. It focused on mutually reinforcing strategies to form and developing partnerships across sectors that can advance girls' education and expand the knowledge base, skills and tools that provide guidance for the SAGE programs, in particular, but also for other girls' and basic education programs and activities<sup>7</sup>. Other donors have been active in supporting girls' education. UNDP/UNESCO and UNICEF both launched girls' education initiatives in 1996. The World Bank supported the Government of Mali's development a ten-year plan that includes as an objective improving girls' access to

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<sup>5</sup> Africa for Women's rights: Mali- retrieved from [http://wikigender.org/w/index.php/Africa\\_for\\_women's\\_Rights\\_Mali](http://wikigender.org/w/index.php/Africa_for_women's_Rights_Mali)

<sup>6</sup> Source: same as in footnote 2 above.

<sup>7</sup> <http://cge.aed.org/Projects/SSAfrica/sage.cfm>

education.

There has been a significant improvement in the ratio of girls to boys in terms of school enrollment. The ratio of girls to boys in primary education rose from 68 girls per 100 boys in 1998 to 81 girls per 100 boys in 2008. United Nations (2009) notes that the progress achieved is as a consequence of the implementation of the Ten-Year Program for Development of Education,<sup>8</sup> and the support of the technical and financial partners makes it still conceivable that the objective of primary schooling for all of the children of Mali by the year 2015 can be achieved. Others attribute the progress to the genuine political will and dynamism of women's associations and NGOs. However, gender disparities still persist at all levels. The rate of illiteracy is still high among girls and women, thus affecting women's capacities, jeopardizing their productivity and limiting their access to development opportunities. While access to education is improving, the greatest impediment to achieving universal basic education remains the poor quality of education. USAID supports the Government of Mali's ten-year reform plan to improve the quality of basic education. USAID/Mali's education objective is to expand access to quality basic education with an emphasis on life-long literacy through its projects<sup>9</sup>. The Government of Mali and local communities also help to finance and implement the effort.

Women are underrepresented in all decision-making bodies, elected or appointed. However, they are better represented in appointed bodies than elected ones. In 2008, 6.4% of elected offices were held by women. There were 15 women parliamentarians out of total of 147 and 7 female mayors out of a total of 703. Compared to only 3 women ministers in 1995, as of September, 2010, out of 29 ministerial positions, 6 were occupied by women<sup>10</sup>.

There has been improvement in maternal health, with the proportion of births attended by skilled health personnel rising from 41 to 49% in the period 2001-2006. The maternal mortality rate is 575 per 100,000 live births. The fertility rate is at 6.8, and the overall contraceptive prevalence rate is 12.7% and 5% in rural area (IMF, 2008). The implementation of the Ten-Year Health and Social Development Program<sup>11</sup> 2005-2009 is noted to have brought about a significant reduction in neonatal, infant and under-five mortality as well as in maternal morbidity and mortality with considerable decline in shortcomings in nutrition and infectious diseases. HIV/AIDS is reported to be on a decline for both men and women, and the significant progress achieved in the fight against HIV/AIDS is attributed to the intensification of awareness raising activities and advocacy, free of charge antiretroviral therapy (United Nations, 2009). The gender related impacts of HIV/AIDS on rural livelihoods, in particular as it affects already existing gender-based differences in rural livelihoods in other parts of Africa, makes it a valid concern for agricultural development policies.

Gender inequalities in access to inputs and control over resources affect women's ability to fully participate and benefit from agricultural activities. Despite the importance of land as a critical resource to women's economic empowerment and to some extent their struggle for equality, land rights are still largely discriminated against women (United Nations, 2009). Malian women have legal rights to property ownership, but these rights are often restricted in practice since access to

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<sup>8</sup> In French Programme Décennal de Développement de l'Éducation (PRODEC)

<sup>9</sup> <http://www.usaid.gov/ml/en/education.html>

<sup>10</sup> <http://www.koulouba.pr.ml/spip.php?article111>

<sup>11</sup> In French Programme de Développement Sanitaire et Social - PRODESS II

land and matters of inheritance are mainly governed by customary law, which discriminates against women. The government has launched several publicly funded agricultural development projects that, theoretically, allow women to access land on the same basis as men. In practice, new investments envisaged have a proportion (typically 5-10%) that is set aside exclusively for women and youth to guarantee some access. They are eligible to compete for the remaining amount with men as well. In reality, many obstacles prevent women from exercising their rights. According to tradition, women are entitled to the less fertile land and often obtain use rights and not ownership (Social Institutions & Gender Index, 2010). Furthermore, although all of Mali's women gain access to resources with difficulty, they do not all gain access to resources with equal difficulty. A number of factors influence variation in gender rights and responsibilities—seniority confers women greater control over resources, and greater free time.

Women's access to bank loans has improved over the years. Previous limitations associated with very low incomes and women's inability to provide collateral have eased thanks to micro-credit development programs. Malian women now have access to hundreds of associations that offer mutual credit, independently managed village savings schemes and short-term loans; women comprise nearly half of the beneficiaries of these credit institutions (Social Institutions & Gender Index, 2010). In spite of the improvement, women still have less access to credit and have more difficulty taking individual loans than men although they are reputed as efficient in paying loans (United Nations, 2009).

## **2.5. Policy Context**

### *2.5.1. Mali's Overall Economic Policy Environment*

Mali is a member of the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS). WAEMU membership results in Mali sharing a common currency with eight other West African countries — the CFA franc — that has a fixed parity with the Euro. Membership in WAEMU facilitates trade within the zone and with the Euro zone, as traders do not have to deal with currency fluctuations. In contrast, fluctuating exchange rates between the CFA franc and currencies of non-WAEMU countries (such as Ghana, Guinea, Nigeria, Mauritania and Liberia) and occasional problems of non-convertibility (e.g., of the Guinean franc) hinder trade and monetary transfers with countries outside the zone. The strict rules of the Union on monetary expansion has historically limited inflation in Mali to very low levels, but at the expense of relatively high interest rates, periodic overvaluation of the currency (which discourages production of internationally tradable goods, such as many agricultural commodities), and putting monetary policy largely outside the control of national decision makers. The viability of the currency is also dependent on the economic performance of other countries in the Union (and hence is currently threatened by instability in Côte d'Ivoire, the Union's largest economy) and the willingness of the French treasury to finance the zone's foreign exchange deficits.

ECOWAS is, in principle, a free trade zone, with the ECOWAS Treaty calling for free movement of goods and people throughout the 15-country Community. Participation in such a free-trade zone offers opportunities for a country like Mali that has potential to become a major regional agricultural exporter. As described elsewhere in this report, however, non-tariff trade barriers (such as frequent road checkpoints and illicit payments to officials) hinder such trade. In

addition, as noted in section 2.3.2, the potential for staple foods from Mali to be shipped to other ECOWAS member states, many of which have per capita incomes higher than that of Mali, raises fears among Malian policy makers that low-income consumers could be hurt by such trade—leading to the occasional imposition of trade bans, despite the provisions of the ECOWAS and WAEMU Treaties.

Since the mid-1980s, Mali has moved from a domestic economic policy characterized by official state monopolies in key strategic sectors, including staple food marketing, towards a strategy much more accommodating to the private sector. The 1980s and 1990s were marked by a series of structural adjustment programs that involved dismantling most parastatals and opening trade to the private sector. A key component of this was the Cereals Market Restructuring Program (PRMC) that abolished the official grain trading monopolies of the *Office malien des produits agricoles* (OPAM) and the *Office du Niger* (ON), liberalized imports and exports, and redefined the roles of these public entities. Following the reforms, OPAM's main roles focused on managing the national security stock (and later the national intervention stock) of cereals and providing facilitating services to the private trade, such as grain stock fumigation services and market information.<sup>12</sup> The ON, which covers the largest irrigation area of the country, has moved out of rice marketing, input provision, and milling and now focuses primarily on provision of irrigation services. These reforms in the staple food value chains were paralleled with a broader opening of other sectors to the private trade, including almost all of commerce and banking, a simplification of import and export procedures, and reforms in the investment code aimed at making Mali friendlier to both domestic and private investment. Many of Mali's neighbors took similar steps beginning in the 1990s, broadening the scope for regional trade.

In agriculture, the cotton sector, which historically has been Mali's number 1 or 2 export earner, moved much more slowly towards liberalization. The *Compagnie Malienne de Développement des Textiles* (CMDT), which in the 1980s was jointly owned by the Malian government and a French government-owned multinational firm (Dagris, now called Geo-Coton), has moved in fits and starts towards privatization, with donors pushing for more rapid state divestiture and the state and farm groups resisting the change out of fear of how this will affect farmers' incomes, value-chain coordination, Mali's small cotton-processing industry, and rents various actors derive from the system (see section 3.1 for more details). In the cereals subsector, the state has also sometimes taken action to limit the flow of resources (grain, inputs) in response to market signals when it deemed that such flows would have high social costs, such as raising consumer prices to politically unacceptable level. Thus, while the overall stated economic policies of Mali are market-oriented, there remains strong concerns among policy makers (which have been reinforced since the global economic crisis of 2008-10) that "unchecked" market forces represent a potential danger. Yet the ad hoc and unpredictable nature of government actions to limit market forces creates uncertainty for the private sector, which reduces its incentives for long-term investment. Improving the predictability of government policies thus remains an important task for the Malian government. In addition, red tape has led to wide spread petty corruption in the public administration, which creates high transactions cost, specifically in the enforcement of contractual agreements through the judiciary system.

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<sup>12</sup> In 1995 this responsibility was transferred to the *Assemblée Permanente des Chambres d'Agriculture du Mali* (APCAM).

### 2.5.2. Decentralization

#### *Background and Objectives*

Since the implementation of Malian decentralization reform in 1998, in varying degrees communes have played an increasingly important role in the provision of basic public services at the local level.<sup>13</sup> Working in parallel with the new decentralized government system is the old and powerful centralized civil service structure governed by the Ministry of Territorial Administration and Local Government. The centralized civil service structure requires that a General Secretary be present in communes throughout Mali. In the long-run, the objective is for the commune-level elected leaders increasingly to take on decision-making responsibilities. In practice, however, the General Secretary still retains control, as all major decisions must be approved by the person holding that office. Perhaps this tension is to be expected...civil servants have the proper training and naturally want to retain the control their positions have historically enjoyed. In addition, many elected commune officials require extensive training to build their managerial and administrative capacities. Further, commune-level resources are very limited, particularly in light of the charge to provide a broad array of local public services. Resource constraints and governance issues continue to hamper the decentralization process.

Mali's current decentralized government includes 703 communes (each covering several villages), 49 cercles, eight regional governments, and one national government. Elected officials at the regional level also have the potential to play an important role in economic development and food security issues. One layer of government above the commune is the cercle. Prefets serve as administrators over cercles; these positions are appointed by national government officials within the Ministry of Territorial Administration. Prior to decentralization, there was also a layer of government called an Arrondissement. While Arrondissements no longer exist, the position of Sous-prefet was retained to provide administrative oversight in the former Arrondissement territories. Activities at the cercle level are overseen by Governors at the regional level of government. Again, Governors are appointed by the Minister of Territorial Administration, overseeing the regions according to instructions provided by national authorities.

In this context, the commune-level General Secretaries report to the Prefet at the cercle level. Sous-prefets also report the Prefet. In turn, Prefets report to the regional Governor. All regional Governors receive instructions from and report to the Ministry of Territorial Administration. Through this system of local and regional governments, authorities hope to provide essential public services such as education, health, and agricultural development. Despite the political will to decentralize, commune-level elected officials have very limited autonomy. Under current conditions, it appears that they can do little without the approval of nationally appointed officials at the commune, cercle, and regional levels of government. For example, commune officials do not have the authority to adjust local taxes in order to align revenue structure with the economic and political realities in a given commune. Similarly, they are unable to shift expenditures from one functional area to another due to the centralized nature of the Malian budgetary system. In practice, commune-level elected official decision-making is limited in scope.

Despite these ongoing issues, communes are well-positioned to play an increasingly important

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<sup>13</sup> For a more in depth description of Malian democratization and decentralization, see Diallo (2003), Diallo (2000) and Pringle (2006).

role in rural development initiatives. Many of the key challenges surrounding rural development converge at the commune level: agricultural development, education, land and natural resource management, health and nutrition, and food security. With ongoing capacity-building initiatives coupled with increasing levels of local autonomy, commune leaders can play a vital role in rural economic development initiatives.

Below, we offer a brief summary of the history and structure of Malian decentralization. We then discuss the challenges and opportunities, emphasizing the role of communes in rural development initiatives.

*History and Structure of Malian Decentralization.* As summarized by Diallo (2000) and Pringle (2006), in 1991 Malian citizens overthrew a 23-year single party regime, calling for the establishment of a multi-party democracy. The transitional government quickly organized a National Conference to help establish a true multi-party democracy. Representatives from political parties and organizations of all segments of the society participated in the conference. One critical resolution resulting from the National Conference was a unanimous decision to strive for decentralization. Title XI of the Mali Constitution adopted after the conference provided the legal foundation to implement decentralization.

The objectives of Mali decentralization reform effort are to strengthen the democratization process, create an underlying structure to support stability and peace, and enhance local development. After a significant effort to develop the legal and institutional framework to support the decentralization process, in 1999 Mali was finally ready to conduct local elections; elections were held for the existing 19 urban communes as well as for the 682 newly created communes. Elections were held again in 2004 and 2009, resulting in the ouster of many of the sitting elected officials—evidence the process is not being undermined by the potentially significant influence of incumbent power.

Under the new structure, communes are charged with providing a broad range of local public services that include education, health, food security, water, environment and nature conservation, veterinary services, and agricultural assistance. However, the funding available for the provision of these services is very limited in most communes. A significant amount of revenue comes from the national government, but there is also revenue potential from local sources. Potential local revenues include: annual head tax, vehicle registration (mopeds, bicycles, and donkeys), animal taxes, firearms tax, and a tax on local grain mills.. Limited resources result in the significant under-provision of core public services in most communes.

*Challenges and Opportunities.* The Malian governmental system has been improperly characterized as decentralized. Despite significant strides toward decentralization, in practice the concentration of decision-making power is still retained by national authorities. Nevertheless, Mali has the legal structures in place to move to a more decentralized system that could promote more rapid, broad-based economic growth, but there are many challenges.

One challenge, particularly for the poorer communes, is limited resources. Every commune receives funds from the national government. In addition, communes can generate local revenues, but the ability of communes to generate their own revenues varies considerably. Generally, own-source revenue generation is very limited. Compliance rates for local taxes are

abysmal in most rural communes. For example, the rural commune of Doumba (in Koulikoro region) achieved only 10% of potential revenue collections in 2009. However, Pringle (2006) cites a case in which the wealthier commune of Keleya (in Sikasso region) was able to collect 80% of the potential. According to officials in *Programme Gouvernance Partagée* (PGP-2), the USAID governance program in Mali, in some regions citizens can and do pay local taxes provided they are convinced that the revenues will be used to finance agreed upon programs. The underlying reasons for the low compliance rates deserve study, but generally failure to pay taxes is due to the several factors. First, many households simply may not have the resources with which to pay taxes. In this context, tax payments may be too high—tax evasion increases with higher effective tax rates. Residents may also not see the connection between the taxes they pay and the local public services they receive. This in part may be due to concerns about corruption and/or ineffectiveness of government officials. Further, it appears that local officials either do not have the means to enforce tax payments or may fear being ousted in the next election should they rigorously enforce tax collection. With greater local government autonomy, it may well be that officials would choose to reduce effective tax rates in order to increase compliance and generate a tax structure that is more in line with the economic and political constraints in their respective jurisdictions. In addition, access to credit markets for public infrastructure development is virtually non-existent.

As a result, the ability of communes to provide basic public services is significantly hampered. Communes are not able to properly fund primary schooling. School attendance is often low, and many students cannot afford to pay for notebooks and pencils. Basic assistance for health and nutrition is often lacking. Access to potable water and basic sanitation services is in great need in many areas, and other infrastructure is limited. Agricultural education, land management assistance, and other assistance to farmers are needed but often unavailable. Consider the following Table 4 to illustrate the existing deficiencies. Despite improvements in recent years, Mali lags behind other developing countries in access to education, healthcare, and basic sanitation services, all major responsibilities of the communes.

**Table 4. Quality of life statistics for Mali**

Quality of Life Indicator	Indicator
Gross Primary School Enrollment	80.0% (2008)
Primary School Completion (female)	48.1% (2008)
Primary School Completion (male)	65.2% (2008)
Literacy Rate for Ages 15-24 (female)	30.8% (2006)
Literacy Rate for Ages 15-24 (male)	47.4% (2006)
Infant Mortality Rate (per 1,000 births)	103
Child Malnutrition Rate (based on height for age)	38.5% (2006)
Child Malnutrition Rate (based on weight for age)	27.9% (2006)
Percent of Population with Access to Improved Sanitation	45% (2008)
Percent of Population with Access to Improved Water Source (rural)	48% (2008)
Percent of Population with Access to Improved Water Source (urban)	86% (2008)

Source: World Development Indicators, 2009 (<http://data.worldbank.org/indicator>)

Other ongoing concerns include property rights issues associated with the Malian land tenure process. Commune boundaries are also a concern, as they were originally established based on historical and sociological factors without the pre-approval of the local populations; economic factors were not a consideration. Thus, the disparities in wealth and economic potential vary considerably across communes.

In the midst of these challenges, the decentralization process is moving forward and there are successes. For example, communes have developed and begun to implement their own food security plans using local resources, with support from the *Commissariat à la Sécurité Alimentaire* and the USAID-supported PROMISAM project. As one illustration, the commune of Loulouni has been able to generate a significant amount of own source revenue to support its food security plan. Importantly, many communes have highlighted in their plans the need for an integrated approach to food security. While grain inventories and the management of those inventories at the commune level are important factors, other considerations were noted for improving long-run food security. Issues like education for women, nutritional education, improvements in potable water and sewage management were also highlighted. A number of the plans articulated a strategy in which food security requires a holistic approach. Though the development of local level food security plans is viewed as a step in the right direction, a number of issues remain unresolved. How will local-level plans be articulated with national strategies and investment plans like CAADP? How will technical ministries at the national level relate to local governments and local plans in determining what is to be done, where it will be done, what investments will be made, and who will pay? To date, these issues remain unresolved.

Communes also have the potential to play a larger role in relaying crucial information about food insecurity. With the increased availability of cell phones nationwide, it may be possible to use this technology to transfer critical information, such as grain inventory levels in local cereal banks, from communes to a central database, and in turn make this information available to



national and sub-national leaders. A pilot program to create a cell phone-based method of collecting and sharing such information is scheduled to begin in 2011 with USAID/Mali support.

In summary, even with the ongoing challenges, progress has been made in the decentralization process. Nevertheless, the transfer of decision-making power from the national authorities to locally elected officials is still limited for the following reasons: (a) Lack of independent decision making authority—for the communes in Bamako, major local level, decisions must be approved by the national administrative authorities in the area. At the commune level outside of Bamako, the Secretary General and Préfet serve the national government in maintaining and overseeing activities; (b) Power of Information—national government retains power because it has the administrative competence and the information needed to make decisions. Local officials do not have such resources available to them to support decision-making. Locally elected officials are therefore dependent on national authorities for most information; (c) Financial Resources—the transfer of resources from the national level to communes is limited, and the potential revenue generation at the local level is hampered by national restrictions, challenges with local governance, and local economic realities; (d) Human Capacity—there is a critical need for human capital capacity building at the local level. Good local level management and decision-making requires the development managerial and decision-making skills.

With the continued development of local government management and administrative capacity, increased use technology for information sharing, and a plan for the transfer of some decision-making authority to locally elected leaders, communes can serve an increasingly important role in rural development activity and with food security.

### 2.5.3. *Mali's Growth and Poverty Alleviation Strategy*

Mali's economic growth, poverty, and hunger alleviation strategies are guided by three fundamental documents:

- (1) The overall framework for all public investment planning, including in the agricultural sector, is spelled out in the **Growth and Poverty Reduction Framework (the *Cadre Stratégique pour la Croissance et la Réduction de la Pauvreté - CSCR*)**. The current version of the CSCR, covering the period 2007-2011, has three strategic foci: strengthening of the “productive sectors” of the economy (of which agriculture receives top priority), continuing reform of the public sector, and strengthening of social safety nets. For the agricultural sector, the CSCR emphasizes improved water control (*maitrise de l'eau*) and intensification through: (a) improved access to inputs (seeds, fertilizer, equipment) and to financing, (b) greater use of a value-chain approach aimed at strengthening processing and other value-added activities, (c) improving physical access to markets (e.g., through construction of feeder roads), and (d) better animal and plant disease control. The document also establishes improved food security as a central development objective. It argues that improving food security will require not only improving food availability and stability of supplies through expanded agricultural production, but also improved economic access to food through raising per capita incomes and strengthening social safety nets.
- (2) The broad framework and vision for agricultural development in Mali is laid out in the

**Agricultural Orientation Law (*Loi d’Orientation Agricole*, or LOA)**, adopted by the Malian government in December, 2005. The LOA establishes a long-term vision for the agricultural sector—the promotion of a sustainable, modern and competitive agricultural sector based primarily on family farms. In so doing, it aims to guarantee *food sovereignty* (a term that the law does not define explicitly) and to make agriculture “the engine of the national economy in order to promote the well-being of the [Malian] population.” The LOA provides a broad definition of agriculture including crop and livestock production, fisheries and fish farming, honey production, forestry, hunting and gathering, processing, transport, trade and agricultural services, including social and environmental functions as well as economic. It reaffirms the state’s withdrawal from direct production and commercial activities in the agricultural sector (those being the domain of the private sector and of farmer associations) and endorses the creation of regional and international common markets for agricultural products.

The LOA also places Mali’s agricultural development strategy squarely in the context of the country’s decentralization strategy, outlining the roles to be played by both national and local governments. Government roles are to be demand-driven, focused on providing technical assistance to farmers and agricultural professional organizations (although private provision of extension services are also allowed for) and on setting policies conducive to agricultural growth and expansion of markets. The law provides for legal recognition of various professions within the agricultural sector and aims to strengthen the legal standing of professional organizations within the agricultural sector. It also creates structures and processes for ongoing dialogue between the agricultural profession and the government and calls for monitoring and evaluation of agricultural policies and programs. The LOA is a broad statement of policy intent and direction, with the details of the programs to be spelled out in subsequent governmental decrees.

- (3) The third key document is the **National Food Security Strategy (*Stratégie Nationale de Sécurité Alimentaire*, or SNSA)**. The SNSA predates the LOA, having been adopted in August 2002. Like the LOA, it clearly places itself within the broad framework of the CSCR. The SNSA identifies food security as encompassing four elements: food availability (e.g., through production and trade), the population’s access to food (both physical and economic), stability of both supply and access, and biological utilization of food (including interactions between health and nutrition). The document states that poverty is the chief cause of food insecurity in Mali, and hence stresses the importance of promoting sustainable income growth in Mali—primarily through a vibrant rural sector. In addition to identifying chronic food insecurity as being due primarily to low incomes and low agricultural productivity, the SNSA also stresses Mali’s need to deal with transitory food crises, and reviews the tools Mali has used in the past to manage such crises.

The SNSA then defines the architecture of what have become since 2004 the Malian government’s institutional structures for establishing food security strategies and dealing with food crisis management. The key structures called for in the SNSA (and subsequently created by the government) include the *Commissariat à la Sécurité Alimentaire* (CSA), housed within the office of the Presidency but with links down to the level of local governments; and the *Conseil National de Sécurité Alimentaire*, which is

chaired by the Prime Minister or his delegate and which meets twice a year to review the food situation in the country and to set overall policy orientation. The CSA's mandate is to provide ongoing information to government and other actors on the current and emerging food security challenges of Mali, promote coordination of government actions to promote food security, and to encourage actions, especially at the local level, to prevent and mitigate food crises. Key services that provide information to the CSA as part of Mali's overall food security system are the Early Warning System (SAP) and the Market Information System (OMA), which provide regular updates on market conditions and transitory food insecurity.

While in practice the CSA spends the majority of its time and effort dealing with transitory food insecurity, the current food security commissioner sees her mandate as one of moving the country away from just crisis management towards long-term food security based on well-functioning food markets and vibrant economic growth. Challenges in moving in this direction include the lack of well-targeted social safety nets in Mali, which often results in actions (such as export bans) to deal with short-term food crises that undercut agricultural incentives, as well as problems of coordination of actions of the wide range of ministries whose mandates affect food security (agriculture, livestock, fisheries, health, transport, finance, local government, etc.)

The CSCRP, the LOA, and the SNSA set out the broad objectives, strategies, and institutional structures of the Malian government to pursue its goals in promoting broad-based economic and agricultural growth and improved food security. The details of implementation, however, are spelled out in a large number of different strategy, policy, and program documents that have been developed over many years in an incremental fashion, and not all of which are mutually consistent. The primary agricultural and rural sector planning document that provides an umbrella for approximately 110 different programs and projects currently under implementation in Mali is the *Schéma Directeur de Développement Agricole (SDDR)*. These programs and projects are supported by a wide range of development partners.

In 2008, in an attempt to ensure more coherence and tighter focus to its rural development efforts, Mali, with the support of some of its development partners (particularly of the Netherlands and Denmark) began a systematic review of all its agricultural development projects and programs. The aim was to move the country from a project-oriented approach to a country-led, sector-wide approach to agricultural development, thereby increasing the coherence across programs and contributing to a more efficient use of development resources. The analysis conducted in putting together the resulting *Plan de Passage à l'Approche Sectorielle* identified that Mali had 22 separate officially validated strategies for various aspects of rural development. These 22 separate strategies in turn established a total 117 different priorities for rural development. Many of the participants in the process concluded that a country with 117 different priorities really had no priorities at all; hence there was a need to focus Mali's agricultural development efforts on a much narrower, strategic set of priorities, while still maintaining coherence with the overall orientation for economic and rural development laid out in the CSCRP, the LOA, and the SNSA.

In 2009, the *Plan de Passage à l'Approche Sectorielle* effort was merged with Mali's NEPAD/CAADP effort, which had been launched in 2007 with the support of other donors

(notably USAID) and which also sought to move Mali towards a sector-wide approach. The merger of the two efforts and the analytic studies that undergirded them (coordinated by the *Cellule de Planification et de Statistique* (CPS) for Rural Development) led to the development of the *Plan National d'Investissement du Secteur Agricole* (PNISA), the broad outlines of which were endorsed by the Malian government, its development partners, the private sector and civil society in October 2009 with the signing of the national CAADP compact. The investment plan is to be accompanied by a new agricultural development policy, the *Politique de Développement Agricole* – PDA. The full PNISA and PDA are currently being elaborated in a participatory fashion, with the completion projected for mid-2011. Key elements of the PNISA will include (a) capacity building (of public, private, and civil society organizations involved agricultural development activities, with strong emphasis on monitoring and evaluation); (b) investments, especially in improved land tenure systems, natural resource management, and in irrigation systems and water management; (c) actions aimed at spurring production and competitiveness in select crop and livestock value chains; (d) training and research; and (e) improved social safety nets to deal with problems of transitory as well as chronic food insecurity.

In the interim, while the full PNISA and PDA are being completed, a 5-year priority investment plan, the *Plan National d'Investissement Prioritaire dans le Secteur Agricole* (PNIP-SA) was elaborated in 2010 and favorably reviewed by an ECOWAS/African Union team in October of that year. The PNIP-SA focuses on strategic investments in five value chains: rice, maize, millet and sorghum, inland fisheries, and livestock products (both meat and dairy). It also includes cross-cutting activities aimed at strengthening nutrition education throughout the country. The hope of the Malian government is to align various donor efforts initially around the priorities outlined in the PNIP-SA and, when completed, the entire PNISA, in order to move to a sector-wide approach. The current efforts of USAID/Mali to develop its Feed the Future program are aimed at supporting key elements of the PNIP-SA.

In parallel to its long-term efforts move to a sector-wide approach to agricultural development, the Malian government also launched several medium-term agricultural development initiatives in response to the global food crisis that first struck in 2008. These initiatives, described in more detail in the sections below on the individual value chains, included a Rice Initiative (*Initiative Riz*) launched in 2008/09, and subsequent initiatives for maize, wheat, and milk launched in 2009/10. The initiatives involve heavy government expenditures for subsidized inputs and seeds, subsidized equipment for production and processing, expansion of extension support, and government involvement (through OPAM) in some output marketing. The initiatives set very ambitious production goals, consistent with President Touré's call for Mali to become an agricultural powerhouse in the region by increasing total cereal production from 3.6 million tons in 2007 to 10 million tons in 2012. These very ambitious production targets have driven the design of these initiatives, which in turn are influencing the goals set out in the PNIP-SA and the PNISA. The integration of the initiatives into the PNISA and the setting of realistic and financially sustainable production goals remains a challenge in the development of Mali's longer-term agricultural development strategy.

### 3. PERFORMANCE OF KEY VALUE CHAINS

#### 3.1. Cotton

Cotton is important not only as Mali's number 2 export (after gold) and as historically a major engine of growth in the south of the country, but also because of the impact of changes in the cotton value chain on cereal production in Mali. The main cotton zone, known as the CMDT zone after the Malian state cotton company (*Compagnie Malienne de Développement des Textiles*), is also the area of the country that produces the largest marketable surplus of coarse grains (millet, sorghum, and maize). The largest producers of these cereals historically have also been the largest cotton producers. Cotton production has financed much of the rural infrastructure in this zone, programs for functional literacy of farmers, creation of farmer organizations, extension programs and capitalization of many of the most productive farms in the zone. Producing cotton also gives farmers access to fertilizer and other inputs on credit, some of which are applied to cereals. The cereals, grown in rotation with cotton, also benefit from the residual effects of the fertilizer used on cotton. Thus, the restructuring of the cotton system, currently underway, is likely to have strong effects on the cereals value chains as well as the cotton system itself.

##### 3.1.1. Structure and organization of the sector

The government is currently in the process of privatizing the CMDT by creating four cotton companies that would operate as monopsonies within designated geographic zones (similar to Burkina Faso). The delicate process began in early 2010. To date, no official announcements have been made concerning the outcome.

Pending privatization, Mali's cotton sector functions in the traditional *filière intégrée* manner, with the 98% government-owned monopsony, CMDT, managing most aspects of input procurement, cotton production, ginning, and marketing, but on a reduced scale from the pre-2000 period. After a number of unsatisfactory attempts by producer organizations to procure both cereal and cotton inputs, the CMDT, OHVN, and representatives of producer organizations formed a *Groupeement d'Intérêt Economique* or GIE (a type of joint venture) in 2008/09 which has since procured inputs for both cotton and cereals via a tender process. An inter-professional council consisting of representatives from ginners, producer organizations and input suppliers has also been created with the expectation that it will play a critical management role after privatization. Because of the stop-and-go nature of Mali's cotton reform process, the institutions put in place are relatively new and relatively weak compared to comparable institutions that have been functioning for many years in Burkina Faso and Benin. One anticipates that additional changes in structure and institutions will evolve as the privatization process moves forward.

##### 3.1.2. Performance

The 2001 USAID strategic assessment concluded that there was little opportunity for additional value added in the sector through growth in textile manufacturing given Mali's high costs of labor, energy, and transport; however, further exploration of the potential for expansion of artisanal cotton products and production of cotton swab for the regional market was recommended. Given the predominant position of the French and the World Bank in cotton

sector reform, the assessment recommended modest USAID assistance:

- Working with producer associations input and credit systems;
- Preparing Mali for WTO international fiber negotiations;
- Working with producer associations on environmental impacts of cotton production;
- Helping to improve the transportation infrastructure.

*Performance since 2000.* Performance during the past decade has been affected by low but volatile cotton prices and volatile exchange rates. Table 5 illustrates not only the volatility of the Cotlook A index from 2001 to 2007, but also the important role played by the US\$/FCFA exchange rate in shaping the prices that are offered to Malian farmers. While the seed cotton price in U.S. dollars was consistently above the 2001/02 rate through 2008/09, the FCFA equivalent fell below the initial rate in 4 of the 7 years covered.

**Table 5. Evolution of the CotLook A index in U.S. cents and FCFA**

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/ 08 (est)
US cents/lb	43.9	51.2	67.4	55.0	56.7	58.7	60.0
% variation (year t divided by year 2001)		16.6	53.5	23.3	29.2	33.7	54.9
FCFA/kg	719	746	831	634	674	663	693
% variation (year t divided by year 2001)		3.8	15.5	-11.8	-6.3	-7.9	-3.7

Source: Estur 2007, Tables 9 and 10.

After reaching a peak in excess of 170,000 producers and 500,000 hectares in the middle of the decade, participation in cotton production in Mali fell rapidly. More than half the producers left the sector, and area planted fell by over 60% by the 2008/9 season (Table 6) The problem of relatively low prices was accentuated by late payment for seed cotton

**Table 6 Indicators of cotton sector performance: 2000 - 2010**

Indicator	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10 (est.)
Producer price (base + supplement)	170	200	180	200	210	165	165	171	200	170
Number of cotton producers	not av	not av	not av	165,204	172,353	174,749	163,420	117,933	83,993	not av
Hectares planted to cotton	212	492	420	516	533	521	459	269	190	250
Yield per hectare (kg)	1,085	1,089	994	1,150	1,047	976	868	861	1,036	
FCFA/ha cost of recommended inputs	54,290	65,388	65,700	73,270	73,725	69,190	63,895	76,225	96,918	not av*
FCFA/ha value of inputs actually purchased	49,215	55,883	57,542	58,398	61,217	58,477	53,473	60,465	72,689	
% of recommended package purchased	91%	85%	88%	80%	83%	85%	84%	79%	75%	
Input purchases as share of gross income	27%	25%	32%	25%	28%	36%	37%	41%	35%	

Source: Diakit  (2010) supplemented with data from [http://www.icac.org/meetings/plenary/69\\_lubbock/documents/country\\_reports/f\\_mali.pdf](http://www.icac.org/meetings/plenary/69_lubbock/documents/country_reports/f_mali.pdf)<sup>14</sup>

**Table 7 Indicators of farm-level cotton sector performance: 2003-2010**

Area	Indicator	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/ 10	2010/ 11(est.)
<i>Production Performance</i>	Fiber production ('000 tons)	260	244	223	176	101	85	98	151
<i>Marketing Performance</i>	Average Cotlook Index (FCFA/kg FOB)	791	572	648	630	672	628		
	CMDT average sales price (FCFA/kg FOB)	774	546	645	614	687	772		
	CMDT minus Cotlook average	-17	-26	-3	-15	14	144		
<i>Cost Performance</i>	Fixed costs (FCFA/kg fiber)	85	92	100	128	223	305		
<i>Income Performance</i>	CMDT net income (billions of FCFA)	12.365	-50.719	-12.301	-18.598	-15.670	-10.656		
	CMDT deficit after payments from support fund (billions of FCFA)	10.300	-50.384	-11.700	-17.400	-14.700	-6.700		
	Price that CMDT could pay to farmers and break even (FCFA/kg)	217	125	147	124	123	not avail		
	Cost of producing fiber (FCFA/kg)	not avail	803	722	749	881	940		

Source: Diakit  (2010) through 2008/09 then [http://www.icac.org/meetings/plenary/69\\_lubbock/documents/country\\_reports/f\\_mali.pdf](http://www.icac.org/meetings/plenary/69_lubbock/documents/country_reports/f_mali.pdf)

<sup>14</sup> Fertilizer costs were substantially reduced by subsidy in 2009/10. NPK prices rose from 12,000 FCFA/sack to 17,210 and urea prices from 10,275 to 17,600 between 2007/8 and 2008/9 before dropping to 12,500 FCA/sack for both products in 2009/10 due to the extension of the Government of Mali fertilizer subsidy to cotton.

CMDT deficits have risen consistently since 2000. Part of the problem is the manner in which base producer prices are set—largely through producer-ginner-government negotiations that involve more politics than economics. Despite the introduction of a new pricing formula and procedures, negotiations frequently resulted in producer prices exceeding what the CMDT could afford, given world market prices. On the cost side, falling cotton production has led to serious underutilization of ginning capacity and very high fixed costs per kilo of cotton fiber produced. A review of cotton-sector performance in 2007/08 noted that costs of ginning were roughly 141 FCFA/kg rather than the 91 FCFA/kg anticipated because of high fixed costs associated with low seed cotton production and underutilization of ginning capacity (Estur 2008). Table 7 summarizes recent trends in some performance indicators for ginning and marketing activities.

In terms of the cotton sector's overall contribution to Malian export revenues and GDP, there has been a substantial decline in value terms since 2001. The cotton sector's share of exports and GDP has shrunk even more rapidly due to the rapid growth of the mining sector and gold exports. Table 8 summarizes some of the macro-economic trends

**Table 8. Selected macro-economic performance indicators for the cotton sector**

Indicator	2000*	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fiber sales value (billion FCFA)	16.2	36.9	28.4	39.9	38.1	35.4	27.7	16.5	26.6	not av	not av
Share of GDP (%)	1.6	3.3	2.5	3.2	3.0	2.6	2.0	1.1	1.7	not av	not av
Share of export revenues (%)	not av	not av	not av	not av	not av	not av	not av	not av	7.5	5.3	6.7

Source: MSU data base developed from INSTAT data.<sup>15</sup>

### 3.1.3. Future growth potential, opportunities and linkages

The most upbeat information concerning cotton for the moment is the recent change in world market price trends. Updating the information presented in Table 4, we note that the Cotlook A index declined to \$0.61 in 2008/09 and then rose to \$0.78 in 2009/10. Current projections have the index rising to \$0.90/lb for the 2010/11 production/marketing season, a level it has not reached since the mid-1990s (ICAC press release, 10/1/2010). Taking annual averages of exchange rates into account, the 2008/09 and 2009/10 FCFA/kg equivalents for the Cotlook A index were approximately 638 and 800 FCFA respectively and likely to rise for 2010/11, providing some hope that the rising world prices will facilitate the reform process in Mali.

Because of the long delays in cotton sector reforms and the less-than-propitious timing of the privatization process (after several years of serious CMDT deficits), there is little optimism that the sector will rebound quickly despite the short-term projections for rising prices. Until the privatization is made final, it is difficult to speculate about the future of the traditional fiber export market.

In terms of opportunities to increase farm-level production and quality, Mali may be at a disadvantage given its decision to stay with traditional cotton varieties rather than adopting Bt cotton as Burkina Faso has done. Although still a topic of debate, most indications are that Bt

<sup>15</sup> 2000 data refers to marketing of fiber from seed cotton produced during the 1999/00 production/marketing year.



cotton is proving more productive and less costly than conventional cotton for smallholder farmers (see Tripp 2009 for a review). Whether Mali can muster the productivity and quality improvements needed to get the sector back to its former position of West African leadership without adoption of Bt cotton is an open question.

In terms of improved marketing strategies, there has been much discussion about niche markets (organic and fair trade cotton in particular), but the consensus seems to be that these markets will remain niche markets—important sources of income for a limited number of producers. This view has been strongly expressed by Francois Traoré, former head of the Burkina cotton producers associations, who encourages the development of the niche markets as a supplement but not as an alternative to the development of the traditional fiber market.

Cottonseed processing industries have the potential to add value to the cotton sector, create employment, and produce import substitutes; but they cannot accomplish this effectively if the cotton fiber part of the sector is not running efficiently and stimulating farmers to produce cotton. Because the value of the fiber per kg of seed cotton outstrips that of by-products by a ratio of approximately three to one, processing industries depend on the cotton fiber sector. While the demand forecasts for edible oils is strong in West Africa, many cotton oil crushing enterprises are facing bankruptcy due to reductions in cotton production that resulted in cottonseed shortages (Holtzman 2007, Kelly 2010). Please see further discussion of the cotton seed sector in section 3.7.4

The outlook for developing an industrial textile industry remains unchanged from what was reported in USAID's 2001 agricultural sector assessment—Mali cannot be competitive given current costs of labor, energy, and transport.

While opportunities are great for growth linkages throughout the economy if seed cotton production regains or surpasses earlier levels, its contribution at present is severely limited due to the significant decline in numbers of farmers growing cotton, area planted, aggregate production, and the indirect effects that this decline has had on related sectors such as input supply, transportation, fiber and by-product processing.

#### *3.1.4. Gender issues*

Cotton in Mali is a “family” crop grown on family fields. All members of the household contribute labor, with women heavily involved in the harvest. Proceeds from cotton sales are managed by the household head and used to cover the costs of agricultural inputs and equipment as well as basic staples for household consumption should the farm's production be inadequate. The household heads (usually men) have the discretion to use any “surplus” cotton income beyond what is needed for inputs and staple foods for other household or personal needs.

Given the current context, the best way to assist women in the cotton sector would be to reduce the amount of time they need to spend working on the cotton fields so they could devote more time to their personal income earning activities. This would mean introducing labor-saving technologies for cotton harvesting.

### 3.1.5. *Sector importance for poverty alleviation*

Historically, cotton was the backbone of Mali's rural economy in several regions of the country: Sikasso, parts of Ségou and Koulikoro, and more recently in Kita, with more than 170,000 farmers growing the crop in good years and an estimated 3.5 million Malians dependent in some way on income derived from the cotton sector. Cotton provided a level of income that permitted farmers to purchase animal traction equipment, fertilizers, and pesticides for cotton as well as for cereal crop production. A recent study in the cotton zone noted a virtuous environmental cycle characterized by a significant share of farmers evolving from a slash and burn system of production to one of continuous cultivation on the same land while maintaining soil fertility through crop rotations, the use of improved natural resource management practices and a combination of organic and inorganic soil amendments made possible by better integration of livestock and crop production systems. Unfortunately, the current generation of cotton farmers is finding it increasingly difficult to access the animal traction equipment that made this transition possible for their parents (Dufumier). In short, the sector has shown potential for reducing poverty, but the present challenges must be overcome if it is to continue to contribute to poverty reduction in the future. Farms that have land resources in lowland areas (*'bas fonds'*) have been diversifying into horticultural crops (potatoes, bananas) or increasing *bas fonds* rice production, but the limited survey data available suggest that this diversification is not fully compensating for the loss of cotton incomes and not as widespread as cotton incomes due to unequal access to the *bas fonds*.

### 3.1.6. *Constraints, risks, and vulnerabilities*

There are two major sources of constraints, risks and vulnerabilities: Uncertainty about the outcome of the privatization process and the likelihood of continued volatility in exchange rates and cotton prices. These problems will also affect the development of other value chains in the cotton zones.

### 3.1.7. *Cross-cutting issues*

There is a tremendous need to build cotton-sector **institutions and capacity** at most levels of the sector: producer organizations, value chain stakeholder organization ("inter-profession"), research, and extension are all very weak in terms of human resources and budgets. Failure to build cotton-sector institutions and capacity will have negative spill-over effects on the ability to build sustainable coarse-grain (millet, sorghum, and maize) value chains in the same zones.

The issue of **agricultural diversification** in the cotton zone is of paramount importance, but making the right investments to support farmers requires high quality monitoring of what is happening at the farm level. The CMDT's monitoring and evaluation unit has long provided excellent data and analysis of area cultivated, crop choices, input use, equipment ownership, crop incomes, etc. for cotton as well as coarse grains such as maize and sorghum. Will this M&E continue to be supported once privatization occurs? If it continues, will it be so cotton-centric that it will not be adequate for good decision making with respect to questions of income diversification and the development of coarse grain value chains?

## 3.2. Cereals

### 3.2.1. Production trends

Over a 17-year period cereal production grew from 1.9 million tons (three-year average 1990/1 to 1992/3) to 4.1 million tons (three-year average 2006/7 to 2008/9), an average annual growth rate of 4.6%. Table 9, Table 10, and Table 11 present information on changes in area, yield and production for each of the main cereals over time, as well as groundnuts (the major oilseed).

Growth in cereal production has been driven primarily by increases in the production of rice, maize and millet. Rice and maize production have grown rapidly (7.3% and 6.7% annual growth respectively) as a result of growth in both area planted and yields. In the case of maize, productivity levels have been dependent in part on the rise and fall of cotton production since the devaluation of the CFA franc in 1994 at least through 2005, as maize benefits from residual fertilizer nutrients applied to cotton, as well as direct applications of fertilizer obtained on credit. Growth in millet production has come primarily from increases in area cultivated, while the area planted to sorghum has declined. The annual yield growth has averaged 1.3% for millet and 0.9% for sorghum.

Approximately 325,000 hectares, just over 7% of the total cultivated area, has irrigation infrastructure in place. Only one third of the country's irrigated area has full water control, however, and poor maintenance prevents full utilization of the area with irrigation infrastructure. Almost half the total irrigated area, 46%, is located in the region of Ségou. With the majority of the country's cereal supply coming from rainfed agriculture, variability in production due to rainfall patterns is to be expected given the high inter-annual and spatial variability in rainfall.

**Table 9. Trends in area of major food crops 1990 to 2009**

Crop	Mean Area (ha) 1990/1 – 92/3	Mean Area (ha) 2006/7- 08/9	% change in 3-yr averages (1990/1-92/3 vs. 2006/7-08/9)	% annual Growth
Millet	1,116,202	1,552,782	39.1%	2.0%
Sorghum	816,379	999,430	22.4%	0.5%
Maize	182,423	391,554	114.6%	4.3%
Rice	230,948	427,639	85.2%	3.8%
Fonio	44,950	43,177	-3.9%	-0.3%
Total cereals	2,392,134	3,418,747	42.9%	1.9%
Groundnuts*	195,422	332,072	69.9%	2.7%

Source: CPS Database ; FAO STAT \*Data available only through 2007/08.

**Table 10. Trends in yield of major food crops 1990 to 2009**

Crop	Mean Yield (kg/ha) 1990/1 - 92/3	Mean Yield (kg/ha) 2006/7 - 08/9	% change in 3-yr averages (1990/1-92/3 vs. 2006/7-08/9)	% annual Growth
Millet	662	797	20.6%	1.3%
Sorghum	797	901	13.0%	0.9%
Maize	1,181	1,790	51.5%	2.3%
Rice	1,641	2,902	76.9%	3.4%
Fonio	617	766	24.2%	1.3%
Total cereals	840	1,208	43.8%	2.5%
Groundnuts*	856	919	7.3%	0.1%

Source: CPS Data base \*Data available only through 2007/08.

**Table 11 Trends in production of major food crops 1990 to 2009**

Crop	Mean Prod (tons) 1990/1 - 92/3	Mean Prod (tons) 2006/7 - 08/9	% change in 3-yr averages (1990/1-92/3 vs. 2006/7-08/9)	% annual Growth
Millet	736,400	1,239,263	68.3%	3.4%
Sorghum	634,577	899,224	41.7%	1.3%
Maize	215,295	697,243	223.9%	6.7%
Rice	382,244	1,253,288	227.9%	7.3%
Fonio	27,724	32,071	15.7%	0.9%
Total cereals	1,998,194	4,131,173	106.7%	4.4%
Groundnuts*	163,796	304,912	86.2%	2.2%

Source: CPS Database \*Data available only through 2007/08.

### 3.2.2. *Heterogeneity of grain producers*

Most development practitioners recognize that a “one-size-fits-all” approach to smallholder development is dangerous. But the diversity in smallholder farming circumstances in Mali, not only in terms of agro-ecological factors but even among households in the same zone, is truly challenging. Table 12, Table 13, and Table 14 illustrate this by comparing cereal production, sales, purchases and net position for three different agro-ecological zones of Mali. Within each zone households are ranked in terms of land area owned and then divided into quartiles (quartile 1 has the smallest land holdings). Some patterns that emerge are predictable but others less so. A predictable pattern, for example, is that cereal production is highest in the irrigated rice zone (Table 14) and lowest in the low potential rainfed zone (Table 12).

**Table 12 Cereal production and marketing profiles low potential rainfed cereal (Tominian)**

Land Area Quartile	Mean Cultivated Area (ha)	Mean HH <sup>16</sup> Size	Cereal Production per capita (kg)	% HHs buying grain	% HHs selling grain	% HHs net sellers	Mean HH sales per capita (kg)	Mean HH purchases per capita (kg)
1	3	16	91	73	3	3	40	29
2	4	13	154	66	15	10	19	27
3	6	11	212	39	19	11	19	34
4	8	8	339	35	35	32	30	33
Mean (n=151)	5	12	198	54	18	14	25	30

**Table 13. Cereal production and marketing profiles medium potential rainfed cotton-cereal (Koutiala)**

Land Area Quartile	Mean Cultivated Area (ha)	Mean HH Size	Cereal Production per capita (kg)	% HHs buying grain	% HHs selling grain	% HHs net sellers	Mean HH sales per capita (kg)	Mean HH purchases per capita (kg)
1	7	18	243	41	51	49	29	30
2	9	17	338	42	61	53	43	21
3	12	17	424	18	68	68	39	14
4	11	11	601	24	71	68	88	25
Mean (=149)	10	15	403	31	63	60	52	24

**Table 14. Cereal production and marketing profiles high potential irrigated rice (Macina)**

Land Area Quartile	Mean Cultivated Area (ha)	Mean HH Size	Cereal Production per capita (kg)	% HHs buying grain	% HHs selling grain	% HHs net sellers	Mean HH sales per capita (kg)	Mean HH purchases per capita (kg)
1	2	13	582	85	94	88	195	55
2	5	18	921	56	97	94	268	63
3	6	13	1,217	71	94	91	421	47
4	11	12	1,416	58	92	89	362	46
Mean (n=141)	6	14	1,039	67	94	91	312	53

Source: Murekazi et al. In progress

<sup>16</sup> HH = Household

### 3.2.3. Rice

#### *Overview of the Rice Subsector.*

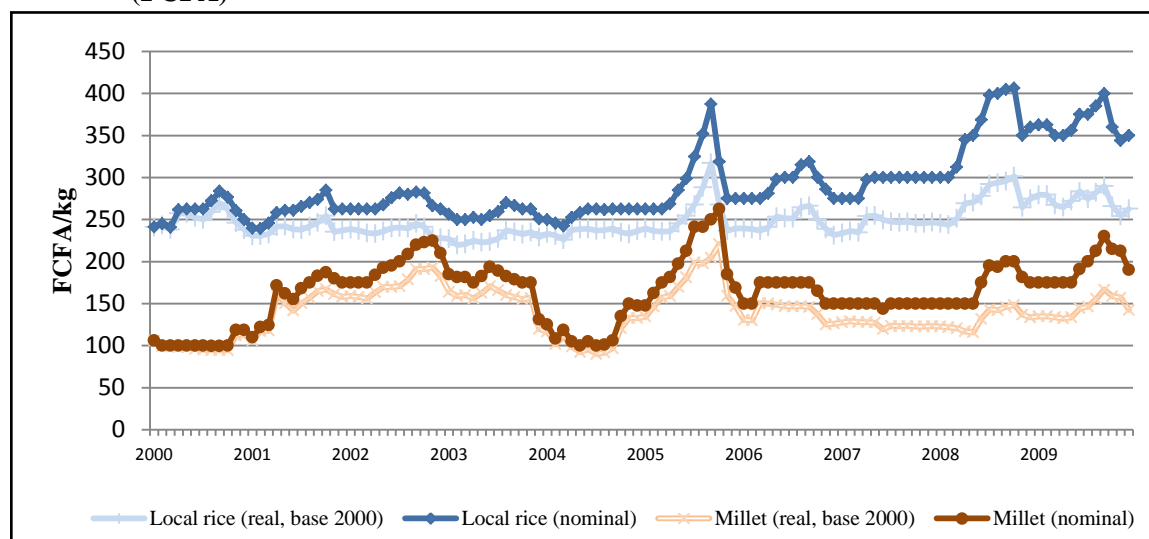
Given the importance of rice as an urban staple and the ability to grow the crop under irrigation, which helps stabilize its production, the Malian government considers rice a key part of the country's food strategy. No other food crop is as "political" as rice. It is also the staple food crop that has had the most rapid increase in production over the past 30 years. Over the period of 1980 to 2004, total value added from rice production rose by an average of 9.3% per year, and it now accounts for 12.3% of agricultural value added (up from 4.3% in the 1980s). This success has been fueled mainly by public-led investments in large-scale gravity-fed irrigation infrastructure and by an improvement in the enabling environment, with a progressive withdrawal of the state from direct marketing and processing of rice. The reasons for this success can be found in the response of rice farmers and traders to the liberalization of marketing and processing in the main production zone of the Office du Niger (ON) during the late 1990s and early 2000s, which created incentives to take advantage of improvements in irrigation infrastructure and varieties that were made available beginning in the mid-1980s. As a result of these reforms, farmers moved massively to adopt improved production practices—mainly transplanting of seedlings instead of broadcast sowing. This has been accompanied more recently by an increase in the use of fertilizer, flowing from improvement in production credit availability in the Office du Niger (ON) zone during the last four to five years (USAID 2009). Despite those improvements, many farmers are still heavily indebted in the ON, which is putting an additional stress on the credit system. Thus, further improvements in the production credit system are needed.

The rice value in Mali has witnessed the emergence of new actors since the mid-2000s, as incentives for quality improvement are clearly positive in the rising high-quality segment of the market for local rice. With a 15 to 20 percent price premium in the market for well-sorted, clean and homogeneously sized local "Gambiaka", wholesaler/importers such as Groupe AMI and the Grands Distributeur Céréalière du Mali (GDCM-SA) have entered the paddy market and have undertaken rice processing activities themselves to achieve high-quality standards by working with a network of mini rice mills, or by sorting through hulled rice that has been already processed and partially damaged by small mobile hullers (which seems to be GDCM-SA's strategy). In late 2010, an Indian-owned company named AGROMA established paddy processing plants in Kita, Bougouni and Ségou to process paddy from expanding production in *bas-fonds* and upland rice areas. Farmer organizations are key potential partners in each of these cases, since their involvement is critical in addressing the paddy quality issue prior to the point of hulling—whether this is done in a larger industrial setting or by a local mini rice mill (USAID 2009).

*Demand.* Rice is increasingly favored by consumers—primarily in urban zones but also in the rural areas where it is grown. National consumption of rice increased from 34 kg per person in 1989 to 53 kg per person in 1998 and to an estimated 57 kg per person in 2007 (USAID 2009). This increase in rice consumption per capita is mainly due to increased urbanization in large cities, and the exponential growth of fast food restaurants (or *gargotières*), as more people are working over lunch in urban areas (OMA 2009). Also, the recurrent drought that disrupted the regular supplies of millet and sorghum in recent years explains much of the increase in rice consumption in both urban and rural areas, as many consumers shifted to rice due to the stability of rice supplies through national production and imports. Consumer prices for millet have

increased by 47 percent over the period 1995-2009 compared to 35 percent for local rice for the same period (see Figure 5).

**Figure 5. Real and nominal price trends for local rice and millet, Bamako-Médine market (FCFA)**



Source: OMA data set

Because the demand for rice is growing rapidly and it is largely consumed by politically influential urban consumers, who represent about 32 percent of Mali's population and are growing at about 4.8 percent per year, the government places a high priority on increasing rice production. However, despite the significant increases in production, Mali is still a net rice importer (see Table 15), and since the rapid increase in rice prices during the 2008 rice crisis, the government has adopted several measures with the aim of lowering consumer prices. Those measures include: VAT and tariff exoneration on imported rice in exchange for importers agreeing to ceilings on wholesale prices, export restrictions, and promotion of local rice production by launching a high-profile rice promotion campaign (referred to as the “Initiative Riz”). The objective of the rice initiative was to increase local rice production by 50 percent in 2009, at a total cost of 42.65 billion CFA francs (i.e., U.S. \$65 million) through: 1) the extension of irrigated areas; 2) the rapid expansion of upland rain-fed rice led by the introduction of the drought-resistant Nerica 4 variety; and 3) the intensification and expansion of controlled flooding or *bas-fonds* systems (OMA 2009).

**Table 15. Rice production and imports (milled rice equivalent)<sup>17</sup>**

	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9
Production (tons)	415,921	562,930	430,850	567,495	631,941	649,429	964,585
Imports (tons)	202,814	186,675	105,390	272,371	180,208	137,142	165,716
Self Sufficiency Ratio	67%	75%	80%	67%	78%	83%	85%

Source: USAID 2009

<sup>17</sup> The conversion rate of paddy to milled rice varies depending on the equipment. It averages about 60% for small mobile Engelberg-type hullers, 63% on average for the compact plastic roller units, 65% for mini rice mills, and 67 to 68% for larger industrial units (Diarra 2004).

As a result of these production efforts, imports decreased by 24 percent in 2008 compared to the previous year, but increased again by 25 percent in 2009 due to high levels of tax exemptions. On the production side, the input subsidy increased the use of fertilizer and led to expanded cultivated areas from 391,870 ha in 2007/08 to 482,552 ha in 2008/09. However, a recent assessment on the impact of the rice initiative highlighted many technical difficulties in the organization and implementation of the project regarding: 1) discrepancies between the announced level of production at 1.6 million tons of paddy versus the of 1.3 million estimated by the assessment team, 2) hasty distribution of untested Nerica 4 seeds, and 3) delays in the distribution of subsidized fertilizer. Overall, the financial irregularities due to both mismanagement and corruption have resulted in a shortfall of over 4.7 billion FCFA (BVG 2009).

*Irrigation Potential and Rice Production Systems.* Rice occupies 11 percent of the total cultivated land, or about 283,400 ha, and rice production in Mali is based on a variety of production systems that exhibit significant differences. There are six main types of production systems: 1) the fully controlled irrigation subsystems in large-scale gravity-fed systems in the Office du Niger zone and much smaller systems around the Baguineda and Selingué dams; 2) small-scale village irrigated perimeter systems fed by diesel pumps that raise water from the Niger River to irrigate relatively small village based systems in the Timbuktu and Mopti Regions; 3) controlled flooding systems in Mopti and Ségou; 4) traditional uncontrolled planting on riverside flood plains in the same zones where controlled flooding is practiced; 5) rainfed rice cultivation with small-scale water retention structures in lowlands (*bas-fonds*) in the Southern cotton belt; and 6) rainfed rice on upland areas having rainfall in excess of 800-1,100 mm/year also mostly located in the cotton belt in the Sikasso Region.

*Full Water Control Irrigated Rice.* Even though Mali is one of the largest countries in West Africa, its agricultural potential is limited by irregular and low rainfall, ranging from 200 mm in the north to 1,400 mm in the south. Mali has the largest irrigable land potential of any Sahelian country; however, only about 200,000 hectares have been developed, 75 percent of which is currently cultivated (see Table 16). To develop its vast irrigable land potential and thereby lessen the unfavorable effects of the irregular rainfall pattern, Mali has established several government-managed irrigation schemes in large and small perimeters along the Niger and Senegal Rivers and other small rivers in the south of the country.

PIVs (i.e., *Périmètres Irrigués Villageois* in French) primarily refer to irrigation schemes (10-40 hectares) around villages along the Niger River in which diesel motor pumps (*group motopompes* – GMPs) are used to pump river water over a dyke into a network of lined or unlined canals. PIV rice production is focused in Northern Mali, especially in the regions of Mopti, Timbuktu, and Gao. In the PIVs, surface area per farm is small— about 0.3 hectares— whereas in larger schemes it is about 0.5 hectares. One diesel motor pump irrigates one PIV, allowing full water control at the plot level, and average yield (in paddy) is between 4.5 and 5.5 t/ha (USAID 2010).



**Table 16. Major rice production systems**

Productive System	Geographic Zone	Current Areas (ha)	Current Production Estimates (paddy) (MT)	Average Farm Size (ha)	Potential for Expansion (ha)	Yields with improved methods (paddy) (MT/ha)	Non-Improved Yields (paddy) (MT/ha)	Cost of Production (CFA/Kg)	Estimated cost of water infrastructure construction (Million CFA/ha)
Large-Scale Gravity Fed Systems	ON/Ségou, Baguinéda, Selingué	90,000	405,000	1-2	900,000	6 to 10	2 to 3.5	130	3 to 3.5
Small Scale Village Irrigated Perimeters	Timbuktu, Mopti	3,300	19,800	0.3	30,000	6 to 7	0 to 5	159	0.7 to 1.0
Controlled Flooding	Mopti, Ségou	75,000	111,000	2.5–10	150,000 to 300,000	2 - 3	0.8	192	0.05 to 1.6
Uncontrolled Plain Flooding	Mopti	150,000 to 300,000	225,000	10		1.2	0.8	181	--
Rainfed systems with small-scale water retention structures ( <i>bas-fonds</i> )	Sikasso, Cotton Zone	5,000	10,000	< 0.5	300,000	3	0.8	96	0.6
Rainfed systems	Sikasso, Cotton Zone	14,000	28,000	< 0.5	300,000 to 800,000	2 to 3	0.8	130	--

Source : USAID 2009

PIVs gave great hope to overcome the shortcomings and inconsistencies of traditional rice farming. However, after more than two decades of full activity, the PIV system in northern Mali has not lived up to expectations. The main advantage of the PIVs lies in the fact that they are operated by organizations that are generally legally incorporated and hence have “ownership” of the systems. However, PIVs have experienced several difficulties at many levels, which are in part due to (Kouyate and Haidara 2006):

- poor management of the organization and equipment, largely due to farmers’ insufficient level of technical knowledge and other technical problems related to production systems;
- difficulties in mobilizing financing related to access to credit, which is needed to procure agricultural inputs. As a result, most farmers use chemical fertilizers but at rates below the recommended doses. Farmers plant improved seeds but do not have easy access to certified seeds;
- chemical degradation of soils and high concentration of people.

New methods for increasing the productivity of irrigated rice in the PIVs have been explored over the past few years. One of the methods that showed the most potential is the system of rice intensification known as SRI. This technique, which originated in Madagascar<sup>18</sup>, increases the productivity of irrigated rice by changing the management of plants, soil, water and nutrients and leads to healthier soil and plants supported by greater root growth and the nurturing of soil microbial abundance and diversity<sup>19</sup>. This method involves carefully planting single, young seedlings (8-12 days old) at a wide spacing (25 cm or more), keeping soil moist but well-drained and aerated, adding compost or other organic material to the soil when possible. SRI has been tested in several PIV systems in three northern regions of Mali (i.e., Gao, Mopti and Timbuktu) and showed average yields increase of 56% (i.e., from 4.85 MT/ha to 7.56 MT/ha). SRI practices present an environmentally friendly alternative to current rice cultivation practices in northern Mali. However, SRI is a very labor-intensive method and hence may not be attractive to farmers farther south where returns to labor in other activities may be higher; timely and effective (soil-aerating) weeding may be difficult for many farmers to do. Furthermore, important reliance of compost represent another important limitation as there may not be enough available biomass, beyond the recycling of rice straw, to meet soil nutrient needs with compost (USAID 2010).

Overall, large-scale irrigation systems of the Office du Niger have proven to be more productive in financial terms (able to produce rice at lower unit cost) than PIVs, with total costs of 130 FCFA/kg in the Office compared to 158 FCFA/kg in the PIVs (Diakite 2009). More than half of the rice produced in Mali is grown under the irrigation system of the Office du Niger (ON). The Ségou Region, which includes the ON lands and the adjacent smaller Office Riz Ségou (ORS) zone of controlled flooding parcels, supplies an estimated 87 percent of the total supply of rice available for trade outside the region of production. In most of the other productive systems and zones, rice tends to remain in nearby local markets or is consumed directly by the families that produce it. Because of the large number of hectares under total water control, Ségou is the only region in Mali that can be counted on to produce a sizeable surplus in drought years when production drops precipitously in controlled flooding and rainfed systems. This zone is the most

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<sup>18</sup> <http://sri.ciifad.cornell.edu/aboutsri/origin/index.html>

<sup>19</sup> <http://sri.ciifad.cornell.edu/aboutsri/methods/index.html>

advanced rice producing area as it has generally larger farms and a much higher adoption rate of improved technologies consisting of use of certified seeds, fertilizers and transplanting. In part, the higher rate of adoption reflects the lower risks involved in farming in areas with good water control. Most of the productivity-enhancing innovations developed until recently for rice have involved heavy use of purchased inputs (fertilizer, improved seeds, and pesticides); the returns to these are highly dependent on soil moisture levels. Hence, it is riskier for farmers in rainfed areas to adopt such practices. In addition, extension services (e.g., through farmer organizations) are more developed in irrigated areas that have more market-oriented agriculture, which have facilitated the diffusion of new technologies.<sup>20</sup> In addition, the ON has also been the locus of private micro-entrepreneur investment in mobile rice hullers that provide critical milling services to the vast majority of small farmers in the zone and create market incentives to increase productivity in rice production.

The introduction of the mobile rice hullers has led to the emergence of a specific market segment for “high quality” local rice, which bifurcated the market for local rice into two distinct segments: a high-end segment with a 15 to 20 percent price premium consisting exclusively of local rice that has been polished and cleaned, and a mass market segment consisting of imported rice and un-cleaned and heterogeneous local rice.

The most important goals of Mali’s rice policy have been to (a) reduce imports, (b) stabilize urban prices and supply, (c) increase and stabilize farmer’s incomes, and (d) promote agricultural exports. The primary means of achieving these goals have been to expand the area under intensive irrigated rice production in the ON. However, outside the irrigated systems of the ON, rice production remains largely dependent on weather vagaries, which lead to weak production and often to total loss of harvest. Thus, the Malian government has pushed heavily to expand irrigated rice production under full water control. For example, the Millennium Challenge Account (MCA-Mali) is financing expansion of the irrigation system at the ON, aiming to eventually add 15,000 ha by 2020. Other major irrigated land development efforts aimed primarily at rice are going on with Libya for 100,000 ha and UEMOA for 11,228 ha (GTZ, 2009). There is also a growing demand from the private sector for land acquisition in the ON for rice, horticulture, and wheat production. This new situation raises some very important issues related to land tenure, farm size and public versus private land development.

The rice schemes of the Office du Niger face structural drainage problems that the rehabilitation works undertaken in the mid-2000s were not able to solve. As in many other irrigation schemes,

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<sup>20</sup> In the past, research has focused on developing improved seed varieties that performed well in irrigated systems. More recent research has focused on creating improved varieties (e.g., NERICA) that are adapted to the harsh growing environment and low-input conditions of rainfed rice ecologies. However, lack of awareness and easy access to information on already established and proven technologies is a constraint to their adoption. Very often, established technologies are not well documented and experiences of their application rarely adequately described. When released, new varieties are typically documented and listed on a catalog. However, since the collapse of the formal extension system in the 1990s, delays in registration of improved varieties in the catalog due to inadequate dissemination has been more common. Farmers’ associations in irrigated zones that have taken over the role of extension services have helped disseminate improved varieties among their members, but farmers who are not formally organized usually have less access to this information. Thus, farmers in irrigated zones have adopted modern rice farming technologies more rapidly than farmers outside those regions.

an inadequate drainage system is an important source of high groundwater tables, water logging, salinization, and eventually yield loss. Drainage problems at the time of harvest in the ON incur increased production costs as well as production and/or quality loss. The principal causes of drainage problems in the ON are the saturation of the drainage system with excess irrigation water and insufficient maintenance of the collector drains. In other words, water being abundant, labor input for water management is minimized by maintaining an over-supply of water in comparison to demand, resulting in an overall irrigation efficiency of about 25% (Vandersypen et al. 2007).

The solution to improve the sustainability of irrigated rice systems consists in improving farmers' water management practices, which depends on two preconditions. First, farmers have to be convinced that drainage problems at harvest are caused not just by the diminished capacity of the collector drain, but partly by their own doing when they over-use irrigation water. In theory, moving to a system of volumetric pricing for water rather than a fixed charge no matter how much water is used, should create incentives for farmers to conserve water, although there are technical problems of monitoring water usage that would have to be overcome to implement such a system (Schrecongost et al. 2004). Second, since the benefits of an individual's efforts often accrue to neighbors or are dissipated through the entire drainage system, water management practices related to drainage need to be tackled at the collective level. The Water Users Associations currently being set up in the irrigation scheme could provide the necessary platform (Vandersypen et al. 2007).

Furthermore, despite the strong underlying demand for Malian rice and constant growth in production, imports have not diminished and exports are still negligible due to several difficulties in the marketing of local rice, notably:

- The lack of a common vocabulary governing quality and varieties. The high quality rice produced in Mali is often referred to as "Gambiaka," which technically is Gambiaka suruni or Kogoni 91-1. However, much of the rice that is called "Gambiaka" is actually a mix of over a dozen other varieties, and thus the name "Gambiaka," means nothing more than irrigated rice from Mali;
- The lack of standard grading systems for rice. Following the introduction of the small-scale millers at the Office du Niger, the overall quality of processed rice declined, as the broken content of processed rice was high and rice was mixed with dirt and other foreign elements. The three main grades for rice classifications that were established in the 1980s before the liberalization of the rice subsector remained, but over the years, there has been little attempt to maintain rigorous sorting with lots being sold in the market having a wide variation of the rate of broken grains, meaning that consumers must inspect each purchase individually since there are no standard labels that can attest to product quality or homogeneity;
- The significant levels of impurities in local rice. Those impurities consist of pebbles, bran, straw, and rice flour that are due to poor quality paddy and processing deficiencies.

Given the underlying profitability of Malian rice, with average gross margin for the farmer of 43CFA/kg and reaching up to 77 CFA/kg in the ON (MA 2009), and the potential to increase

value added, a diverse group of value chain actors, including the two industrial mills belonging to wholesaler/importers, a small number of SME “mini rice mills” and some informal market retailers/sorters who hand sort and clean mixed lots of rice, have started to develop business strategies to capture part of the 15 to 20 percent price premium for the high-end market segment. This market remains small with limited quantities available, and the new private investments flowing to rice production or processing that have been undertaken in recent years are unrecorded. Even though there have been some new investments from the private sector, the magnitude and the nature of those investments is still unknown. Reasons for the lack of private investment in the value chain stem from a number of constraints related to the business enabling environment and the nature of the rice value chain itself. These systemic constraints include:

- The lack of access to bank credit discourages upstream involvement on the part of wholesaler/importers, resulting in a less competitive structure;
- A non-competitive fertilizer market, due to in part strong government interventions and in part to problems of poorly functioning credit markets. Weak and conflicted farmer organizations, some of which have proven effective in facilitating household access to credit, centralizing input orders and providing leverage for extension and training efforts, but many have not been as successful in processing and marketing activities on their own account in part due to politically motivated arrangement (e.g., selling large quantities of rice at below market prices under the rice initiative<sup>21</sup>). As a result, farmers who receive production credits through their farmer organization may reimburse the organization in-kind with paddy; but they rarely market any rice through the farmer organization beyond what they are required to submit to pay back their loan, preferring to sell most of their harvest to collectors;
- The lack of secure land rights and inadequate irrigation infrastructure maintenance have combined to lessen yields and lower paddy quality in the ON. Most of the reasons for the unfulfilled yield potential are thought to be related to inadequate water control—principally the poor drainage in many sections of the ON, which also renders proper drying of harvested rice impossible, leading to high loss rates during hulling.

While the ON currently supplies about 50 percent of the country’s domestically produced rice, the high costs of rehabilitating and/or expanding the existing schemes has prompted policy-makers and researchers to explore the potential for intensifying other production systems, notably *bas-fonds* rice cultivation, which were shown to be relatively profitable in the late 1990s (Dimithe et al. 2000).

*Bas-Fonds Rice.* *Bas-fonds* and flooded plains, which had received limited attention in the past (Dimithe et al. 2000), are now being developed under the rice initiative through the intensification and expansion of controlled flooding systems, and the rapid expansion of upland rain-fed rice led by the introduction of the drought-resistant Nerica 4 variety (OMA 2009). *Bas-fonds* (inland lowland swamps) are largely undeveloped (i.e., little or no water control infrastructure) and are primarily cultivated by women.<sup>22</sup> *Bas-fonds* rice quality is categorized as 45 percent broken rice, which is comparable in quality to Thai A1 super (Diakite 2009).In

<sup>21</sup> See USAID 2009 for more details

<sup>22</sup> Dimithé (1997) reports that among the villages he surveyed in Southern Mali, the proportion of women involved in *bas-fonds* rice production ranged from 45% (in the Sikasso area) to 88% (in the Bougouni area).

contrast to irrigated rice, which is cultivated on relatively larger farms in a low-risk environment with a clear commercial strategy, *bas-fonds* rice tends to be cultivated on smaller areas within the context of a more diversified cropping mix. Although there may be marketed surpluses, the objective of maximizing cash sales revenue from rice has been a secondary concern as *bas-fonds* rice was primarily produced to meet household consumption objectives. However, *bas-fonds* rice production appears to have great potential for expansion and yield increases through better water control, better rice management and planting, and better seed varieties.

Several studies have shown that it is less costly, in financial terms, to produce 45 percent broken rice quality in the *bas-fonds* than in perimeters managed by the ON. Dimithé et al (2000) demonstrated that this was the case in the late 1990s, and other studies (Ministère de l'Agriculture, 2009 and Diakité, 2009) estimated that the unit cost of production of rice in the *bas-fonds* averaged 96 CFA/kg compared to 130 CFA/kg in the ON. Adjao (2011) found that while *bas-fond* rice is more costly to produce than irrigated rice from the ON in financial terms (i.e., 109 FCFA/kg in the *bas-fonds* compared to 74 FCFA/kg in the ON), it is less costly in economic terms (i.e., 76 FCFA/kg in the *bas-fonds* compared to 92 FCFA/kg in the ON)<sup>23</sup> Despite lower production costs, full-water irrigated rice was found to be more profitable than *bas-fond* rice, in both financial and economic terms, due to the price premium for irrigated rice (Adjao 2011). These results contrast with previous findings from Dimithé (2000), who assumed no price differential between *bas-fond* and ON rice. Furthermore, the economic profitability of Malian rice, produced in both the *bas-fond* and the ON, has significantly increased since the late 1990s, mainly due to higher world rice prices (i.e., a 120 percent increase in CIF prices since the late 1990s) (Adjao 2011).

Similar cost advantages apply in comparing *bas-fonds* production to flooding systems (controlled and uncontrolled). Even though the areas under flooding in the Mopti and Ségou regions far exceed the area under *bas-fonds*, and thus have much more potential to increase domestic rice production, they also have the highest production costs among all rice production systems (i.e., up to 192 FCFA/kg), and the costs of improving water infrastructure in flooded plains far exceed the costs of comparable endeavors in the *bas-fonds* (up to 1.6 million FCFA/ha in flooded plains versus 600 000 FCFA/ha in *bas-fonds*, see Table 16).

Given its low production costs and its low water improvement costs, *bas-fonds* rice production is seen as the most cost-effective complementary production system to the large government-managed irrigated schemes, and developing the untapped potential of Mali-Sud's *bas-fonds* would significantly contribute to the government's effort to boost domestic rice production. Dimithé estimated in the late 1990s that if all of southern Mali's *bas-fonds* were brought into production, it would increase rice production by the equivalent of 31% of the total paddy produced by the Office du Niger. This contribution could be even more significant, if greater attention is given to addressing constraints that limit intensification of these systems. USAID (2009) estimates that there are up to 300,000 ha available throughout Mali suitable for *bas-fonds*

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<sup>23</sup> Financial costs refer to the costs currently borne by farmers given existing market prices, including any taxes and subsidies. Economic costs refer to the cost to the country as a whole, netting out the cost of taxes and subsidies and valuing all inputs and outputs at their opportunity cost. Economic costs reflect the comparative advantage of the different rice production systems.

rice production, with a potential yield of 3 tons per ha, implying a total production potential of 900,000 tons of paddy.<sup>24</sup>

Such efforts have already been undertaken, especially with respect to improving water management. While the rice initiative focuses its efforts on expanding area cultivated under irrigated systems, Mali's Priority National Investment Plan for the Agricultural Sector (PNIP-SA) focuses its investments on community-level irrigation with the development of 27,027 hectares in areas including *bas-fonds*, flood plains, ponds, village-level irrigated perimeters, horticultural perimeters, dry riverbeds (*wadis*) and oases with the objective to increase production by 258,000 tons of paddy rice by 2015, with total anticipated investments of 168.5 billion FCFA (317.9 million US dollars) (ECOWAS 2010). According to the most recent agricultural census of 2004, 170,000 households are involved in rice production, accounting for 21 percent of the 805 000 agricultural farms in Mali, while only 4 percent of farms are located in the ON. Furthermore, the development of high-yielding varieties that are appropriate for the *bas-fonds* environment, including NERICA, could enable a greater intensification of *bas-fonds* rice farming. The drought-resistant Nerica 4 variety has been introduced in *bas-fonds* systems under the rice initiative, but more testing and research needs to be done to develop appropriate complementary technologies to relax fertility, pest, and disease constraints. *Bas-fonds* rice research in Mali, launched in the mid-1980s by the national agricultural research institute (*Institut d'Economie Rurale* (IER)), is currently undertaken primarily by the Farming Systems Research Program (ESPRN) and the Bas-Fonds Rice projects (PRBF), both based in Sikasso, as well as the Subsector Economics Program (ECOFIL) based in Bamako. However, these programs' research activities in the *bas-fonds* have been limited in scope due to limited funding and human capital. Unless sufficient financial support is available, it will be impossible to carry out the research required to generate appropriate technologies suitable for intensifying *bas-fonds* rice farming. Thus, for these efforts to succeed, the Malian agricultural research system must mobilize a political constituency in support of agricultural research on *bas fonds* production systems.

Five cropping systems based on rice cultivation have been identified in the *bas-fond* of Southern Mali, including (1) pure rice cultivation, (2) intercropping rice with potatoes, (3) intercropping potatoes with rice, (4) intercropping rice and potatoes with eggplants, and (5) intercropping rice and potatoes with sweet potatoes. Profitability analysis of these different systems, in financial terms, revealed intercropping of rice with potatoes to be the most profitable systems and rice systems in pure cultivation to the least profitable one. While most women cultivate rice during the rainy season and the vegetables in the off-season, the monoculture of rice is mainly carried out by women. In fact, *bas-fonds* rice cultivation is considered a "female" activity, while potato growing is exclusively a "male" activity in the family fields and involves use of improved mechanized inputs and monetary investments for the purchase of improved seeds and fertilizers. The areas allocated to women are small and vary according to availability of land resources, with land plots varying between 0.1 and 0.5 ha. Furthermore, women have very limited means and have very narrow margins in their ability to access inputs and credit (Adetonah et al., 2010).

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<sup>24</sup> The USAID figures are potentially subject to a large margin of error. Dimithé reported in the late 1990s that the area available for *bas fonds* production in southern Mali was slightly under 50,000 ha, with a mean yield in improved systems of 2.4 tons/ha.

Efforts to modernize rice farming in Mali have largely centered on promoting the adoption of modern varieties and increased use of fertilizer and herbicide, all of which require capital. Yet, although *bas-fonds* rice farmers are predominantly women, existing institutional arrangements do not provide women direct access to new rice technologies and other resources such as credit.<sup>25</sup> This condition is worsened by the patriarchal nature of the rural social structure which tends not to expect women to generate household income. As a result, women have limited access to household resources for investing in rice inputs.

*Growth Linkages* Expansion of rice supply to the domestic and regional markets can contribute to poverty reduction by creating employment opportunities for agricultural laborers and increasing the demand for inputs and services. Increased rice supply through expansion of irrigation can contribute to developing the production of horticultural products (especially in the dry season), which are produced mainly by women and represent 40 percent of the agricultural income in the ON. Expanded rice production has also the potential to expand the demand for transport services for inputs and rice, as well as packaging materials, thus, creating additional wealth through its multiplier effects. Furthermore, addition of fish to full-control irrigated rice could double per hectare income in the ON. Some testing and research on fish/rice intercropping technologies is currently being conducted at IER in the ON and Baguineda, but more work is needed.

*Possible Interventions for USAID.* One possible intervention for the USAID would be to help Mali with its efforts to develop water infrastructure construction in marginal lands including flooded plains and *bas-fonds* given the high potential of those systems to increase rice production.

Imperfectly operating credit markets continue to be a problem in Mali. USAID could support creative efforts to find new solutions to the agricultural credit problem, including mobile and cell phone banking and commitment savings devices for fertilizer purchases.

Cross-cutting issues that affect the rice sector as well as other value chains concern both the agricultural research system and the extension system. Researchers often lack the incentive to produce adequate packages and technologies for farmers. Some revisions of the incentives within IER and other research institution will be necessary to hasten the release of appropriate technologies (i.e., better seed varieties, new intercropping techniques, etc.). Once those technologies are released, an extension system will be needed for more rapid diffusion. The lack of an effective extension system is a key constraint, and USAID could help Mali in its efforts to hire and train more extension agents, including female agents in rural areas, given the government's will to improve gender justice.

#### 3.2.4. Maize

For two decades, maize has experienced the fastest growth of the rainfed coarse grains cereals in Mali. After being cultivated at low level during the first years after independence, maize was adopted by farmers during the early 1970s as an important crop for lean seasons and crop diversification. Its production was intensified in the CMDT and OHVN zones in the South

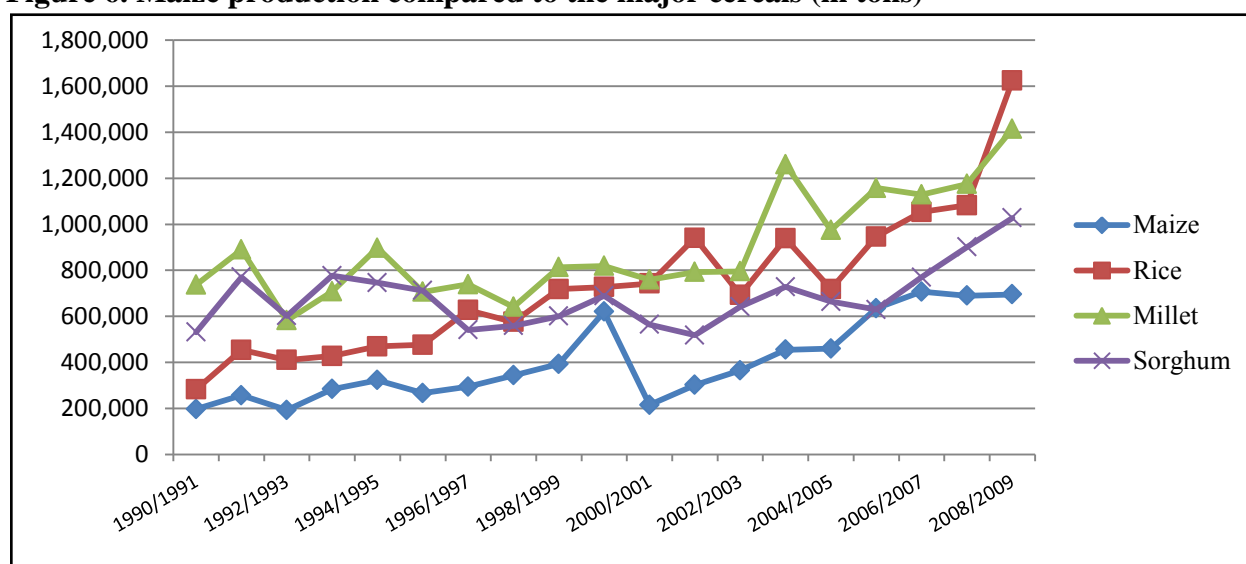
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<sup>25</sup> Dimithé (1997) reported that in the villages he surveyed in southern Mali, the percentage of women involved in *bas-fonds* rice production ranged from 45% (in the areas near Ségou) to 88% (in the areas around Bougouni).



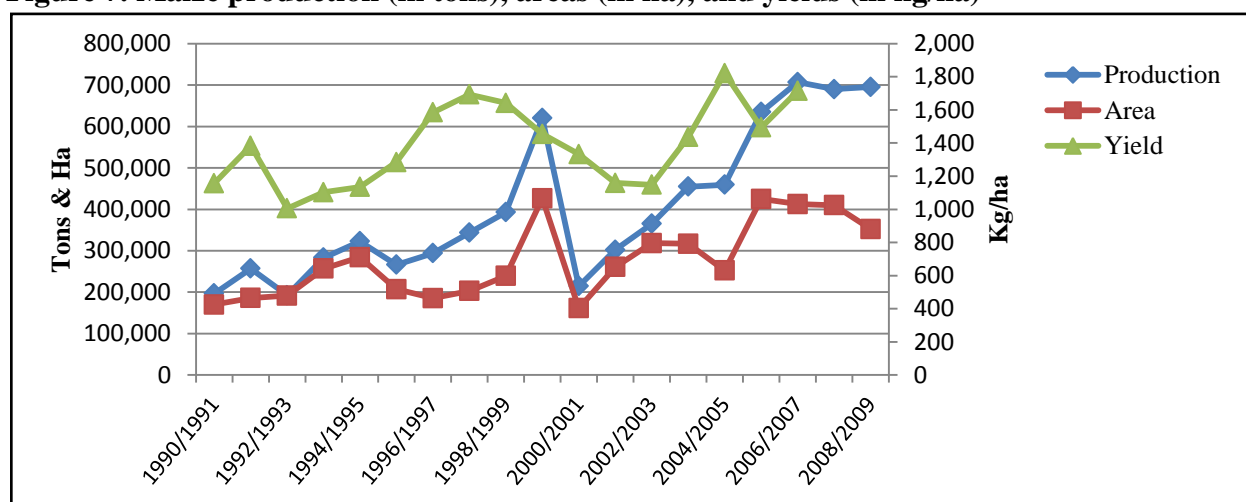
during the 1980s. As shown in Figure 6, maize production increased from about 200,000 tons in 1991 to close to 700,000 in 2009. Maize production followed cultivated area closely until 2003, then, the increases in yield began to account for more of the production growth; this shows the process of intensification (see Figure 7). The share of maize production in the total cereal production increased from around 10 percent in 1991 to close to 18 percent in late 2000s (INSTAT); maize has the highest yields among all coarse grains with a yield that could be about 5 tons per hectare in certain southern production zones (Coulibaly, et al. 2007).

**Figure 6. Maize production compared to the major cereals (in tons)**



Source: Figure drawn from INSTAT data

**Figure 7. Maize production (in tons), areas (in ha), and yields (in kg/ha)**



Source: Figure drawn from INSTAT data

The total value of maize production in food crop production rose from CFA 16.7 billion in 1991 to 42 billion FCFA in 2008. The large spike in maize acreage and production in 1999/2000 corresponded with a strike by many cotton producers in the CMDT zone and reflects their shift into maize and cereals that year in lieu of cotton. Maize accounted for 7.7 percent in Mali's total

agricultural GDP in 2008; it was 5.7 percent in 1991 (INSTAT). Moreover, maize consumption in Mali, which was about 250,000 tons in mid 1990s (Sissoko, 2005), has more than doubled to 704,000 tons in 2007 (Teme et al., 2010).

*Subsector organization* Since the cereal market reforms of the early 1980s, which liberalized cereal market and transferred commercial trade from the public to the private sector, the marketing of maize grain (like other coarse grains) has involved several actors. The main marketing functions are exercised by farmers, collectors, wholesalers, semi-wholesalers, the retailers, and other agents providing various services such as transport and storage. Maize producers are mainly in the Sikasso region, where more than 60 percent of the production takes place. The grain marketing structure utilizes a large number of collectors in the production zones linked to wholesalers who are the actual engine of the system, as they buy large quantities of maize grain and supply markets. Wholesalers do not buy directly from producers except from very large producers who are able to supply them directly. The bulk of wholesalers sourcing of grain is done through collectors and semi-wholesalers who do assembling in the production zones (Samaké et al. 2008b).

Although some forms of contracting are emerging slowly in Mali's cereal sector, there are practically no contracts between farmers and other actors of the value chain, since most farmers are still producing mainly for their own consumption. The lack of contracting increases supply risks for some major maize users, particularly in the poultry sector. Despite the increasing number of small processing and semi-industrial units in Bamako, most maize is sold in grain form, as low costs of household labor limits demand for processing services. In the late 1980s, a dozen milling units for women were launched in the CMDT zone for grain processing; however, it was not a successful experience due to the poor quality of the flour produced (de-germing and hulling problems) and marketing and management issues. Also, the *Grands Moulins du Mali*, a large processing unit that produces industrial flours and poultry feeds, is constrained by high marketing costs and high prices of raw materials; it has been seeking government to help promote its products (Tall, et al. 2007).

*Performance 1991-2009.* The situation of the maize subsector, as described in the 2001 Agricultural Sector Assessment, was one of increased production over time. In addition to area expansion, good rainfall and fertilizers played a huge role in that production hike. Maize had benefited from the higher rainfall in the South and cotton fertilizers through crop rotation. The 2001 Assessment had projected a continuing increase in production and demand through 2009, especially demand for human consumption, but with a potential growth opportunity as well from the livestock subsector. Furthermore, a growth in regional trade for coarse grains with countries like Mauritania and Senegal (that have demand for poultry feed) was expected.

The actual performance as of 2009 was close to that projected in the 2001 report. Maize production has continued to increase. However, it is striking that maize production, which was mainly supported by cotton, has continued to increase despite the crisis in the cotton sector, as maize has increasingly become a cash crop in its own right. Also, farmers' increased spending on fertilizers has sustained maize production. Moreover, the improved maize varieties (see Table 17) such as Sotubaka, Niéléni, and Dembanyuman, have helped expand production and are well appreciated in Malian markets.

**Table 17. The most widely used maize varieties**

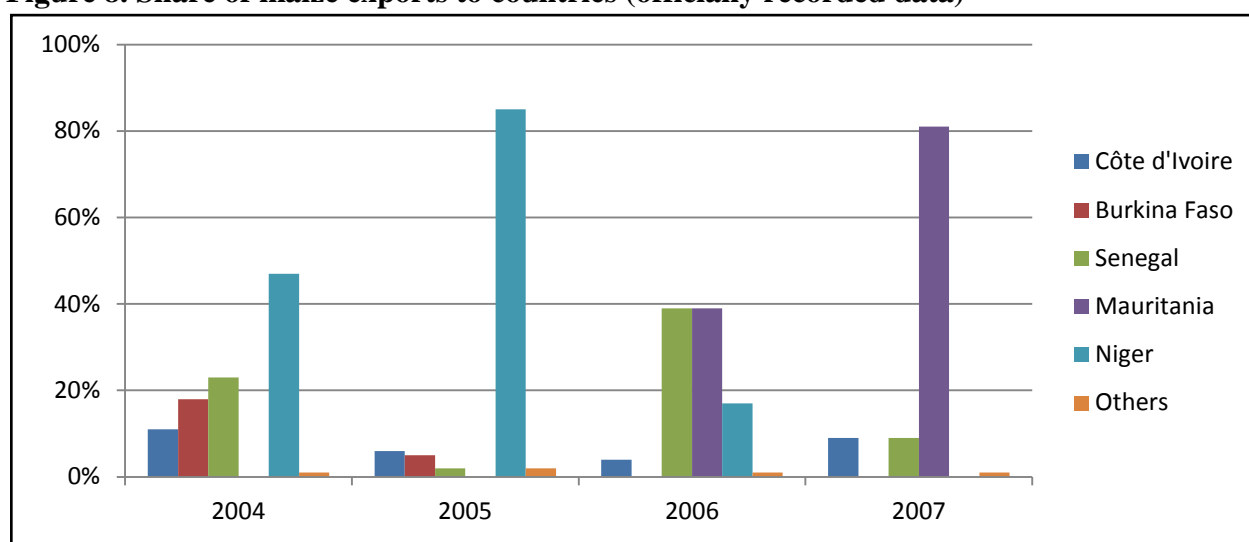
Varieties	Year	Cycle	Yield	Milling	Grain type	Weight of 1000 grains
		<i>days</i>	<i>tons/ha</i>	<i>%</i>		<i>g</i>
<i>Tiémantié</i>	1970	110 – 115	4 – 5	84	yellow	235
<i>TZESRW</i>	1983	80 – 90	3 – 5	80	white dent	235
<i>Sotubaka</i>	1995	115 – 120	5 – 7	85	yellow flint	250
<i>Niéléni</i>	1995	80 -90	4 – 5	84	yellow flint	250
<i>Apollo</i>	1996	65 -75	3 – 4	80	yellow flint	213
<i>Dembanyuman</i>	1998	105 – 110	4 – 5	80	white dent	310

Source: IER Programme Maïs / Afrique Verte

Livestock feed has definitely been an expanding demand opportunity for maize since 2000. The *Direction Nationale des Industries de Production Animale* estimated that more than 30,000 tons of maize grain are used yearly as feed for cattle and poultry; maize grain accounts for 60 to 70 percent of poultry feed rations. The rapid urbanization in Mali has expanded substantially the demand for poultry (see section 3.4) The Mali Poultry Development Project (PDAM) estimated 70 million chickens and 21,000 tons of poultry meat have been marketed annually since 2005. Also, the increased demand for eggs is helping to drive poultry production.

Mali's exports of maize ranged officially from around 5,000 to 10,000 tons from 2002 to 2006 (INSTAT); however, most cross border trade is informal and not quantified. Mali also imports maize seasonally from Côte d'Ivoire and Ghana, with imports concentrated in the May-July period, before the new Malian maize crop is harvested but when maize is being harvested along the humid coast. Later in the season, the trade flows reverse, as Malian maize helps fill a seasonal shortage in Côte d'Ivoire as well as growing demand in neighboring Sahelian countries. The main export market historically was Côte d'Ivoire, but recently, as predicted in the 2001 Assessment, it shifted to Senegal, Mauritania, and Niger (see Figure 8) where the demand for poultry feed is also important and road access from Mali has recently improved. Around 2,000 to 11,000 tons of maize grain is imported annually, mainly from Côte d'Ivoire before the lean season (INSTAT).

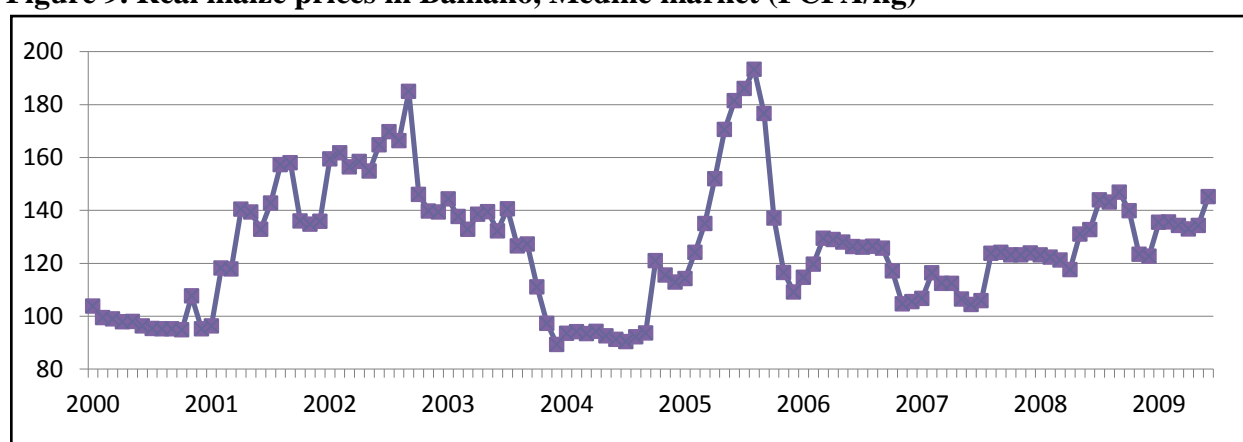
**Figure 8. Share of maize exports to countries (officially recorded data)**



Source: Figure drawn from INSTAT/CPS data

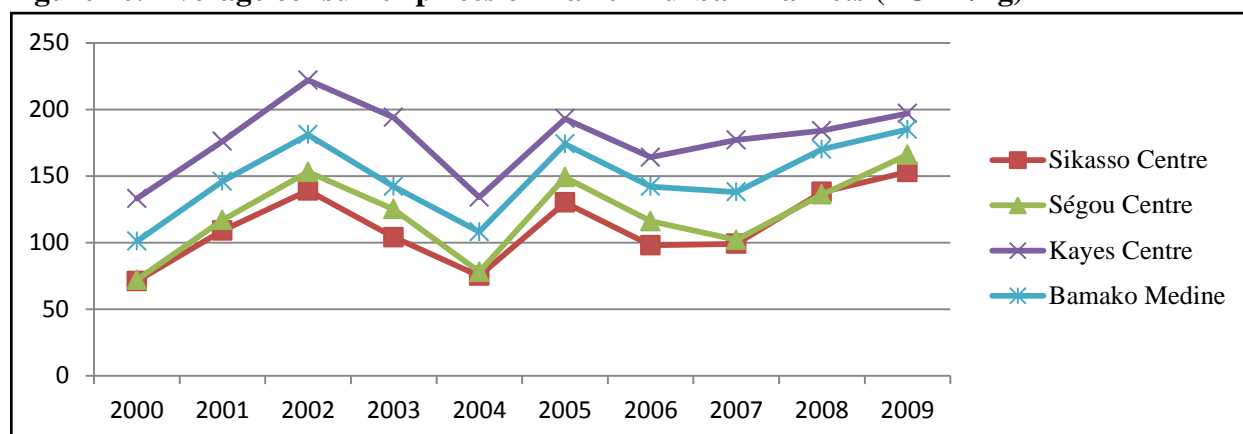
With respect to prices, real consumer prices for maize in 2009 are higher than in 2000. In the Bamako Medine market, for instance (see Figure 9), real consumer prices increased dramatically from 2000 to 2005, and moderately between 2006 and 2009. Although other factors affect prices, the increase in price while supply is also increasing suggests a demand pressure and the competitiveness of maize compared to other coarse grains. On the other hand, the margins between consumer prices across markets are narrowing, and the prices at both producer and consumer levels are evolving together (see Figure 10 and Figure 11). This suggests that markets are becoming more integrated. Finally as shown in Figure 12, the share of producers' prices in both the wholesaler and consumer prices in the Sikasso region is high (80 to 90 percent and 70 to 80 percent, respectively), indicating that farmers are capturing much of the benefits of the increase in demand for maize.

**Figure 9. Real maize prices in Bamako, Medine market (FCFA/kg)**



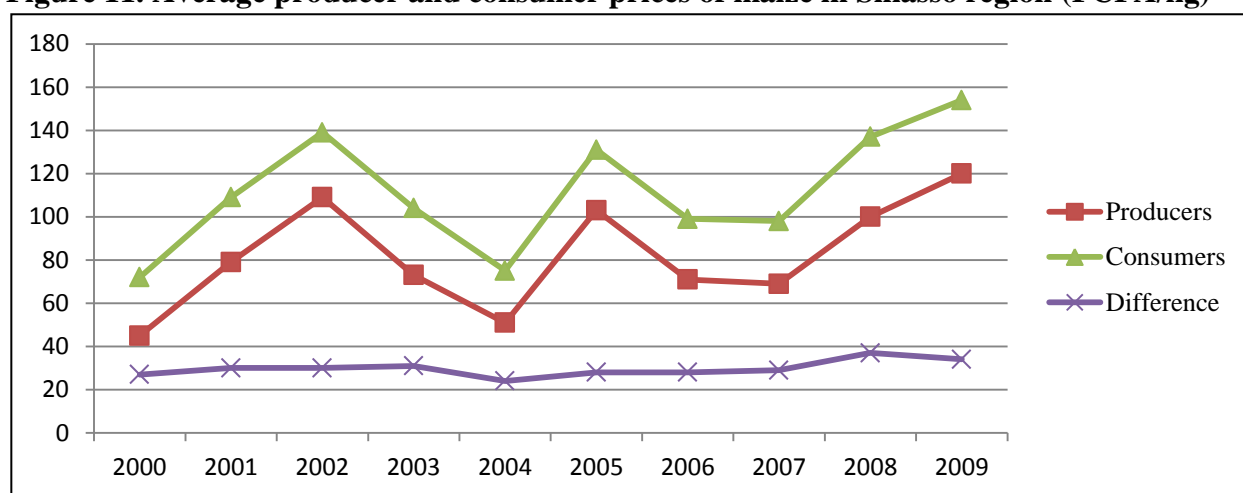
Source: Calculated from OMA's data; nominal prices were deflated by the CPI and are expressed in 2000 price levels.

**Figure 10. Average consumer prices of maize in urban markets (FCFA/kg)**



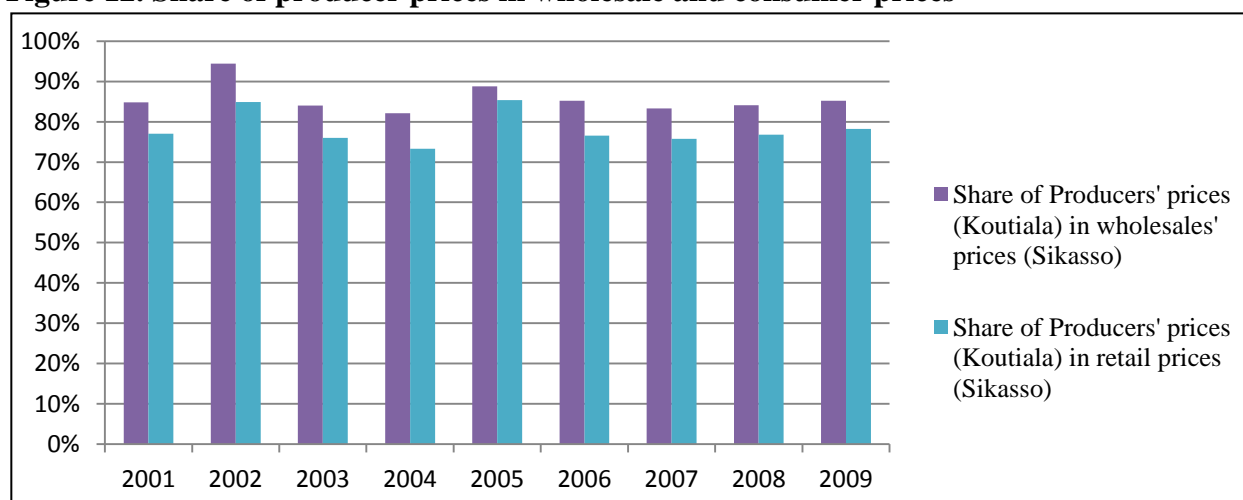
Source: Figure drawn from OMA's data

**Figure 11. Average producer and consumer prices of maize in Sikasso region (FCFA/kg)**



Source: Figure drawn from OMA's data

**Figure 12. Share of producer prices in wholesale and consumer prices**



Source: Figure drawn from DNSI/CPS's data

*Growth potentials, opportunities, and linkages.*

The maize subsector will continue to grow, as farmers and other private-sector actors expand their investments in response to growing demand. The government has already stepped up efforts to increase cereal production from 3.6 million tons in 2007 to 10 million tons in 2012, with a 40 percent increase anticipated for maize production (Coulibaly, N. 2008). These are very ambitious, perhaps unrealistic, short-term production targets, but they signal the importance the government is assigning to the cereals sectors. Thus, a *Maize and Wheat Initiative* aiming at enhancing maize and wheat production, mainly through fertilizer subsidies, was launched following the *Rice Initiative* in 2008. According to the Ministry of Agriculture, a total production of more than 2 million tons of maize grain is expected for the 2010-2011 campaign, although in our view, this target is overly optimistic. This production level, if achieved, would more than cover anticipated domestic consumption, which is expected to rise to 851,000 tons in 2011, and then to 1,107,000 tons in 2015 (Teme et al. 2010). The potential excess of domestic production above domestic consumption (at current trends) thus could exceed a million tons in the upcoming years. This will force maize producers to search for additional opportunities beyond human consumption, which currently accounts for 80 to 90 percent of total production. Demand for poultry feed, both domestically and in neighboring countries, will undoubtedly be the second major market for maize. The urban population demand for more chicken meat and eggs will make the poultry sector consume more maize. A new milling firm, *Moulins du Sahel*, opened in December 2010, with a planned processing capacity of 120 tons per day of maize/millet and storage of 12,000 tons. It will begin marketing, in 2011, a 1 kg pack of maize flour aimed at urban consumers is adding to the existing maize consumption units for poultry feed. The firm becomes the third large-scale industrial grain miller in Mali, in addition to the Grands Moulins du Mali (Groupe AMI) and the Grand Distributeur Céréalière au Mali (GDCM-SA). Other opportunities for utilizing the increasing maize supply will be food industries (biscuits, breads, baby foods, etc.). Also, it should be noted that Mali's brewing company (*BRAMALI*) has a yearly demand of 1,080 tons of maize grits. Some bakeries are ready to substitute 5 percent of their wheat flour with maize flour; given a reliable supply and stable prices, this could represent an estimated potential additional demand of more than 15,000 tons of maize grain per year (Kone, 2005). Finally, export markets in neighboring countries could further expand; the annual total maize import in West Africa is estimated to be more over 298,000 tons in 2008 (FAOSTAT, 2011). Combining all these potential demands, Diallo (2011) estimates total potential demand for Malian maize at roughly 1.3 million tons in 2015 at current price levels.

*Gender aspects* Maize production is a family enterprise in the CMDT zone, so expanded maize production, while potentially increasing household incomes, may also increase demands on women's time for certain field operations, such as weeding and harvest. Many women, however, are involved in maize marketing (particularly of fresh maize) and in small-scale maize processing. Expanded maize production and demand has the potential to expand these businesses. In addition, the *Zones Greniers* program, which was launched by the Ministry of Agriculture and the Alliance for Green Revolution in Africa (AGRA) for an integrated sustainable transformation of the cereal sector, plans to create or rehabilitate 10 to 20 milling units (each one having a processing capacity of 300 to 600 tons per year) in villages in the Sikasso region (Teme, et al. 2010). Some of the women's milling units in the CMDT zones mentioned earlier could get back on their feet through this program.

*Importance for poverty alleviation*

Expansion of maize production and marketing can have positive effects on food security through expanding farmer and processor incomes. To the extent that the expansion takes place through unit-cost reducing technologies, it may also result in lower consumer prices. Whether this occurs will depend in part on how quickly export demand expands; higher exports will tend to hold prices up (a plus for net sellers of maize, but not a benefit for lower-income consumers).

*Key constraints, risks, and vulnerabilities.* If reliable contract enforcement incentives can be designed into agreements, a movement towards contracting with major users of maize grain (e.g., poultry processors) could reduce the market risk for both buyers and sellers. In addition, there is a need to improve information flows between producers, marketers, and buyers.

Producer prices for maize still remain volatile, but as maize becomes more of a cash crop, the market should become less thin and hence volatility would be expected to decrease. An analysis of the past 20 years' producer price data for Koutiala shows that while expansion of the maize market has led to a decrease in within-year seasonal price fluctuations, the variability of year-to-year prices has increased. The latter likely reflects greater regional integration of Malian markets with those of neighboring countries, so that demand and supply shocks from those countries (particularly countries like Niger where production is more volatile) now spill over more onto Malian markets. It further suggests that managing inter-annual price risk may have become more challenging for farmers and traders over the past 20 years (Diallo, 2011). A movement to greater contracting could also help stabilize returns. Currently, prices follow a fairly predictable seasonal pattern: they are low during the first four months after harvest and high toward the lean season (see Table 18). As shown in Figure 13, most producers sell much of their maize during the periods directly after harvest. They sell their grain for liquidity purposes, and also cannot stock in large quantity because of storage infrastructure issues.

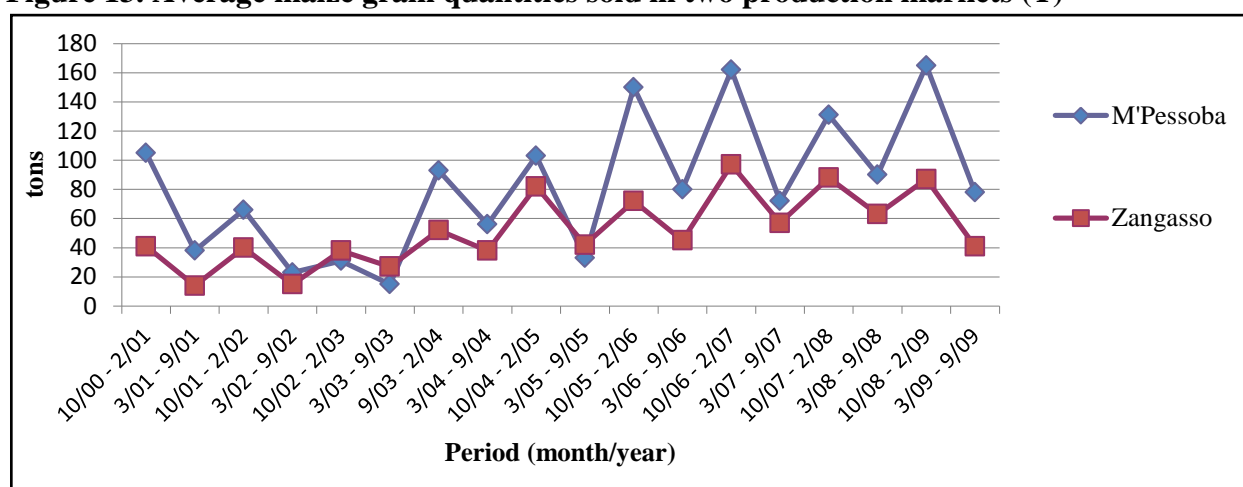
**Table 18. Average maize producers' prices in Koutiala (PP, CFA/Kg)**

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Oct-Feb PP	87	100	40	76	78	59	84	101
Mar-Sept PP	128	90	53	135	81	74	119	120
Margins	41	-10	13	59	3	15	35	19

Source: Calculations done from OMA's data

Other constraints to expansion of regional maize trade include poor (but improving) road conditions and continued unofficial trade barriers. Farmers also need quality improvements in order to meet competitive standards, particularly for the feed industry. Finally, rainfall instability in Mali is a major constraint, as maize relies heavily on good rainfall.

**Figure 13. Average maize grain quantities sold in two production markets (T)**



Source: Figure drawn from OMA's data

A potential vulnerability that should be monitored is aflatoxin contamination of maize. Although no concrete information is yet available on the extent of aflatoxin contamination in Malian maize (personal communications Rooney, Sanders, Pendleton, and Narrod)<sup>26</sup>, it has become a major issue in Benin, and Togo, where it has gotten into the food chain at such high levels that it is having negative impacts on children's health (Egal, 2005) and in Kenya (CIMMYT 2011). The Bill and Melina Gates foundation is currently funding a study to identify improved means for assessing and controlling aflatoxin in Malian peanuts and in Kenyan maize. The study is being conducted by a consortium of research institutes led by Clare Norrad, Senior Research Fellow at IFPRI, who has expressed interest in looking at maize in Mali if funding were made available (personal communication). In general, maize is more vulnerable to aflatoxin contamination than is millet and sorghum (personal communication Sanders and Rooney). Should Mali be found to have high levels of aflatoxin in maize, maize's competitive advantage vis a vis sorghum as an input to animal feeds as well as in use for human consumption would need to be reassessed taking into account the added costs of controlling for aflatoxin.

### 3.2.5. Millet and Sorghum

*Overview of the sector and its structure.* From 2006/07 through 2008/09, millet and sorghum have represented 73-76% of land cultivated in cereals and 51-62% of total cereal production (Ministry of Agriculture, January 2009)<sup>27</sup>. Given their relatively low cost for consumers

<sup>26</sup> Dr. Lloyd W. Rooney, Regents Professor and Faculty Fellow at Texas A&M and an expert in aflatoxin contamination. Personal communication

John Sanders works in the USAID-funded INTSORMIL program at Purdue. Personal communication.

Dr. Bonnie B. Pendleton, Associate Professor of IPM – Entomology at West Texas A&M University and has worked on storage issues in Mali. Personal communication, March 2011.

Clare Narrod, Senior Research Fellow at IFPRI in the Markets, Trade, and Institutions Division and manages the Gates-funded research on aflatoxin in Kenya and Mali. Personal communication, March 2011.

<sup>27</sup> There was considerable controversy over the estimates of rice production during the 2008/09 campaign. Our crop shares are based on those contained in the cited publication (1,624, 246 tons of rice) but want to note that other official sources (CPS) reported rice production of only 1,309,758 tons (81% of the published estimate). With the alternative estimate for rice, millet/sorghum would have been 55% of 2008/09 production rather than 51% and rice would have been 28% rather than 33%.



compared to rice and their large share of domestic cereal production, the two crops make a critical contribution to national food security as well as to the food security of rural farm households that are not well integrated into markets. In the “traditional sector,” which does not benefit from the higher levels of investments in research, extension, and infrastructure that are commonly found in the cotton and irrigated rice zones, these crops are the mainstay of the farming systems and grown primarily for home consumption. Millet and sorghum are also grown for home consumption by farmers in the cotton zone and some farmers in the Office du Niger who produce the crops on non-irrigated (*hors casiers*) land, relying on irrigated rice for a cash crop. We know of no nationally representative estimates of millet/sorghum sales for Mali as a share of total production, but available evidence suggests that it is relatively low compared to maize and rice. Data from a 2006/07 survey conducted in three production zones in Mali showed 4% of production sold in Tominian (a deficit production zone) and only 3% in Macina (primarily a rice production zone). In Koutiala, a major cereal production zone in the CMDT, 2006/07 sales represented 9% of millet production and 14% of sorghum production. Results for the 2008/09 season are generally lower; for millet and sorghum combined sales were <1% of production for Tominian, 2% for Macina, and 7% for Koutiala. Based on this survey data, we estimate that not more than 20% of national millet/sorghum production is likely to be marketed in a year of good production (most by farmers in the Ségou and Sikasso regions), with the average across years probably being 10% or less.<sup>28</sup>

The Malian government’s very ambitious cereal production objectives (Ministry of Agriculture, January 2009) involve continued increases in the absolute amount of millet/sorghum production but a relatively sharp drop in its share of total cereal production (from its present level of 50-60% to 33% by 2012/13). Increases in maize production are expected to compensate, by moving that crop from 15% of production to 39%. Nonetheless, the millet and sorghum value chains are key components for planned government investment under the PNIP-SA.

As of early 2009, the officially announced (Ministère de l’Agriculture, 2009b) approach to sorghum was:

...to limit area cultivated and improve yields in the principal production zones (southern region, areas of recessionary or dune agriculture where appropriate varieties have been developed) by the use of agroforestry practices, soil and water conservation techniques, crop rotations, and organic fertilizers. Varieties to encourage will be those that produce white flour, which is better adapted to industrial processing.” (translated from the original French).

By September, 2010, the PNIP-SA had expanded this approach to include a plan to intensify sorghum production on 30% of its currently planted acreage, with the aim of raising average yields from roughly 1 ton/ha in 2010 to 2 tons/ha on this area by 2015 (République du Mali, 2010). For millet the official approach is to encourage the crop primarily in the central part of the country (Ségou and Mopti) where millet production is important in terms of food security.

The structure of the sector is similar to that described for maize. The main marketing functions

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<sup>28</sup> The 2006/07 and 2008/09 production seasons were characterized by lower than average rains in the Koutiala zone, so the data do not reflect well what would happen in terms of sales during an average or better than average production season.

are exercised by farmers, collectors, wholesalers, semi-wholesalers, retailers, and other agents providing various services such as transport and storage. The grain marketing is structured by a large number of collectors in the production zones linked to a small number of wholesalers who are the actual engine of the system (Samaké et al. 2008a). Contracting is rare, but there are some recent USAID programs (PMP, IICEM, INTSORMIL) that have been supporting farmer organizations in an effort to help them supply processors with better quality grain that obtains higher prices (see below).

*Performance.* The 2001 USAID Agricultural Sector Assessment (Tyner et al. 2001) identified the key constraints of the millet/sorghum sectors as rainfall variability, lack of appropriate input packages, and poor post-harvest handling resulting in poor quality of marketed grain and little value added. Opportunities noted included: growing domestic demand for millet/sorghum for both human consumption and animal feeds as well as growing regional demand, particularly from Senegal and Mauritania. The report noted that Mali exhibited a strong comparative advantage in the production and marketing of coarse grains for local and regional consumption based on work by Barry (1994) and Stryker et al. (1987) (we have not found any updates of these analyses).

In terms of recommendations, the 2001 assessment focused on technology issues, noting that: "...yield increases for sorghum and millet of 20-30 percent might be possible if improved seed varieties were more widely available and used in combination with fertilizer and water retention technologies." Recognizing the inherent difficulties in building a profitable commercial seed sector for millet and sorghum, the assessment team proposed "...that USAID provide assistance to NGOs and/or producer associations who would do the seed multiplication and dissemination.... The system also should include demonstration plots on farmer fields widely spread around the country to demonstrate the benefits of improved seed and fertilizer use." To further refine the recommendations, the team noted a need for a study to better understand the types of "...mechanisms to use to encourage seed multiplication by producer associations and/or NGOs..." and "...the potential gains from widespread adoption of improved varieties... to serve as a check on the benefits of undertaking this activity."

Because of the importance given to seed by the 2001 Assessment, we review developments concerning production and use of improved millet/sorghum seed before turning to our overview of the more general performance of the entire millet/sorghum value chain.

The emphasis in the 2001 Assessment was on seed supply issues with the medium term objective (5 years) being the transfer of R1 and R2 seed production activities to the private sector. A recent study of millet/sorghum seed value chains has shed more light on some of the challenges of improving both supply and demand of improved millet/sorghum seeds (Diakité et al. 2007). The report notes that:

There is no consensus regarding whether it is lack of effective demand or insufficient seed supply that is the foremost constraint to use of certified sorghum and millet seed in Mali. Effective demand of farmers remains poorly understood. Even if demand is limited, however, it is evident that the supply of certified seed in many rural areas is hard to find. Total supplies of R1 and R2 seed produced represent an estimated 2-5% of the area sown to the crops each year (Diakité et al. 2007 p. 27).

The authors noted increased production of improved sorghum seed during the decade preceding their report (229%) but little progress for millet (2%). Estimated area cultivated with improved varieties ranged from 1-2% for millet between 1996 and 2006 and from 2 to 6.5 % for sorghum; inter-annual changes were erratic with no clear positive trend. These estimates were based on information about the amount of seed produced. An alternative source of information on use of improved seed is the CPS annual agricultural survey, which reported very limited use of improved seed for the 2007/08 season. Only farmers in the Sikasso Region reported using improved millet seed, with just 2% of millet area cultivated in Sikasso benefiting. For sorghum, only farmers in the Kayes Region reported using improved seed, covering 4% of that region's sorghum area. Information on the use of improved seed is not found regularly in annual CPS reports, so it is difficult to track changes at the regional or national level.

The following observations about the organization of the millet/sorghum seed sectors are drawn from field work conducted in 2007. These organizational points will need to be kept in mind as USAID develops strategies to improve the performance of the overall millet/sorghum value chains (Diakité et al. 2007, p. 12):

- The vast majority of sorghum and millet seed grown is supplied by farmers, is not certified, and is regulated by social norms and custom rather than formal structures;
- Farmers are quite active in diversifying their seed supplies, as long as this does not involve money;
- Farmer-supplied seed does enter village markets, but is more often exchanged among farmers without the use of cash;
- Neither agro-input dealers, nor grain traders, nor shopkeepers are active in supplying certified seed of sorghum and millet, although they are active in rice and horticultural crops;
- The formal seed value chain has almost no interface with village markets where farmers are active as sellers and buyers;
- The formal seed production and supply chain is still heavily state-based despite the stated plan to privatize the production and distribution by 2002;
- There is no clear relationship between the formal seed chain and the formal grain marketing chain, which is needed to transmit market-related signals to farmers, such as seed-to-grain price ratios.

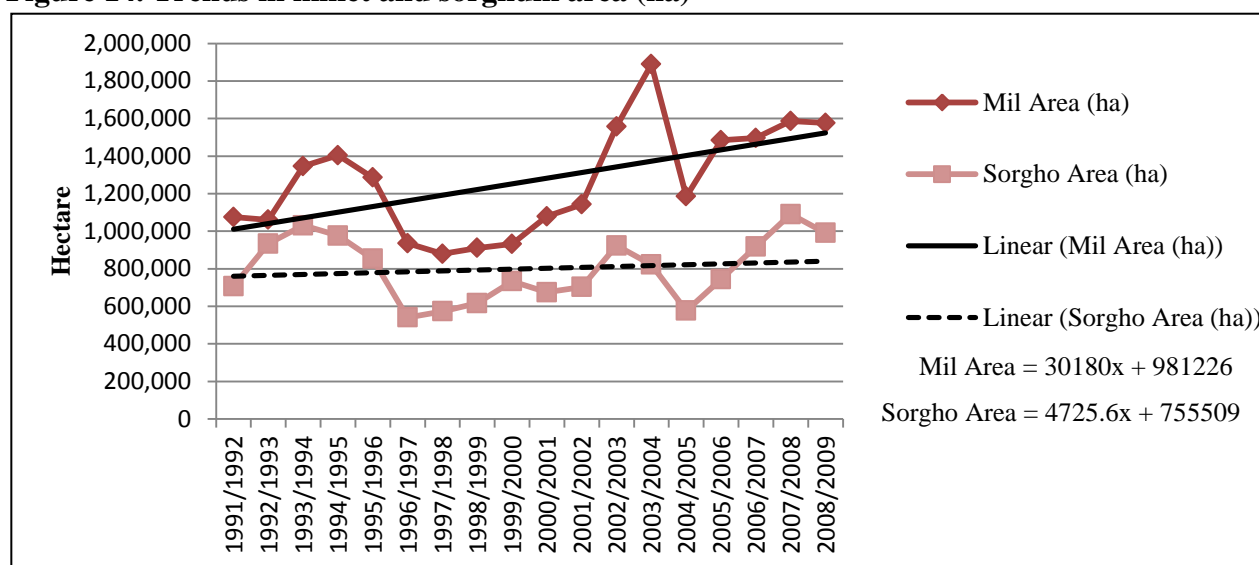
The long standing cultural context of exchanging rather than monetizing millet and sorghum seed helps one to understand the relatively slow development of the millet/sorghum seed markets compared to the seed markets for rice and maize, as those crops are viewed as cash crops by most farmers and lack the cultural tradition of seed exchange.

We next look at performance of the broader millet/sorghum value chain in terms of area planted, production and yields. This is followed by a discussion of marketing performance looking at price and margin trends and progress made by projects attempting to increase marketing of millet and sorghum.

Figure 14, Figure 15, and Figure 16 illustrate the trends in area planted, production, and yields

from 1991/92 to 2008/09. From 1991 through 2000 all three indicators for both crops were stagnant (no statistically significant trends). Since 2000, an analysis of millet production and yield trends shows positive movement (F-tests significant at .004 and .064 levels, respectively) and a statistically insignificant trend line for area planted, which exhibited frequent inter-annual changes. There was an unusually sharp increase in millet area and production from 2001/02 through 2003/04, followed by a sharp decline in 2004/05 (a year of drought and locust attacks) and then a resurgence which continues to the end of the data series.

**Figure 14. Trends in millet and sorghum area (ha)**

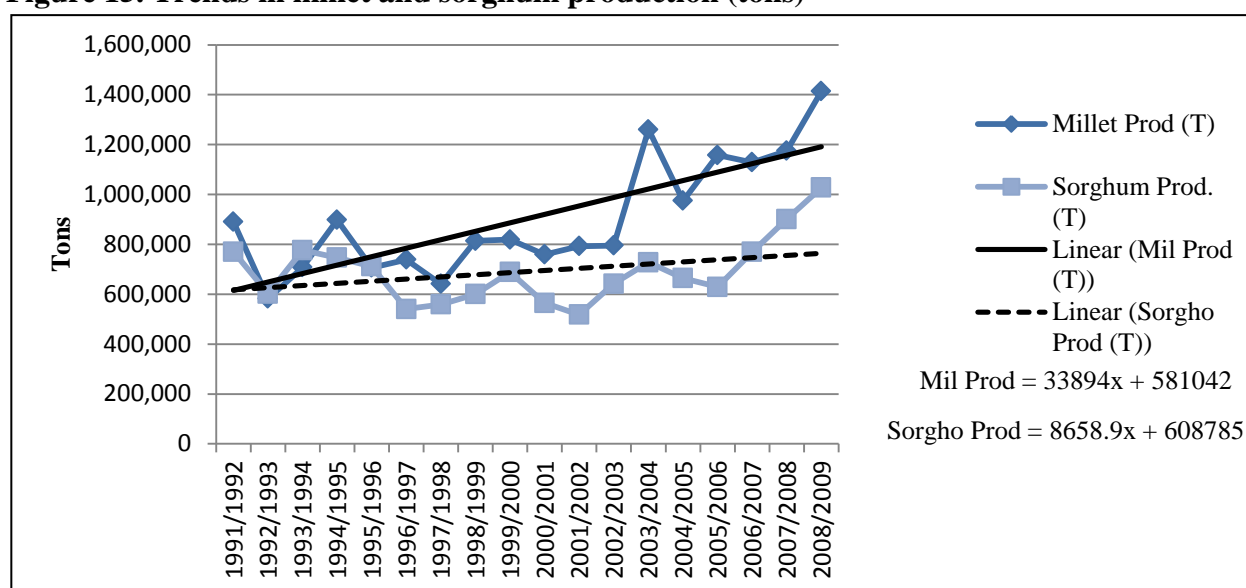


Source: Graph developed using DNSI data.

For sorghum, production and area trends have been positive (0.002 and 0.063 levels of significance), but yields have remained stagnant. Millet production appears to be increasing at a faster pace (72,000 tons per year) than sorghum (53,000 tons). Much of the boost in sorghum production and area has occurred since 2007, when both area and production exceeded for the first time levels attained in the early 1990s. One hypothesis for the recent increase might be the combined effects of the rising prices of fertilizer and declining cotton prices, which would have encouraged farmers in the cotton zone to switch from cotton to maize and sorghum.

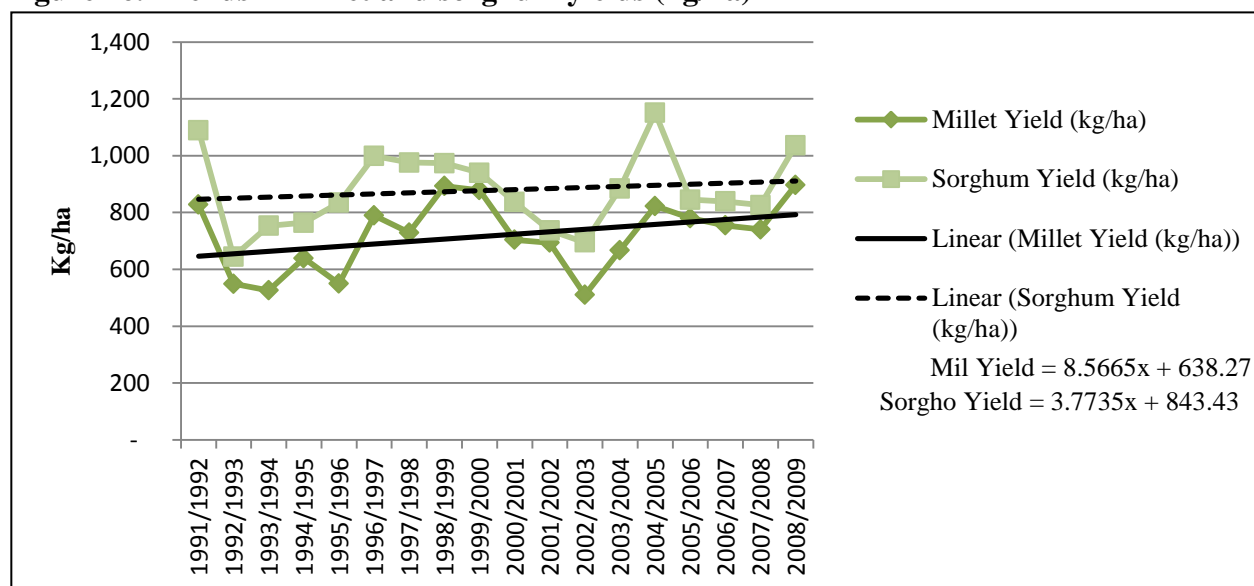
The only statistically significant trend lines for the entire period 1999 – 2009 are positive for millet production (0.00 level of significance), Figure 15, and millet area (0.02 significance), Figure 14. None of the trend lines for sorghum were statistically significant.

**Figure 15. Trends in millet and sorghum production (tons)**



Source: Graph developed using DNSI data.

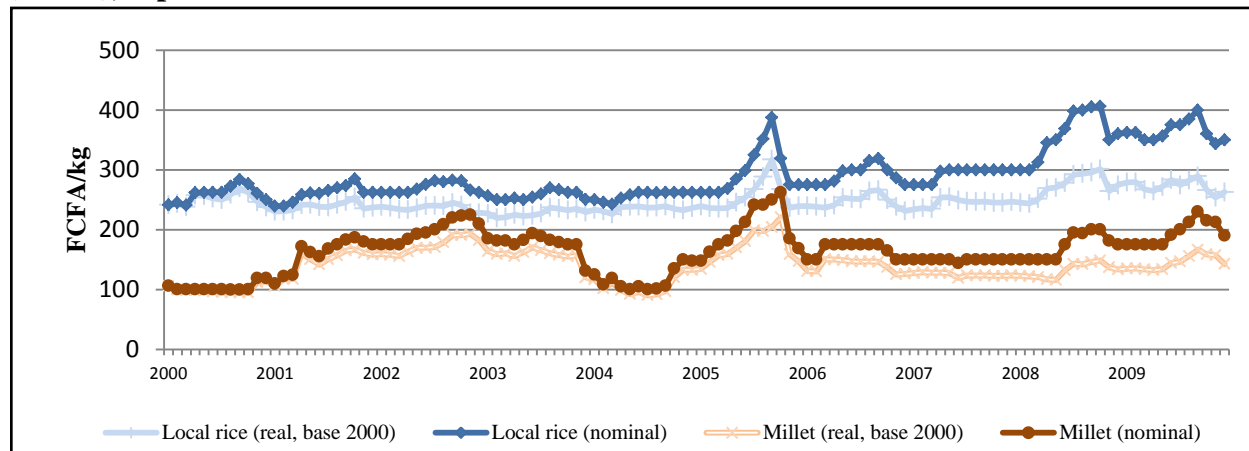
**Figure 16. Trends in millet and sorghum yields (kg/ha)**



Source: DNSI data.

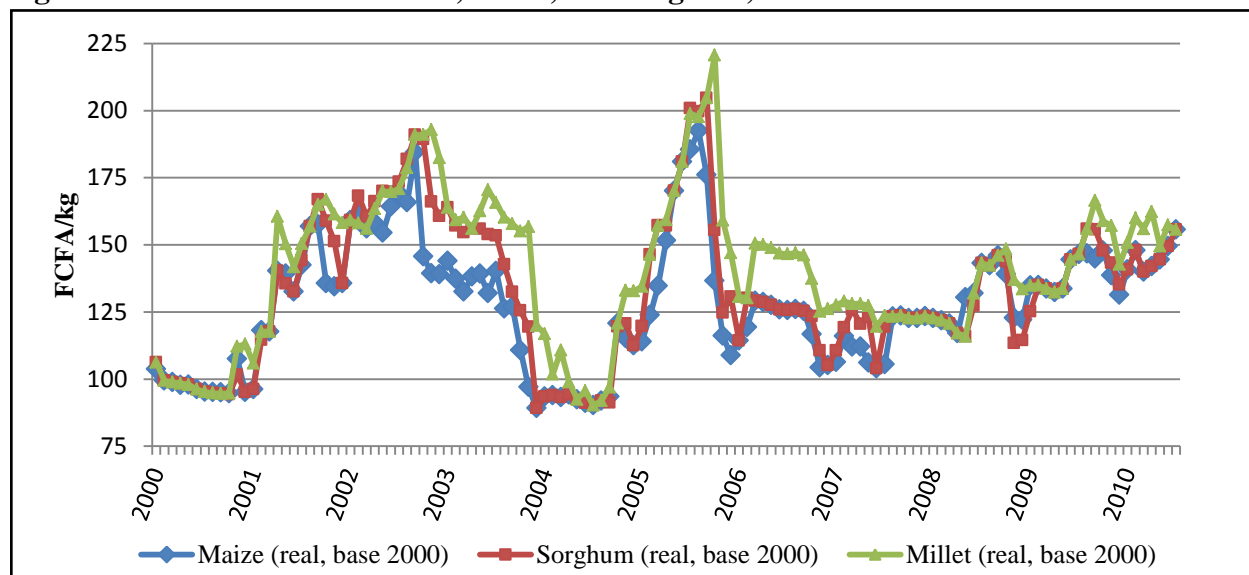
*Price trend.* Figure 5 (reproduced below) shows that millet prices/kg were substantially lower (average of 164 FCFA/kg from 2000-2009) than rice prices (291 FCFA/kg) but tended to follow similar patterns for both nominal and real prices. Sorghum and maize prices (Figure 17) follow a similar pattern to those for millet, with sorghum averages running slightly lower (155 FCFA/kg) than millet, and maize (149 FCFA/kg) lower than sorghum. During the period reviewed, the linear trend for real prices of rice shows a statistically significant (0.00) average annual increase of 3.4 FCFA/kg. There was not a statistically significant trend in real prices for millet, sorghum, or maize.

**Figure 5. Real and nominal price trends for local rice and millet, Bamako-Médine market (FCFA), reproduced**



Source: Graph compiled from OMA data

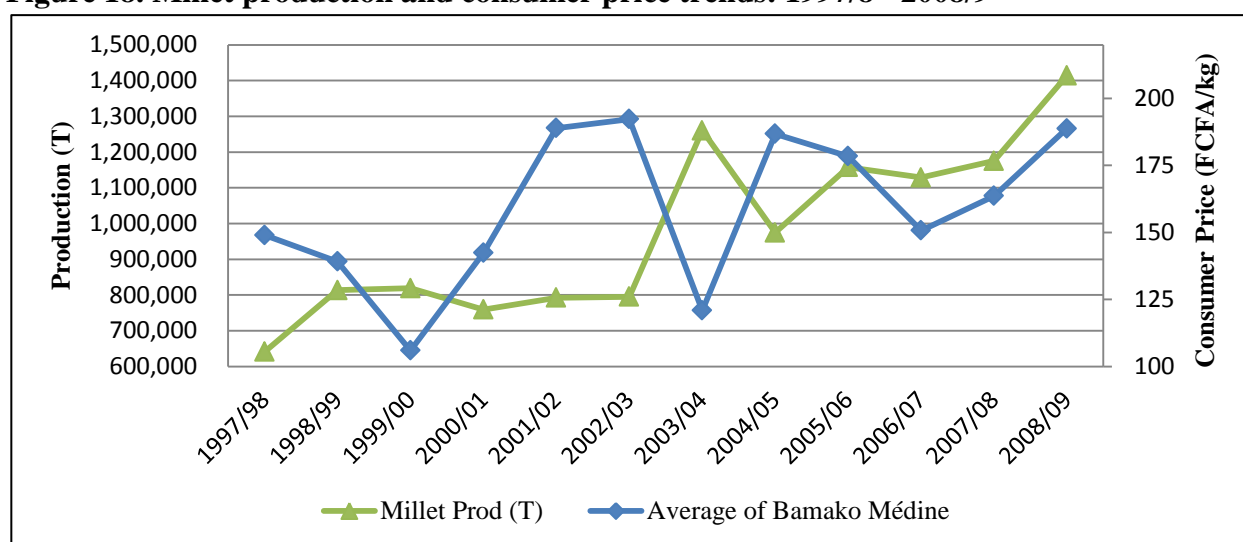
**Figure 17. Price trends for maize, millet, and sorghum, Bamako Médine market**



Source: Graph compiled from OMA data

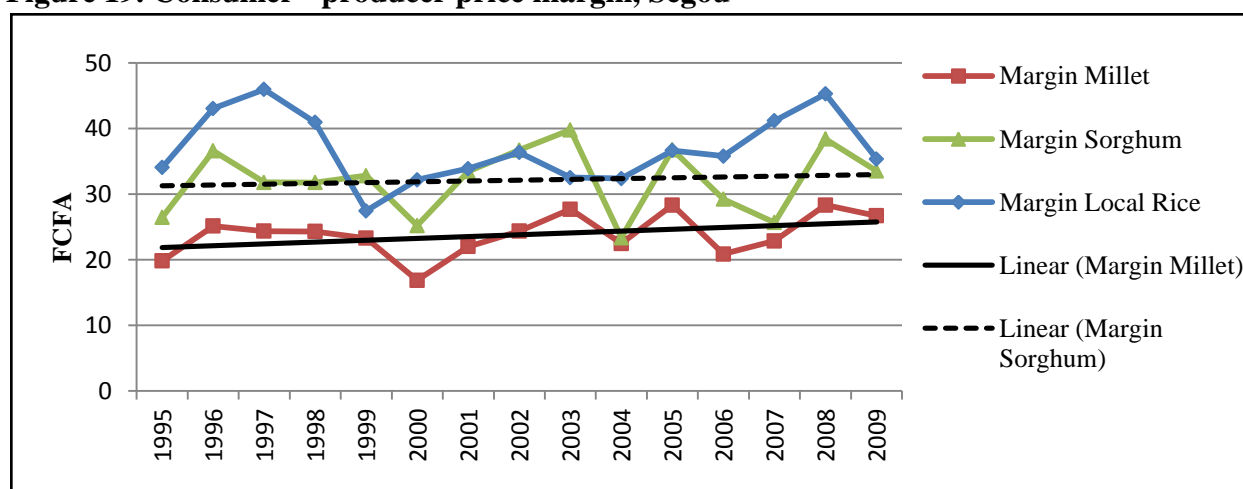
Theory tells us that coarse grain prices should be a function of domestic production and imports, prices of substitute grains such as rice, and demand (both domestic and that from neighboring countries) among other factors. We are not aware of any recent analyses of the determinants of cereal prices, but the conventional wisdom is that coarse grain prices tend to be influenced strongly by production, which is highly variable due to the rainfed nature of the crop. If Mali were a closed economy, one would expect prices to decline increases, assuming demand remained relatively unchanged. In reality, there is little statistical correlation between millet/sorghum production and price trends (0.13 for millet and 0.14 for sorghum—see Figure 18 below). Furthermore, since 2004/05 there seems to be a tendency for prices to rise as production rises—the opposite of the anticipated relationship. This tendency towards higher prices even as production increased reflects in part the general price increase of major staples globally since 2007 and increased regional export demand for these cereals.

**Figure 18. Millet production and consumer price trends: 1997/8 - 2008/9**



Source: Compiled from DNSI production and OMA price data.

**Figure 19. Consumer - producer price margin, Ségou**



Source: Compiled from OMA price data.

The margins between consumer and producer prices for maize and sorghum across markets are not increasing significantly—meaning that marketing costs are not the prime factor driving increases in consumer prices for these products--and margins in Ségou, the major millet and sorghum producing region, are on par with maize margins in Sikasso. Note that consumer-producer price margins are higher and more volatile in other regions of Mali, probably reflecting higher marketing costs due to weaker transport and smaller marketed volumes in these other regions. As with price and production trends, the margins for millet and sorghum evolve together, roughly mirroring local rice, although the differences in price for sorghum are both larger and more volatile than those of millet.

*Growth potentials, opportunities, and linkages.*

Improved varieties are constantly being developed by research, but adoption remains timid. In recent years, there have been two different approaches to millet/sorghum breeding and extension in Mali (Foltz 2010):

- a high-input solution, supported by INTSORMIL and Sasakawa Global, which see chemical fertilizers and fertilizer responsive millet and sorghum varieties as the best technology;
- a low-input solution, represented mostly by ICRISAT's efforts to produce new seed varieties that can produce more under the low input conditions that farmers currently experience.

The low-input solutions can produce a 20-30% increase in yields over farmers' conventional seeds with the farmer using the same techniques as before. Meanwhile, the high-input solutions require farmers to put approximately \$100/ha into chemical fertilizers, work best with animal traction, but can produce yield increases of 75-100% over traditional varieties grown with traditional levels of fertilizer. Both systems work best with water conservation efforts and with additions of organic fertilizers such as manure. Foltz (2010) argues convincingly that it should be a farmer's choice as to which of these techniques makes most sense for his/her individual farm, situation, budget, and risk profile. Unfortunately most farmers are just offered one solution or other rather than seeing both and choosing the one most appropriate to their needs.

A study of extension programs in Mali (Stoop 2002) concluded that one of the shortcomings of the Malian system was that it focused too much on intensification and efficiency, while farmers were most concerned with risk. While this assessment makes an important point, Malian farmers are not a homogeneous group with respect to risk preferences, so programs that allow farmers to select from a menu of millet/sorghum technical packages with different levels of risk and potential payoffs is more likely to advance production and productivity than a one-size-fits-all approach to breeding and extension. A scenario with farmers using the low-input ICRISAT varieties as a safety-net approach for their subsistence production and the high-input varieties on land they devote to cash crops could be the future outcome. For use of improved seeds of any type to increase substantially, however, more thought and experimentation will need to focus on what can be done to change farmers' mindsets concerning the non-monetized nature of millet and sorghum seed.

The contribution of fertilizer and animal traction equipment to increased millet/sorghum production is nuanced. While access to animal traction equipment is considered essential for improvements in labor productivity and aggregate production, past research has shown that farmers owning more equipment per hectare tend to have lower maize and millet yields, suggesting that in traditional farming systems the equipment is used more for expansion of area cultivated than for raising yields through more timely planting and weeding (Kelly et al. 2005). On the other hand, access to animal traction can be a determining factor in the adoption of some of the more promising soil and water conservation (SWC) practices capable of increasing soil moisture and quality. SWC practices are particularly important in some of the low-rainfall zones where millet and sorghum predominate.

In addition to the technical options for significantly increasing yields and production, there is considerable need to develop better output market links between farmer cooperatives and processors who are willing to pay premium prices for regular supplies of higher quality millet and sorghum. Several USAID funded activities (PMP, INTSORMIL, IICEM) have made inroads in this area, but the data available on the total area of millet/sorghum planted to improved



varieties and marketed through producer organizations is a very small share of total millet/sorghum area cultivated (about 1% based on recent reports from PMP in 2009 and IICEM in 2010). Nevertheless, the growth rate in terms of area expansion has been remarkable (from 685 ha in 2009 to 4340 in 2010), so if this growth can be sustained for several years there could be a revolution in the production of millet and sorghum for commercial purposes.

The challenges of moving millet/sorghum from the status of a subsistence to a cash crop are substantial, and we do not want to give the impression that this is likely to happen given the variety of other crop options available to farmers in the rainfed zones (e.g., sesame, groundnuts, cowpeas, fonio, maize, etc.). Ongoing surveys of approximately 150 farm enterprises in Tominian and another 150 in Koutiala show extremely limited interest in growing millet and sorghum as a cash crop on fields cultivated by women, unmarried men, and dependent household heads. In Tominian, only one individual field was devoted to coarse grains; in Koutiala only two fields were reported. Groundnuts and vegetable gardening were much more popular in both zones.

*Gender aspects.* Women play an important role in cereal production, though generally by providing labor for family fields managed by the household head rather than thorough production of millet and sorghum for their own account. Research has shown that the availability of female labor in a household is a more important determinant of the area planted to millet than the availability of male labor, most likely because women help during the critical weeding periods (Kelly et al. 2005). While there is some evidence that women cultivate small cereal plots to earn personal income, they have traditionally focused on crops such as peanuts and cowpeas, which are generally considered to be more profitable. Crops such as groundnuts also offer more value-added opportunities (shelled or roasted nuts, and peanut butter). Millet and sorghum production do not seem to offer women particularly good income-generating opportunities at present given that they tend to cultivate relatively small plots of land, but this is something that may change. For example, recent (February 2011) focus group discussions carried out by MSU and IER in four villages of the cotton zone revealed that some women have been increasing their production of millet and sorghum as a cash crop because of declining peanut yields and growing problems with insect and rodent attacks on stored peanuts. We do not think this is the cusp of a major change in women's income generating activities, but it does merit monitoring.

*Importance for poverty alleviation.* Improved millet and sorghum productivity will contribute to food security for vulnerable households. The extent to which it will be able to increase cash incomes is probably limited compared to other agricultural and non-agricultural activities. Its greatest promise is probably in promoting improved varieties intercropped with other cash crops such as groundnuts, sesame, or cowpeas. Foltz (2010) noted:

In Mali, experiment station work has demonstrated that intercropping sorghum/millet with cowpeas/soybeans using added chemical fertilizers can be done such that sorghum/millet yields per hectare are comparable to intensive mono-cropping (1.5 – 3 tons per hectare) and cowpea/soybean yields are 300 – 500 kg/ha all with fertilizer applications that are 33% lower in quantity and 45% lower in monetary terms. Economic studies have also demonstrated the income risk reducing properties of intercropping...New cash crop potential also exists in sesame and soybeans, especially where one can intercrop them with existing

subsistence crops such as sorghum and millet. Both of these are likely to be technologies available and beneficial for women farmers.

*Key constraints, risks, and vulnerabilities.* While the 2001 agricultural assessment focused on the inadequacies of millet/sorghum seed production and dissemination and other technical issues such as cost-effective approaches to fertilization and SWC, we think that what is really constraining the adoption of these improved varieties is the costs of the inputs and the production and marketing risks associated with moving to production systems that require more up-front expenditure. Malian farmers are accustomed to purchasing inputs for cash crops but it requires a major change in mind-set to consider millet and sorghum as cash crops. Recent work on the promotion of improved millet/sorghum technologies through the development of producer organizations that provide members with input credit and output marketing services seems promising, but it is still too soon to tell if such activities can be scaled up and eventually convince farmers to use improved technologies on their subsistence plots as well. A major vulnerability for these value chains is their political importance as food security crops and the tendency of the government to intervene in markets or place embargos on exports when prices start rising.

The foregoing analyses indicate some major missing pieces of information/analysis that are needed to be able to make good policy decisions:

- What are the factors affecting cereal price movements? Is there anything we can do with existing data to better understand this?
- What is the relative profitability of producing millet and sorghum compared to other crops? Does profitability differ by zone or by household type (e.g., level of mechanization)? Updated crop budgets for these crops using current costs with sensitivity analyses for market price risk could help address these questions.
- What is the competitiveness of millet and sorghum produced in Mali with that produced elsewhere in the region (e.g., updating of Barry and Stryker et al. analyses referred to in 2001 assessment)?

### 3.2.6. *Fonio*

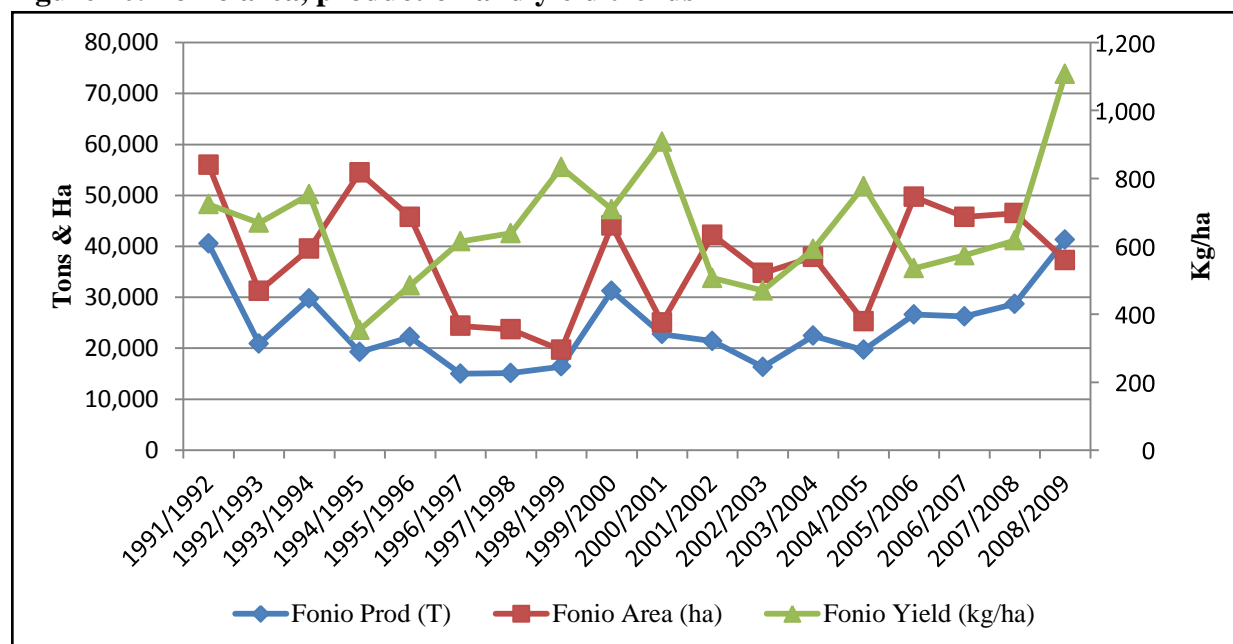
Fonio and wheat are two cereals that were not discussed in the 2001 Assessment (Tyner et al. 2001), but have since attracted attention. Together, the crops represent less than 2% of total cereal area and production, but they are “niche” crops of potential importance for certain zones and types of producers.

Fonio is grown in rainfed zones with low rainfall, especially in the Dogon plateau and southwest Mali. It is highly valued crop for its low labor needs, early season production, and drought resistance. Women are its primary producers. The Malian government objectives for fonio are to stabilize area cultivated and increase yields; there are no plans to increase fonio’s share in overall cereal production (Ministère de l’Agriculture, 2009b).

*Fonio performance.* Available data suggest that fonio area, production, and yields have been variable from year to year since 2000, but with no statistically significant increasing or decreasing trend (Figure 20). Average area was about 38,000 ha, average production about

24,000 tons, and average yields 659 kg/ha. The 1994 devaluation gave fonio producers an incentive to increase area planted in 1995, as Malian consumers shifted from imported to domestic foods, but since 1995 area planted has not exceeded that initial supply response and production has only exceeded 1995 levels in two subsequent years (1999 and 2008).

**Figure 20. Fonio area, production and yield trends**



Source: Graph developed from DNSI data.

We do not have a price series on fonio, but some information on prices is available from a 2008 survey of fonio processors in Bamako (IER 2008). The processors bought most of their fonio supply in Bamako markets at an average price of 320 FCFA/kg during the dry season and 454 FCFA/kg during the rainy season. After processing, four different products are sold with prices in the following ranges:

**Table 19. Processed fonio products, Bamako**

Product	Price (FCFA/kg)	
	low	high
Cleaned and bleached fonio	788	813
Pre-cooked fonio	1237	1379
Grilled fonio	1000	1010
Djoika (fonio grilled w/ peanuts)	1628	1700

Source: IER 2008 Bamako fonio processor survey

Unfortunately, we do not have any indicative producer prices for fonio (it is not covered by the Malian agricultural market information system), so it is difficult to assess if there are price incentives for producers to grow fonio rather than alternative cereals such as millet. Average fonio yields for the 1991/92 through 2008/09 period were 92% of the average millet yields for the same period. Given what looks to be a potentially large price differential between fonio (average price of more than 320 FCFA/kg during 2008) and millet (sold in Bamako markets at an

average price of only 173 FCFA/kg during 2008), it is surprising that we do not see a more sustained increase in fonio area and production. One explanation may be the greater inter-annual variability in production. The coefficient of variation for millet yields was 18% while it was 27% for fonio. A second explanation is that fonio is more labor-intensive to clean and prepare for market

*Fonio: growth potentials, opportunities, and linkages.*<sup>29</sup> Fonio has the rare distinction of being one of the few grains grown by poor smallholders for their own consumption that also has a market as a luxury good for the wealthy of the country. Fonio is highly appreciated as a food crop by all sectors of society and contains many nutritive qualities (methionine, cysteine and other amino acids vital to human health) lacking in other local grains such as sorghum and maize, and it can have protein levels as high as 11%. It is also recommended for diabetics (a growing concern in Mali) due to its low starch/sugar content. In Mali, it is considered the fanciest grain that one could serve at a festival such as a wedding or a baptism. It sells for a 30-50% premium over rice both due to its desirability as a luxury good and the low levels of supply (in part, a result of low yields).

Fonio requires relatively less maintenance as a crop than the typical Sahelian field crop (sorghum, millet, maize, and rice) because its planting density often out-competes most weeds. It also has low water requirements and is extremely drought resistant; although there are cultivars/varieties that thrive in wetter climates. An additional attribute of fonio is its resistance to root nematodes *Meloidogyne incognita* and other pathogens. Fonio also grows well in poor to fair soil conditions. Producing fonio requires no fertilizer, no pesticides, and it is well adapted to drought conditions. It thus already has many of the properties most desired in a cultivar. This makes it an ideal crop on marginal and reclaimed lands and lands depleted by production of cash crops such as cotton. It is often the last crop before a parcel is put into fallow in the typical fallow cycle of the Sahel.

Although increasing the share of fonio in aggregate cereal production is not a stated GOM objective, IER, with assistance from European partners such as the *Centre Wallon de Recherches Agronomiques* and CIRAD has participated in a regional (Senegal, Mali, Guinea, and Burkina) research program entitled “Upgrading quality and competitiveness of fonio for improved livelihoods in West Africa”. The program began in 2006 with an initial focus on variety testing and improvement (Stilmant 2007). In 2008, IER conducted a survey of 15 fonio processors in Bamako, shedding some light on what appears to be a growing sector of small and medium sized entrepreneurs processing fonio for both the local and the export market (IER 2008). Of those firms interviewed, 7 were some type of association, 6 were individually owned, and 2 were family owned; 8 had the legal status of an Economic Interest Group or a Cooperative, while 7 had no legal status. Ownership was generally in the hands of women, and all firms relied primarily on women for both their permanent and temporary employees (permanent employees ranged in number from 1 to 30, depending on the firm).

Most enterprises processed other cereals (millet, maize, and to a lesser extent rice) and food products (vegetables, dried meats, juices); but on average 63% of the processing activity across the different enterprises interviewed concerned fonio. Four principal fonio products are

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<sup>29</sup> This section draws heavily on Foltz 2010.

produced: cleaned and bleached (22% of production), pre-cooked (44%), grilled (23%), and grilled with peanuts, known as djouka (37%). All four products tend to be packaged in 1 kg sealed plastic sacks and sold in local shops or exported to Europe, Côte d'Ivoire, Senegal, or the US. Seven firms claimed that 25% or more of their production was sold in Europe and five were selling 20-30% in the US. Aggregate quantities bought and processed by these 15 firms during a typical dry season month ranged from 80 to 6000 kg, with an average of 1129 kg/firm; the comparable numbers for the rainy season were 50 to 3000 kg, with an average of 751 kg/firm. One important finding of this study was that many of the processors preferred fonio from Guinea to that from Mali because it tended to be cleaner and of better quality. Malian fonio was, however, preferred by some because the cost was lower.

*Fonio: gender aspects.* Its low maintenance attributes make fonio an ideal crop for women to grow and in fact across the region women are in charge of most of the fonio cultivation. This implies that increases in fonio production can create important improvements in women's incomes. In addition, as increasing numbers of young Sahelians leave rural towns and villages for cities and foreign migration, the low labor requirements of fonio make it an ideal crop for those who remain in rural areas who are typically the elderly and women with young children.

As noted above, fonio is also processed primarily by women. It is a logical value chain to develop if the objective is to increase women's income because both production and processing can be initially undertaken with relatively limited access to inputs and credit. It is, however, labor-intensive, to process, and thus may compete with other demands on women's time.

*Fonio: importance for poverty alleviation.* In the Sahelian regions of Mali, many of the poorer farmers grow fonio because it grows relatively vigorously with limited resources. Because fonio grows faster than most grain crops it is also grown as a crop to break the hungry season in August and September. This agronomic characteristic makes it an extremely desirable crop for poor farmers. Crops that break the hungry season can help increase the yields of other field crops since the calories they provide poor farmers are key to the farmers having energy to weed and maintain their other crops. Given the relatively low levels of initial production nationally, however, even if production is scaled up substantially, it is not likely to be a crop that will move a huge portion of the rural population out of poverty.

More information is needed, however, on the farm-level profitability and whether that could be improved through new varieties, improved farming practices, or by training producers to improve quality by more careful threshing.

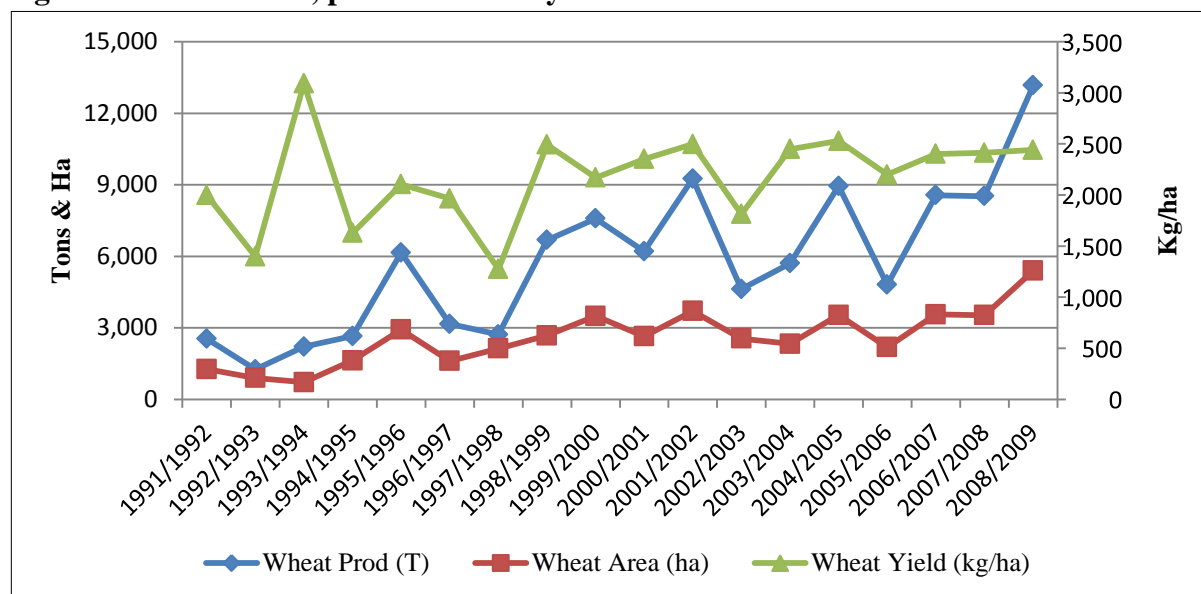
*Fonio: key constraints, risks, and vulnerabilities.* Unfortunately, fonio yields are low, and this has reduced the acreage devoted to fonio despite its evident benefits and high prices in the market. Improvements in fonio seeds and cultivation techniques would go directly to addressing women's income, especially in the Dogon plateau and southwest Mali where fonio is grown extensively. Better fonio cultivars could also extend the reach of fonio cultivation into other areas where it was formerly grown. More research and extension is needed to provide women farmers with higher yielding fonio varieties and better agronomic techniques. Among the processors interviewed by IER, there was a need for credit. Most operations were quite small because they were entirely self-financed. To the extent that there are economies of size or scale in fonio processing, access to credit would help the women in this sector take advantage of them.

### 3.2.7. Wheat

Wheat is currently grown under irrigated conditions as a dry season crop in northern Mali (Region of Tombouctou), where its production dates back to ancient times. Malian wheat production is currently consumed largely in the North, with wheat products in the south imported from overseas. The Malian government's plan is to more than double the share of wheat in total cereal production (from less than 1% currently to 2%) by 2012. This expansion is likely to involve improvements in production in Tombouctou as well as expansion of production into irrigated zones in the Region of Gao and in the Office du Niger, where there has been recent work on developing varieties that are adapted to the climate and timing needs of Mali's rice/wheat crop rotations (Ministère de l'Agriculture, 2009b). In 2010, the firm Grand Distributeur Céréaliier au Mali (GDCM-SA) obtained a lease for 7,400 ha of land in the Office du Niger, near the village of Sanamadougou (located in the commune of Sibila and the cercle of Ségou) on which it plans to grow irrigated wheat, rice, maize and potatoes (L'Indépendant, 30 December 2010). The lease covered land previously cultivated by smallholders, has been highly contentious, and has led to some villagers and NGOs raising charges of "land-grabbing" by the firm. As of late 2010, the firm was moving ahead with land development, and attempts were being made to work out the dispute with villagers opposed to the project<sup>30</sup>. (L'Indépendant, 30 December 2010).

*Wheat performance.* Figure 21 plots area, production and yield data for wheat from 1991/92 through 2008/09. Upward trends for wheat area and production are statistically significant (.00 level), indicating that wheat area increased an average of 173 ha/year and production an average of 469 tons per year. Yield trends suggest an average increase of 31 kg/ha per year; but the trend line is not statistically significant (F test @ 0.13 probability).

**Figure 21. Wheat area, production and yield trends**

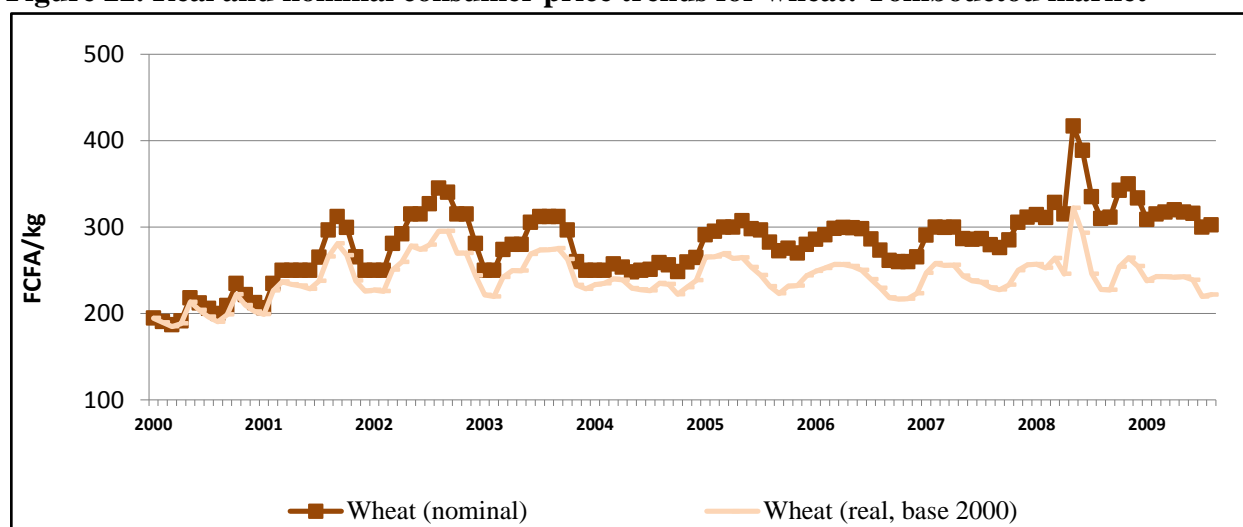


Source: Graph developed from DNSI data.

<sup>30</sup> See also Ciwara Infos, 29 July 2010 and Foodsovereigtytours.org, 5 March 2011;

Consumer prices of wheat in the Tombouctou market (Figure 22) show a positive and statistically significant (0.00 level) trend from 1991/92 – 2008/09, with nominal prices increasing an average of 9 FCFA/year and real prices an average of 2 FCFA/year.

**Figure 22. Real and nominal consumer price trends for wheat: Tombouctou market**



Source: Graph developed from OMA data.

*Wheat growth potential, opportunities, and linkages.* The Government of Mali has set forth an ambitious plan to increase wheat acreage up to ten-fold in the next 5 years, from approximately 5,000 ha to 50,000 ha. Such an expansion would involve shifting the focus of production from meeting local consumption needs in the North to substituting for imported wheat and flour currently consumed in the South. This expansion has had two components. The first is encouraging expanded wheat growing in the ON, as epitomized by the GDCM initiative described above. The second involves expanding the number of firms engaged in wheat milling from the former dominance of a single firm (Groupe AMI) to at least 2 new entrants, GDCM and Moulins du Sahel. In July 2009, GDCM opened a milling facility in Ségou, the *Moulin Moderne du Mali*, with a capacity of 60,000 tons of wheat flour per year as well as the capacity to produce animal feed (Nouvelle Libération, August 4, 2009).

While wheat grown in the north benefits from some “natural protection” from imported wheat because of high transport costs to the region, Malian wheat sold in the south will face that international competition more directly. Government interest in expanding wheat production has political support from very high levels (*Conseil Présidentiel d'Investissement* or CPI). As early as 2005, the CPI was engaged in discussions about expanding wheat production with the AMI Group, which owns the *Grand Moulins du Mali* and historically had wheat importation and processing activities in Mali, and the *Compagnie Malienne pour le Développement du Blé*, created in the mid-2000s to promote wheat production in Mali and the provision of input/extension services to wheat farmers. CPI interest in wheat is based on its being one of the few agricultural sectors where the downstream investments in processing and marketing already exist. Commercial demand for wheat in 2005/06 was estimated at 50-60,000 tons per year and growing, almost entirely met by imports. In 2006, AMI was asked by the CPI to consider direct investments in the development of up to 70,000 ha of irrigated land in the Office du Niger that would be used for wheat production (commercial rather than smallholder production was most

likely). Although there was some information available on production potential based on IER research in northern Mali (Goita 2005a, Goita 2005b, Diarra and Goita 2005), AMI felt they needed to conduct a feasibility study to better understand the situation in the *Office du Niger*. AMI was assisted by Shaffer International, a potential partner, in the design of the study. Their aim was to develop about 2000 ha during a five year period. We have no information on whether AMI and Shaffer decided to proceed with the study or not in light of GDCM's decision to launch irrigated wheat production in the ON.

*Wheat: importance for poverty alleviation.* Given that poverty is high in the northern zones where this crop is grown, wheat could contribute to poverty alleviation. There appear to be a number of production constraints, however, that might make this crop less desirable than others for poor households to grow (see next section).

*Wheat: key constraints, risks, and vulnerabilities.* According to a recent technology review (Foltz 2010) the key to expansion of wheat production is acreage expansion and improvements in cultivation techniques. Foltz focuses on production in the North. He notes that most of the wheat expansion would be from increased irrigated acreage and so is dependent on the creation of *périmètre irriguée villageois* (PIV) and small moto-pump based fields in northern Mali. Past experience in the sector suggests that the 5-year time frame for getting to 50,000 hectares may be overly optimistic. In addition, Foltz (2010) notes that:

...wheat is relatively more management intensive than rice, especially with respect to the timing of flooding and other water management issues, which are often poorly done in PIV's. Thus, it may make more sense for farmers, especially resource poor farmers, to grow rice on these irrigated areas than to grow wheat.

The just started *system de blé intensif* (SBI) program in northern Mali shows some promise as a way to address the management issues in wheat production, but many of the water management issues are going to be community or PIV-wide and need better organization. In addition, more effort is needed in the production and replication of the CIMMYT seed varieties, perhaps by importing them from higher productivity places. A key constraint in producing wheat seeds in Mali is that the low yields and high seed requirements make it hard to devote enough area to seed production.

### **3.3. Livestock and Related Products<sup>31</sup>**

Livestock production accounts for approximately 30% of Mali's agricultural GDP (INSTAT) and, according to the 2004 agricultural census, 85% of Mali's agricultural households owned some form of ruminant (cattle, goats, sheep, or camels). Cattle represent Mali's third most important export commodity, after gold and cotton. Livestock are an extremely important form of rural savings account, and income is derived from livestock (especially milk sales) year-round, helping to relieve the cash-flow constraints that rural households would face if they relied solely on crop income. Small ruminants and poultry are frequently an important source of women's income. Cattle are the main draft animals, particularly in the south where soils are too

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<sup>31</sup> This section draws heavily on the syntheses of recent studies on livestock included in Samaké et al. 2008 and documents feeding into Mali's 2010 National Priority Investment Plan for the Agricultural Sector (PNIP-SA), complemented by data from INSTAT.



heavy for donkey-powered traction, and animal manures are an important contributor to soil fertility. Furthermore, because demand for livestock products typically increases rapidly as incomes increase, the demand outlook for Malian livestock production is strong, both domestically and in the sub-region. Certain components of the livestock industry, such as dairy marketing, are labor-intensive, offering important opportunities for employment expansion.

Because of the importance of livestock to the Malian economy and its important growth potential, improving livestock value chains is one of the priorities of Mali's CAADP Priority National Investment Plan for the Agricultural Sector (PNIP-SA). Historically, the livestock industry has had much less direct government involvement in production and marketing than other agricultural value chains (e.g., cotton), with government action focused on animal health (e.g., vaccination campaigns), maintenance of trade/trekking corridors, supporting development of improved pasture management schemes, research, provision of market information, and public health regulation of slaughter and dairy processing facilities. The 2010 PNIP SA continues this tradition, with the major focus of the proposed interventions on research and extension of improved pasture varieties, improvement of marketing and slaughter infrastructure, support to producer groups to acquire inputs, improve pasture management, and facilitate access to veterinary services, and genetic improvement of the stock, particularly dairy cattle (e.g., through artificial insemination).

### *3.3.1. Beef*

Mali's cattle population is estimated at approximately 8.8 million head in 2010, up from an estimated 7.7 million in 2006 and 5.2 million in 1992. While cattle numbers fell from the early 1980s through the early 1990s due to drought, they appear to have grown steadily since the 1990s. In part, this reflects the increase, noted in the 2001 USAID Agricultural Sector Assessment, in the proportion of Mali's cattle population in the higher-rainfall mixed farming areas. Thus, while cattle (and other ruminant) production remains important for herders in the Northern regions of Gao, Timbuktu, and Kidal, only about 20% of the total cattle reside in these three regions. An additional 28% are found in the Mopti region and 52% in the more southern areas of Mali (Samaké et al, 2008a).

*Domestic production, consumption and marketing.* Most authors estimate the off-take rate of Mali's cattle herd at around 11% per year, which translates into 968,000 head slaughtered in 2010. In 2006, Alary (cited in Samaké et al., 2008a) estimated 82% of the off-take was consumed domestically, with the remainder exported (153,469 head, compared to recorded exports of 140,368 head). If off-take rates remain static, then even if there is modest income growth in Mali over the coming years, growing domestic demand for beef will lead to increased competition between the domestic and export markets for the available supply. However, modest increases in off-take (due to, for example, improved animal nutrition that would allow animals to reach market size earlier) could dramatically increase the marketed surplus. Although it is frequently alleged in studies of the Malian livestock industry that herders hold large numbers of animals for prestige, the experience of the rapid increase in off-take in 1995 following the spike in cattle prices due to the CFA franc devaluation belies this assertion. That increase was short-lived (as prices subsequently fell), but it illustrated that livestock owners do respond to market incentives.

Major slaughter facilities in the country include 2 refrigerated abattoirs in Bamako, 5 regional abattoirs (in Kayes, Mopti, Ségou, Sikasso and Koutiala) and 124 officially recorded slaughter slabs. The refrigerated abattoirs in Bamako consist of the former municipal abattoir, constructed in 1963, located in the industrial zone (*quartier “sans fils”*) and sold to private operators in 2005; and a new abattoir, opened in 2005 and located 20 km from Bamako (on the right bank of the Niger River across from Sotuba). The old abattoir, which slaughters around 250 head per day, faces serious problems of urban congestion, while the new facility has serious access problems, particularly in the rainy season, due to poor roads. While both abattoirs were designed to produce meat for export as well as for the domestic market, exports have remained overwhelmingly in the form of live animals, for reasons explained below.

*Exports.* From the mid-1980s through 2002, Mali exported around 200,000 head of cattle per year to its southern neighbors, with Côte d’Ivoire accounting for nearly 75% of the total. The Ivorian civil war severely disrupted the trade, and by 2003, exports to Côte d’Ivoire had fallen to only 10,000 head (although some cattle exported to Ghana during the Ivorian strife were probably re-exported by Ghanaian traders to Côte d’Ivoire). As the Ivorian market collapsed, Malian exporters sought alternative outlets. A major shift has occurred towards the Senegalese market, a development that was greatly facilitated by the paving of the road between Bamako and Dakar. Truck traffic on that route has increased dramatically; the large increase in trucks hauling general merchandise from Dakar to Mali has created an opportunity for Malian cattle exporters to ship their animals to Dakar as a backhaul at favorable rates. Other export markets that have emerged or expanded include shipments to Ghana, to Guinea (although problems of non-convertibility of the Guinean franc has constrained this trade) and via Niger to northern Nigeria. The return of peace in Côte d’Ivoire in 2008/09 helped re-establish trade volumes there, but the trade will likely suffer from the current strife. Nonetheless, the diversification of export markets augers well for a strong future demand for Malian cattle exports in the future. Alary (cited in Samaké et al. 2008a) estimates a potential net import demand of 500,000 to 1 million head per year by 2016 in the production/consumption basin covering Burkina Faso, Mali, Côte d’Ivoire, Ghana and Togo; and double that for the basin including Nigeria, Chad, the Central African Republic, Cameroon, and Niger. Taking advantage of these opportunities will require increased off-take from the Malian cattle herd, which will require addressing some of the production constraints discussed below. Failure to address these constraints will likely lead to higher domestic beef prices, and hence pressure on the government to restrict cattle exports to protect domestic consumers, at the expense of higher incomes for Mali’s cattle producers.

In principle, livestock, as “unprocessed agricultural products” should transit duty-free across borders within the ECOWAS zone. In reality, while export and import procedures have been simplified over the past 15 years, exporters from Mali still need certain authorizations and have to pay fees to export animals. For example, Malians exporting cattle to Senegal need to obtain a temporary export certificate, an animal health certificate, a vaccination certificate and the authorization of the governor of the region from which the animals are to be exported. These documents cost between 9,000 and 10,000 FCFA (approximately \$20 to \$22) per animal. Once at the border, one has to pay for a certificate for livestock movement (*laisser passer sanitaire*) for 2,500 FCFA, a payment for the use (“rental”) of the Senegalese importer’s license (5,000 to 10,000 FCFA) and an import tax, which as of early 2011 was approximately 4,000 FCFA (having been reduced, after negotiations between Mali and Senegal, from 17,500 FCFA in 2009). Thus, total fees run from about 20,500 FCFA to 26,500 FCFA, or 14-18% of the cost of a typical

slaughter animal (excluding any “non-official” charges paid at road checkpoints if the papers of the vehicle or the animals are judged not to be in order). In contrast, exports to the Gambia do not pay any customs duty, but require a livestock movement permit and health certificate that are only delivered in Banjul, requiring the exporter to have an agent there or travel there himself.<sup>32</sup>

Although Malian policy makers have long hoped to increase the volume of meat export relative to live animal exports from Mali in order to capture value added from processing, this goal has proved elusive, for reasons well explained in the 2001 USAID agricultural sector assessment. The constraints include the limited market for high-quality meat in the regional export markets, high costs and unreliability of refrigerated transport (both by road and air), and the generally overlooked fact that coastal consumers are willing to pay much higher prices for the “fifth quarter” (offal, hide, and hooves) than are Malians. In coastal countries such as Ghana and Côte d’Ivoire, many of these products (including hides) are prized for human consumption; hence, the price of live animals is bid up to take those products “on the hoof” to the coastal markets, making local slaughter in Bamako for meat export less profitable. (The “fifth quarter is very perishable, making it costly to export it in any form other than as part of a live animal—although there are some exports of cattle hides to Ghana for human consumption.) It is unlikely that factors favoring live animal exports over meat exports will change dramatically in the next five years.

*Constraints and Opportunities.* It is striking when reading the 2001 Agricultural Sector Assessment how many of the principal constraints facing the cattle industry identified in that study remain today. The number one constraint remains feed availability and quality, as reflected in the following observations:

- Malian cattle are overwhelmingly dependent on natural pastures, whose quality declines sharply in the dry season and whose year-to-year quality and quantity depends on variable rainfall.
- There is a widespread expressed need by stakeholders, both in commune-level food security plans and in the PNIP-SA, for improved pastures through research and extension on improved forage crops, assistance to producer groups in developing codes and plans for local pasture management, and provision of water points for livestock.
- The potential exists for serious encroachment of traditional dry-season grazing areas along the Niger River with the expansion of irrigation schemes in the Office du Niger. Loss of these dry-season grazing areas would seriously constrain the ability of transhumant cattle producers to exploit areas to the north during the rainy season, as there would be no way of maintaining their animals in the dry season. There is need, in developing new irrigation schemes, to consider allocating some of the area to production of forage crops and improved pastures to help address this problem.
- The collapse of Mali’s cotton industry in recent years has drastically reduced the production of cotton seed, which until 2005 was the main protein supplement in cattle feed (and was particularly important in maintaining draft animals). With the reduction

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<sup>32</sup> Information in this paragraph is from a major Malian cattle exporter. The modal price of a slaughter animal, 150,000 FCFA, is taken from the *Observatoire du Marché Agricole’s* monthly bulletin (*Le Reflet*) for February 2011.

in the availability of cotton seed, there is a need to identify other locally produced protein sources (other oilseed cakes, high-protein leguminous crops, detoxified jatropha seed cake, etc.) for cattle and other livestock. Even where farmers are successfully engaged in livestock fattening, evidence suggests that they are not using least-cost rations based on locally available feedstuffs, thereby limiting the profitability of their enterprises (Kassoge, Dembélé and McPeak, 2010). The emergence of new large-scale milling enterprises in Mali, such as the Moulin Moderne du Mali (see section 3.27) that see livestock feed for both poultry and ruminants as a potentially profitable enterprise and that are looking at alternative protein sources, such as peanut and sunflower cake, may lead to greater availability of feed concentrates.

- More variable weather and possible reduction of rainfall levels in more northern areas due to climate change reinforces the need to address the feed constraints that limit the productivity of Mali's ruminant production.

A second need is improvement of marketing infrastructure and supporting services, including maintenance and improvement of corridors ("couloirs") for trade cattle to move on hoof to major collection points, provision of market information (which USAID is already facilitating through the Global Livestock CRSP), and facilitation of border crossing procedures with neighboring countries. The ECOWAS CAADP plan includes actions along these lines to facilitate regional trade, but bilateral efforts are also needed between Mali and its neighbors (such as Senegal, where, as noted above, negotiations have been necessary to reduce import/value added taxes imposed in contravention to the ECOWAS treaty).

### 3.3.2. *Small Ruminants*

Mali has an estimated 11.3 million sheep and 15.7 million goats. In contrast to cattle numbers, nearly half (48%) of the small ruminant population is located in the northern regions of Gao, Kidal, and Timbuktu, where these animals constitute a critical component of pastoral livelihoods. But small ruminants are also widely held in other regions of Mali and are important sources of income and stores of wealth for poorer households. Their ability (particularly of goats) to survive in harsh environments make them an important part of rural safety-net systems. Given their much shorter reproductive cycles than cattle, they offer the opportunity to expand production more quickly if feed resources are adequate. Because of their shorter reproductive cycles, the annual off-take rate for small ruminants, at 34.5%, is triple that of cattle. This greater off-take rate, plus their higher total numbers, results in consumption of small ruminant meat in Mali nearly equaling that of beef despite the smaller size of the animals: total estimated meat consumption from small ruminants totaled 71.4 thousand tons in 2005, compared with 82.6 thousand tons of beef (Samaké et al. 2008a). A higher proportion of the small ruminant meat is consumed in rural areas compared to beef, which is more of an "urban meat."

Seasonal fattening of sheep for Muslim feasts, particularly Tabaski, has long been an important enterprise in Mali, as prices for sheep can double or triple as the feast approaches. In recent years, this activity has increased in the Dogon plateau, offering an expanded source of non-crop income in that low-income area. Mali has also historically been a major exporter of small ruminants to its neighbors, particularly for the Muslim festivals. But this trade suffered the same perturbations as the cattle trade during the 2000s due to the Ivorian crisis. Total recorded small

ruminant exports from Mali fell from an annual average of 430,000 head in 2000-2001 to 165,000 in 2003. As with the cattle trade, there has been some diversification in export markets since that time, particularly to Senegal with the opening of the paved road to all the way to Dakar. Seasonal exports of live animals to Algeria and Libya have also grown.

The 2001 Agricultural Sector Assessment pointed out that despite their importance and widespread ownership in Mali, small ruminants have received much less attention in terms of interventions than have cattle. This remains true. While feed constraints, as with cattle, are a major constraint, there is also significant room for improvement in animal health, perhaps through working with producer (including women's) organizations. Research and extension on least-cost rations and on market research to expand exports to Mali's northern neighbors and to the Gulf (e.g., for the Hadj) also should be explored.

### *3.3.3. Hides and Skins*

The prices offered to livestock producers for their slaughter animals reflect the value not only of the meat but also of the byproducts, of which hides and skins are particularly important. Mali has long struggled to improve the quality and profitability of its hides and skin industry, as discussed in the 2001 Agricultural Sector Report. Approximately 62% of cattle skins collected from slaughter facilities are exported in raw form, primarily to Europe. Recorded exports of hides and skins earned Mali approximately 2.9 billion FCFA (US \$6.4 million) in 2005 (Samaké et al. 2008a). The remaining hides and skins are processed locally or are consumed, particularly by people originally from coastal states like Ghana or exported by them to the coast for consumption.

Mali has two tanneries: TAMALI and the Spanish-owned firm TAO. Both firms reportedly operated well below capacity through the mid-2000s, but a significant increase in capacity utilization occurred in 2006. By far the biggest constraint to these firms has been the poor quality of the hides and skins collected from local slaughter facilities—both the urban abattoirs and the local slaughter slabs. Often the skins are perforated or poorly cut as a result of less-than-attentive skinning of the animal. There are also frequently blemishes due to ticks and other parasites, the skins have been allowed to decay before collection, and often they have been damaged through traditional “branding” of cattle through scarring. It seems evident that the incentives facing butchers (particularly in smaller localities) and their apprentices, who handle the skinning and slaughter of animals, are not aligned with the need to produce high-quality skins. The 2010 PNIP-SA calls for investment to improve the quality of local slaughter facilities and the training of slaughter personnel to improve the quality of hides and skins flowing into the tanneries. It also appears that a study of the pricing system for the collection of such hides and skins is also needed to understand why, if it would be profitable for the tanneries to get higher quality raw materials, that demand is not being translated into incentives at the local slaughter level (and down to the farmers and herders) to produce that quality.

## **3.4. Poultry**

### *3.4.1. Introduction*

The poultry sector in Mali is composed of two main systems of production: traditional and

modern systems. The main products from the sector are eggs and meat. The traditional system, which includes two sub-systems, represents 95% of poultry population. The first subsystem is traditional village production, in which birds range free, receive little or no medical care, and cover their feed needs through scavenging. In recent years, this system has been transformed into a more organized system around urban centers. The improved traditional system, also called “improved village poultry,” is characterized by improvement of the housing facilities and improved hygiene and medical prophylaxis (vaccination against the Newcastle disease and deworming). Regarded as an important instrument to reduce poverty in rural areas given its relatively low investment requirements, this improved traditional system is the focus of many planned projects in the future (PDAM 2007). The modern system (also called the “commercial system”) covers only 5% of the poultry population. This system is practiced by entrepreneurs oriented towards the urban egg and broiler markets. It uses modern livestock raising techniques, including improved health, nutrition and hygiene practices and use of improved breeds. This production system is mainly located around Bamako, with 87% of commercially produced birds produced in the Bamako area, and an additional 7% in Koulikoro. Sikasso, Mopti and Ségou are the major zones of traditional poultry production, accounting for 35%, 17% and 16% of poultry population, respectively (PDAM 2007). The gender orientation of traditional poultry is difficult to assess due to lack of data; however, there are an increasing number of women entrepreneurs entering the modern poultry value chain.

### 3.4.2. *Performance of the Poultry Sector*

In 2008, the poultry industry contributed about 0.74% of Gross Domestic Product (GDP) and 2.1% of the agricultural GDP (INSTAT 2008). Since the creation of PDAM (Program for the Development of Poultry in Mali) in 2001 and PSSA (Special Program for Food Security) in 2004, the sector has experienced a profound reorganization. The efforts under PDAM are designed to improve the efficiency of the sector through disease control, training of stakeholders, providing stakeholders with equipment and the construction of modern slaughter centers and poultry markets. The number of poultry reported by technical services rose from 5.6 million in 1999 to 27 million in 2006. The number of birds sold and tracked in 32 markets rose from 983,000 in 1999 to 6,000,000 in 2006 (PDAM 2007). However, it is difficult to assess how much of this increase simply represents better reporting of poultry numbers.

**Table 20. Recent trends in egg production in the modern poultry system.**

Year	2001	2002	2003	2004	2005	2006
Egg production (1,000s)	83,000	23,000	44,000	54,000	68,000	27,000

Source PDAM 2007

Almost all (99%) of marketed egg production comes from the modern system (DNPIA 2008). Its evolution is shown in Table 20. The decrease in production in 2006, after yearly increased production since 2002, resulted from a temporary ban the Malian government imposed on imports of chicks from France due to presence of avian flu in Europe. It should be noted that Mali does not import chicken and eggs for consumption. Evolution of imports of chicks and fertilized eggs are shown in Table 18.

**Table 21. Trends in the imports of chicks and fertilized eggs, 2001-06**

Product	2001	2002	2003	2004	2005	2006
Chicks	500,	500	300	350	450	200
Fertilized eggs	n/a	300	130	400	500	750

Source: PDAM 2001-2006, DNSV/GDRC

In recent years, the sector has seen an increased number of producers and other supply chain agents who are now engaged in a more vertically integrated relationship. For example, a number of small and medium-sized feed millers in Bamako are also producing chickens. Producers are organized into associations or cooperatives of poultry farmers (modern and village poultry). Additionally, the relationship between feed blenders, hatcheries, poultry dealers and technicians is conducted through informal or formal contracts.

#### *3.4.3. Constraints and risk*

The dependence of the poultry sector on natural resources, its high vulnerability to weather conditions, and the threat of avian diseases limit its capacity to increase production. Mali contains portions of the Central Niger Delta and the Senegal River Basin, which are on major flyways of many migratory birds, making the country particularly vulnerable to the spread of avian diseases. In 2006, many poultry producers left the market in response to the threat of avian flu, which was diagnosed in the neighboring countries of Ivory Coast and Niger. Consumers, fearing the spread of disease, reduced their consumption of chicken and eggs, which led to losses by producers who were forced to feed their birds for a longer time or to sell them at loss. The government has created a committee designed to assess the risk of avian flu to the sector and identify measures to prevent its introduction in Mali. In addition, there are information campaigns to promote vaccination of birds throughout the country. As with other value chains, access to credit is a serious problem, caused in part by the perceived risks of investing in the poultry sector. The price of outputs and the inputs are also unstable; caused in part by seasonality in the availability of inputs. The high cost of energy and transportation are other factors that constrain the development of the sector. Finally, the low level of coordination among the sector's stakeholders mitigates the efficiency and process of professionalization of a modern poultry industry. Lack of strong professional organizations in the sector constrains efforts at educating stakeholders about improved production and marketing techniques. Most of the cooperatives are formed by small-scale producers, who are attempting to meet the lower prices offered by large producers. The latter cut prices in order to expand market share and help ensure full use of their production facilities.

#### *3.4.4. Opportunities and growth potential of the poultry sector*

Despite these constraints, the growing demand for poultry products, especially in urban areas, offers strong opportunities to expand production. Growing maize production, described earlier in this report, facilitates this expansion, as maize accounts for over 60% of the cost of poultry feed. In addition, local production of other key inputs is expanding. In Mali, there are three units producing day-old chicks: Mali Chick, SODOUF and Veto-service, with incubation capabilities of 58,000, 46,000, and 10,000 heads per cycle, respectively (PDAM 2007). The expansion of these chick production units could help reduce the need for Mali to import chicks from neighboring countries at high prices. Locally produced chicks are sold at an average price

of 550 FCFA a piece, which is less than half the price of imported chicks (Minta 2006). According to the 2007 PDAM yearly activities report, imports of chicks decreased from 130,000 in 2001 (when Mali had no domestic production of day-old chicks) to 26,000 in 2006 (these numbers represent the import of day-old chick for broilers only). As day-old chick imports have fallen, imports of fertilized eggs have increased to supply local chick producers. Eventually, it may prove profitable for these chick producers to integrate backward to increase their own production of fertilized eggs.

#### *3.4.5. Importance for poverty alleviation*

The poultry sector plays an important role in the reduction of poverty and the diversification of Malian population's diet by increasing animal protein availability. It is practiced by 80% of the rural population (National Program for Livestock Development 2004). The cycle of production is short, and there is important local, regional and international demand for poultry meat. This demand increase has given incentives to private stakeholders to invest in the poultry supply chain from food processing to the supply of veterinarian products to the marketing segment.

### **3.5. Dairy**

#### *3.5.1. Evolution of Organization and Performance since early 1990s*

Most cattle are managed as dual-purpose animals in Mali, and dairy production is an important enterprise in rural areas, particularly for women. In the past 30 years, peri-urban dairy production has also grown, aimed at satisfying a growing urban demand for milk. Milk production data are poor and vary considerably by source. For example, in 2010, the World Bank reported that "that Mali's total milk production is estimated around 500 million liters, of which 300 million liters are from cows" (World Bank 2010), while an estimate by Mali's DNPIA (PNIP 2010) suggests that production is well over twice that, with 600 million liters available for human consumption. In spite of its large number of milk producing animals, Mali imports approximately 10 to 15 billion FCFA worth of dairy products on an annual basis, mostly powdered milk from Europe. A 2008 report by The National Directorate of Animal Production (DNPIA) indicated that increased world powdered milk prices (approximately 86% increase from 2004 and 2007) has caused a great deal of strain on efforts to improve the nutrition status of Malians through increased per capita milk consumption.

Per capita dairy product consumption estimates vary greatly by year, author and by region (Bonfoh 2006). One commonality across sources is that consumption estimates fall far behind Mali's target of 40 L/person/year and the FAO's global estimate of 60 L/person/year.

Production in rural areas relies almost entirely on local breeds, which have very limited and variable production (typically between 0.5 and 3 L/day for cows). Most observers believe that in rural areas, lack of adequate nutrition, rather than genetic potential, is the binding constraint. Rural milk production is widely dispersed, with the largest concentration of animals in the Mopti region (see data on ruminant numbers in the section on the livestock/meat subsector and recall that most of these animals are dual purpose). Women typically manage dairy cows and sell either fresh or fermented milk (*lait caillé*) from home or in local markets. Local market availability of milk in northern areas also depends on where the animals are in their seasonal



transhumance path. Given the lack of any refrigeration in the traditional system, there is a significant risk of bacterial contamination in the products sold.

Peri-urban milk production is more intensive, making greater use of purchased forage (groundnut and cowpea hay), crop residues, and feed concentrates to supplement natural pastures. Some peri-urban producers have developed crossbreeds with European breeds (e.g., Montbeliardes), using both artificial insemination and direct importation of breeding stock.<sup>33</sup> These crossbreeds produce up to 20 L/day.

There are now several dairy-processing firms in the Bamako area, including Yoplait, Malilait S.A. and GAM (*Générale Alimentation Malienne*) as compared to just the latter two in 2001. Malilait, GAM and Yoplait produce fluid milk and a range of processed products, such as yogurt, *lait caillé*, and ice cream. Approximately 80% of the milk they process is reconstituted milk powder imported from Europe. The remaining 20% is sourced from local producers and producer organizations. These firms benefited from the heavy export subsidies on European dairy products throughout the 1990s and early 2000s, which made it easy to rely on powdered milk imports. In addition, using such milk is logistically much easier, as the firms can more easily control raw-product quality, seasonal availability of product, and relations with suppliers.

As a result of relatively high world dairy prices since 2005, these firms have faced increasing production costs that have been passed on to consumers. This has resulted in some restructuring of the Malian dairy sector, characterized mainly by increased consumer interest in local milk (*lait locale*). In order to meet local milk demand and in spite of local milk production and marketing challenges, networks of small-scale dairy producers and cooperatives have proliferated throughout the country's main production basins. These include the Réseau Danaya Nono (with technical assistance from French and German funds); FENALAIT (with technical assistance from Swiss funds) and Solaima in collaboration with APCAM. These increasingly organized and professional organizations sell fresh and pasteurized dairy products through a variety of marketing channels including both rural and urban kiosks along major thoroughfares, urban food stores, directly to schools as well as directly to the larger milk processing firms who incorporate fresh milk in their products to give it a local taste.

### 3.5.2. *Growth potential and lait locale value-chain opportunities*

Demand for local milk is strong and growing. This can be attributed to high world powdered milk price trends that favor locally produced milk. Milk is also a relatively inexpensive and convenient protein source. As a result, demand has increased with household income growth, resulting in both consumption and lifestyle changes as well as Mali's rapid rate of urbanization, which the world's 11<sup>th</sup> fastest, according to the 2005 World Development report. Despite these trends, estimates indicate that the average Malian consumes 12-15 L/person/year versus FAO world estimates of 60 liters of milk per year. The Malian government previously set a goal to reach 40 L/ person/year by the year 2000. This was revisited more recently with a goal of reaching this level of consumption by the year 2015.

Local milk marketing networks have expanded recently in order to overcome both production

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<sup>33</sup> Artificial insemination is arranged through local private veterinarians, but is reportedly costly (35,000 CFA F/insemination) and with a low success rate (approximately 30%). [Dick Cook, CAE, personal communication.]

and marketing bottlenecks. For example, in many peri-urban areas, producer associations (cooperatives) are now responsible for input procurement for producers (concentrate feed often purchased on credit which is reimbursed with fresh milk delivery), fresh milk quality verification (with assistance of technologies disseminated by French and Swiss projects), milk processing (pasteurization) and marketing through marketing channels described above. In addition, the federation of milk processing cooperatives, FENALAIT, has developed an ongoing relationship with larger industrial milk processing firms. Although this partnership is strained at times, it does allow peri-urban producers a marketing outlet to overcome milk storage and processing challenges, especially during the production glut of the summer months.

Artisanal value-added products such as cheese, ghee (liquid butter) and *féné* produced by individual women or by producer organization are also popular and contribute to more generally to income development and job-creation goals. Successful development of these activities depends on producers' and marketing agents' incentives to make safe and healthy products.

### *3.5.3. Importance for Poverty Alleviation and Growth Linkages (Production and Consumption)*

Local milk production has both production and consumption linkages with the Malian economy. For example, aside from imported genetic stock, hormones, vitamins and some feedstuffs, inputs are mainly sourced locally: forages are produced locally, often by the producers themselves, and the bulk of concentrate feeds are local agro-industrial by-products from the cotton, coarse grain and cereal sectors.

Women play a central role in the local milk value chain in milking activities and as paid laborers in peri-urban dairy cooperatives. Consumers prefer to purchase milk from Fulani (Peulh) women, who have a reputation for quality. Consequently, women of this ethnic group also work in sales kiosks.

As discussed above, milk is a relatively inexpensive source of high quality protein. Improving Malians nutrition status through dairy product consumption will likely have long-lasting effects on health and human capital accumulation outcomes.

### *3.5.4. Key Constraints, risks and vulnerabilities*

The major constraints facing the Malian dairy industry are the following:

- *Low cost of imported powdered milk.* The success of local milk production efforts are directly linked to the non-availability of cheap imported powdered milk from the European Union.
- *Feed constraints.* On the production side, livestock feed continues to be an important source of vulnerability for the local dairy sector in Mali. Dairy cattle require two types of feed— forages and concentrates— as well access to clean water in order to reach their production potential. Forage availability and quality are highly variable across seasons (Dembélé et al. 2007). Both peri-urban and rural producers have reported conflicts over access to pasture land, likely resulting from the weak land tenure system. Historically, dairy farmers relied on inexpensive cottonseed meal as a source of high fat and protein feed. But cottonseed meal prices have hit record highs with the scaling

back of the Malian cotton sector (Hanson 2009). Farmers as well as researchers and extension agents continue to be faced with the challenge of identifying affordable alternative concentrate (high fat and protein) feedstuffs to support both dairy and cattle fattening activities.

- *Marketing constraints.* Rural, peri-urban and urban marketing constraints are also a source of vulnerability for the Malian dairy sector. These constraints are largely related to harnessing Mali's estimated production potential and bridging the gap between production and consumption basins. Many animals are produced well outside current marketing channels (e.g., large livestock herds that participate in annual transhumant circuits). Local dairy processing plants closed in Niono and Sikasso because rural demand was not strong enough to absorb all of production and because of heightened competition between different marketing entities (Corniaux et al. 2005). Another important challenge is how to effectively capture the production glut during rainy season by appropriately treating milk through small-scale pasteurization techniques (area of focus for the Swiss development agency) and improving the managerial skills of milk cooperatives.

#### 3.5.5. *Potential Interventions (some cross cutting)*

- *Improve feed availability.* Continue current efforts (along with USDA) to improve livestock feed availability including possible work at the commune level with local grazing associations and efforts to improve the feed concentrate market (e.g., identify alternatives to cottonseed). Related to this is improving clean water availability.
- *Professionalism of agricultural marketing actors.* USAID could continue and expand upon various forms of technical assistance to producer groups: input procurement, investment financing, dairy plant management, seasonal balancing and marketing.
- *Monitor Results of ongoing efforts by both the Suisse and GOM.* USAID may monitor and coordinate with the efforts of the Swiss "*Lait Sain pour le Sahel*" and the Malian government's strategy to develop production basins throughout Mali through the *Initiative Lait*.
- *Institutional development.* Several cross-cutting institutional issues need to be worked out in order to meet milk production and consumption goals in Mali. USAID may help value-chain coordination and organization through technical assistance to Dairy Professional and Inter-professional Organizations. USAID may also assist with the more general development of land policy reforms (related to access to pasture land) and food safety standards (related to consumer safety) as well as the infrastructure and technical expertise to enforce them.

### 3.6. **Fish and Aquaculture**

Accurate data series on the evolution of inland fishery production, estimated at about 3.5% of GDP, are hard to come by. In the short run, production is pro-cyclical with rainfall and flood levels, but more importantly, there has been a steadily growing gap between demand and supply of fish protein over time due to over-exploitation and environmental degradation. Given the level of poverty in urban areas, where daily family expenditures on the non-cereal component of meals may be little

more than a dollar a day, few households can afford to eat meat or poultry except on rare occasions. Consequently dried fish, often in the form of ground fish heads, is a major source of protein included in the sauce that accompanies the daily cereal ration.

The high demand for fish protein in turn provides a large potential market for fish farming, which is considered to be an under-exploited resource for income generation and food security. Fish farming has the advantage of being able to use existing by-products from cereal processing and livestock production for fish feed. Infrastructure costs are significant, similar to irrigation on a per hectare basis, but potentially more scalable. An increase in the availability of fish protein could be a significant lever on nutrition indices for both the urban and rural populations, as well as a significant source of income for women who dominate the marketing and processing stages of the value chain. The PNIP-SA identifies support to the inland fisheries value chain as one of its priorities, including promoting aquaculture in association with irrigated rice production.

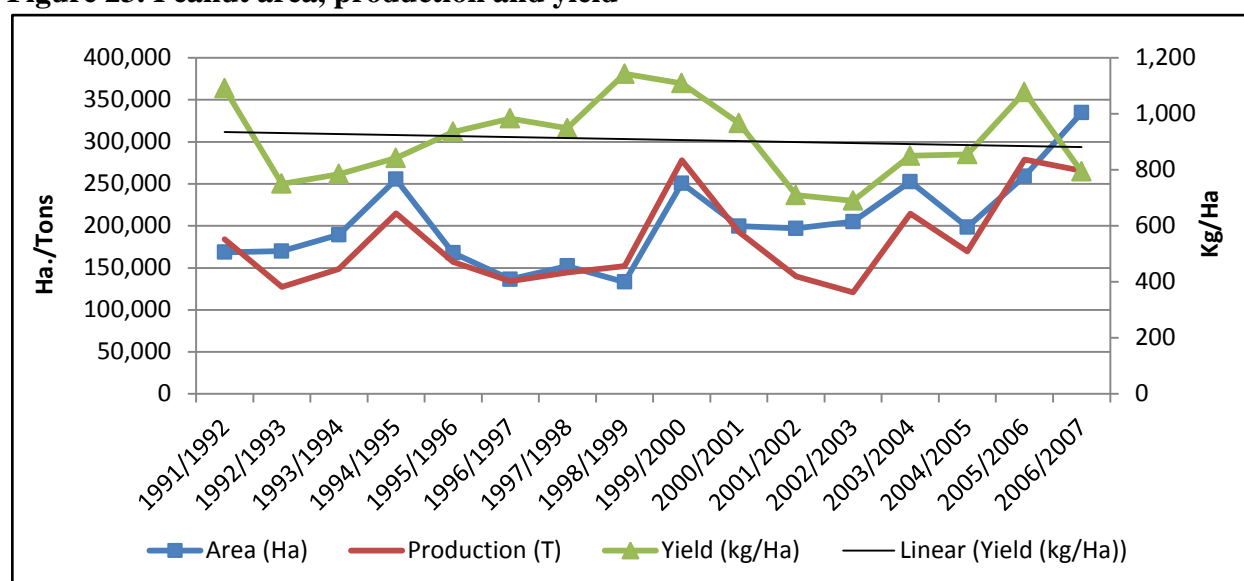
### **3.7. Oilseeds**

Oilseeds produced in Mali include peanuts, cotton and to a lesser extent sesame and soy. We provide an update on the peanut and cotton oil value chains and more limited information on sesame.. Shea nuts, although gathered from wild trees rather than being cultivated oil seeds, are also an important source of vegetable oil and are discussed below.

#### *3.7.1. Peanuts*

*Evolution of Organization and Performance since early 1990s.* Since the parastatal firms managing the peanut sector were disbanded in the early 1990s, peanut processing has remained in the hands of the private sector, and much of that activity is in the artisanal sector in which women transform peanuts into peanut butter and oil for sale on the domestic market. In 2010, the Groupe Tomota, a conglomerate Malian firm that purchased a controlling interest in the former state-owned cottonseed processing firm HUICOMA in 2005, laid out plans to expand into peanut and sunflower production to serve as feedstock into its vegetable oil processing plants. During the last five years the plants have been operating under capacity due to the sharp fall in cotton production described in section 3.1. As illustrated by the area and production trends, performance has been mediocre since 1990/91 with some expansion in area (about 6700 ha/year on average) and production (about 5000 tons/year), but no statistically significant changes in yields.

**Figure 23. Peanut area, production and yield**



Source: Graph developed from INSTAT data.

A characteristic of Mali's oil processing sector in general during the recent past has been the inability of the government to correctly monitor product and by-product quality. Formal sector processors must be licensed, but there are no regular checks of quality; the much larger shares of peanuts that are processed in the informal sector completely escape any type of control. Aflatoxin contamination of peanuts and peanut products is a major problem in the sector, with a number of informal assessments of the contamination of products sold in Bamako markets alarmingly high.

#### *Growth potential and value chain opportunities.*

The short-run growth potential for peanuts and peanut products is the domestic and regional market. Aflatoxin eliminates any possibility of exporting these products to Europe or the US, and raises major ethical issues for the development of the sector for domestic consumption until there are adequate aflatoxin controls in place. The Bill and Melinda Gates foundation is now funding aflatoxin research on peanuts in Mali and maize in Kenya. The research is being carried out by a consortium led by IFPRI. Documents on methods and a preliminary report mapping the transmission of aflatoxin in the Malian peanut value chain are available on their website:

<http://programs.ifpri.org/afla/afla.asp>. Once aflatoxin contamination can be properly addressed, the potential for further development of the sector seems good given the growing demand for edible oils. One missing element in our current assessment of the sector, however, is solid information on how competitive commercially produced peanut oil might be with domestically produced cotton oil or imported palm oil from Asia.

A large unknown is how heavily the Tomota group will get involved in groundnuts. The group has announced its ambition to cultivate up to 100,000 ha of sunflowers and peanuts in the Monipedougou area near Macina, but has not yet worked out the arrangements for a lease for the entire area. In 2010/11, plans were to cultivate 663 ha, of which 203 would be for peanuts intercropped with sunflowers (L'independant, December 9, 2010). If Tomota were to implement outgrower schemes with smallholders, it could become a value chain leader in promoting best

practices for controlling aflatoxin in peanuts.

*Gender Aspects.* Although both men and women produce peanuts to earn personal income, the crop is one of the more important ones produced by women in Mali. In addition, women are also the major processors. Since women are already heavily involved in the sector, it would be a logical choice of value chain to develop if the objective were to increase women's incomes.

*Importance for Poverty Alleviation and Growth Linkages.* Peanuts do present opportunities for value added at the farm level in terms of shelling and processing into peanut butter and oil, but encouraging the development of these activities at the farm level is likely to create more problems than it solves if aflatoxin contamination is not addressed.

Peanuts also provide a cash crop that can be used to diversify production in zones that have become heavily dependent on cotton. Research conducted in the early 2000s when the CMDT was expanding cotton production toward the Kayes Region found that a key difference between production choices of the more traditional cotton farmers in the Sikasso Region and the new cotton farmers in the Kayes Region was the tendency of the new producers to integrate cotton into their existing system of cultivating peanuts as a cash crop rather than allowing cotton to replace peanuts (Koenig 2003). This was facilitated by investments in roads that accompanied the cotton expansion because it made it easier for farmers to market other products as well. This experience raises the question of whether cotton farmers in Kayes, as a result of this integration, have fared better than those in the older cotton zones where there was greater dependence on cotton.

For example, cotton production began declining modestly in 2006/07 and the decline accelerated in 2007/08 and again in 2008/09. Unfortunately, our data base for peanut area and production only goes through 2006/07, but statistics for Kayes show a 11% increase in peanut production from 2005/6 to 2006/07, while the national average production declined by about 5%. Other regions that also increased production from 2005/06 to 2006/07 were Sikasso (8%), Ségou (28%) and Timbuktu (34%), but these other regions were increasing production from a much lower base than that in Kayes. In short, there is a need to better understand the choices farmers make with respect to area planted to different cash crops and how flexible they can be in switching from one to the other when price signals change. Increasing this flexibility should reduce price risk at the farm level and improve average incomes.

*Constraints, risks, and vulnerabilities.* The main constraint to the long-term development of this sector is the lack of aflatoxin awareness and control.

*Potential Interventions (some cross cutting)* ICRISAT has developed a kit that provides a low-cost way of testing for aflatoxin. Given the serious health consequences of aflatoxin-contaminated peanut products and the important share of the Malian diet that comes from peanut-based products, any attempt to develop the peanut value chain must include effective means of detecting and limiting aflatoxin contamination.

### 3.7.2. Sesame

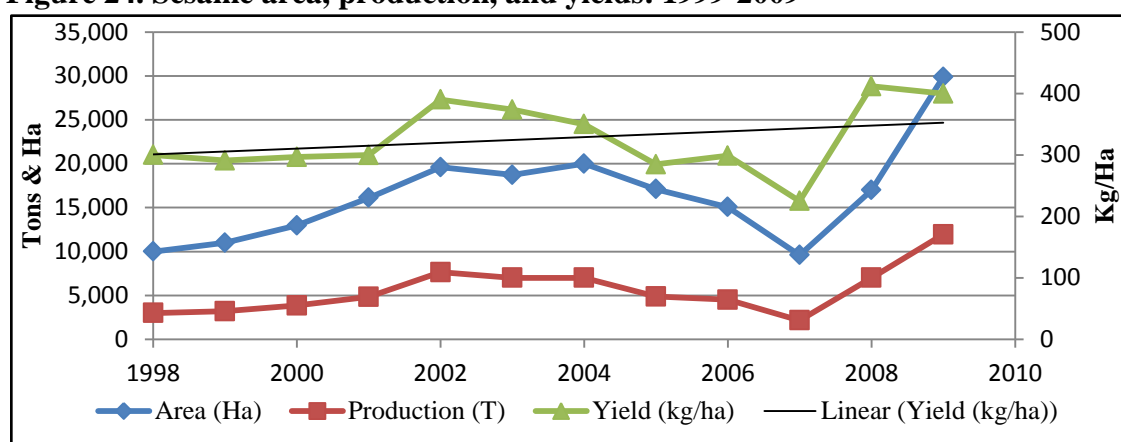
*Evolution of Organization and Performance since early 1990s.*

The sesame value

chain was not covered by the 2001 Agricultural Assessment. In February 2001 a report was issued by Chemonics based on a study by Yiriwa Conseil of several vegetable oil sectors in Mali, including sesame. We have found no more recent documentation on the sector other than some production statistics available from FAOSTAT.

In comparing FAOSTAT production, area, and yield data for 2000-2009 to that reported by Yiriwa for the 1990s (DNAMR/CMDT sources), we find that average area for the 2000s was 4.6 times that reported for the prior decade; average production was 5.5 times greater and yields were about 11% lower. These results suggest significant expansion of the sector, particularly in 2008/09 (see Figure 22), but little progress in productivity improvements.<sup>34</sup> Because sesame is grown in some areas where cotton is also produced, we expect that the large increase in area and production in 2008/09 is related to the continued decline in the cotton sector, but this needs to be verified by on-the-ground farmer surveys.

**Figure 24. Sesame area, production, and yields: 1999-2009**



Source: Graphs prepared from FAOSTAT data

The principal production zone is found in the area between Tominian and San, a zone supported by the CMDT. Before the CMDT was required to drop all activities in support of crops other than cotton, it was providing extension services to sesame producers as well as marketing services. Tominian was producing 75% of all sesame in the zone, with the other production centers, by order of importance, being Fangasso, Sayes, San, Yangasso and Kimparana. While the importance of sesame is dwarfed by crops such as cotton, it involved as many as 4600 farm enterprises in 1999, 2775 women producers, and over 3300 hectares (of which 186 were cultivated by women). CMDT production overall represented 95% of Malian production with the remaining 5% coming from the OHVN zone.

The production cycle of sesame is complementary to other crops grown in the zone, as it is planted in July (later than most other crops) and harvested in October.

According to Yiriwa Conseil, sesame production was profitable for farmers in the late 1990s:

<sup>34</sup> Our data series for this crop is problematic with missing data for 2004 and 2008 and discrepancies between the FAO estimates available for 1990-1999 and the DNSI data reported by Yiriwa (2001). Logically, if production increased more than area between the two decades we would have expected yields to have increased too; this is not what is reported in the available data.

Costs of production in San were about 140 FCFA/kg, with an average sales price of about 200 FCFA/kg. Given relatively low yields (about 350 kg/ha), a farmer's sales revenue could be as much as 70,000 FCFA/ha, leaving a net gain of about 21,000 FCFA/ha. Although it is not clearly stated, the costs seem to include a value for all labor used in planting, weeding, and harvesting (Table 22). There is a need to update these budget numbers given the significant increases in fertilizer prices and oil seeds during the recent past.

**Table 22. Crop budget for sesame: 1990s**

Item	Costs (FCFA/ha)
Land Preparation charges	18,750
Seeds	2,750
Fertilizer	9,250
Seeding	400
Maintenance (weeding, etc.)	4,000
Harvest costs	12,000
Sacks	1,400
<b>Total Charges</b>	<b>48,550</b>
Mean yield (Kg/ha)	350
<b>Cost of production (FCFA/Kg)</b>	<b>139</b>
Average producer price (FCFA/Kg)	200
<b>Net margin realized by the farmer (FCFA/Kg)</b>	<b>61</b>

Source: Data from CMDT Division for Diversification and cited by Yiriwa Conseil 2001.

The primary market for sesame is the export market, with CMDT and OHVN acting as facilitators between traders and producers. The marketing chain in the late 1990s was structured as follows:

- Individual producers organized in associations;
- First buyers who purchased production in rural markets;
- Wholesalers who are supplied by the first buyers, usually after providing some financing;
- Exporters who are either Malian nationals or foreign firms.

OHVN, for example, worked with the export firm KAGNASSY for a number of years. World market prices for sesame were variable and led to several years where OHVN ignored the sector. By the end of the 1990s, however, prices began rising and OHVN again began supporting producers and exporters.

We have not found any more recent information on the sector than that reported in 2001, so we do not know if there have been changes in the role of OHVN, CMDT, or other private sector firms entering the marketing part of the value chain. The increase in area and production statistics suggests that farmers' interest in the crop is increasing, but the decline in yields



suggests that the decision for the CMDT to no longer provide extension to non-cotton crops may be slowing intensification of the crop.

*Growth potential and value chain opportunities.* The primary growth potential seems to be in the export market. Yiriwa Conseil reported an activity by the NGO Enterprise Works (ex-ATI) to help women's groups process sesame seed into oil, but as the prices for the seed rose from a level of about 75 FCFA/kg to more than 200 FCFA/kg, the oil extraction activity became unprofitable and was generally abandoned.

*Gender aspects.* Women are among the sesame producers, but they do not dominate the sector. As noted above, there do not seem to be profitable opportunities for sesame processing by women's groups based on past experience.

*Importance for Poverty Alleviation and Growth Linkages.* Although more current information is needed on crop budgets, if the situation presented by Yiriwa Conseil for the late 1990s still holds, there should be opportunities for rural producers in zones that are generally considered marginal production zones (low rainfall, poor soils) to increase cash incomes through the production of sesame. Many of these zones are in the margins of the cotton zone where sesame could act as a complement to or a replacement for cotton production.

Growth linkages in terms of domestic processing do not seem as promising for sesame as for other diversification crops.

*Constraints, risks, and vulnerabilities.* Lack of current information on the sector is a problem that limits our ability to make concrete suggestions. In general sesame is subject to the same constraints as other rainfed crops in Mali, output price and production variability.

Another issue is Mali's ability to organize the marketing value chain and export market so Malian exporters are the key actors. According to Yiriwa Conseil, much of the production in zones bordering on Burkina Faso was purchased by traders coming in from Burkina and taking the production back home for export. This has enhanced Burkina's reputation as an exporter of sesame, when much of what they are exporting in some years is coming from Mali. The positive side of this development is that there is strong competition to buy from farmers, and this keeps the price high at the farm level.

*Potential Interventions (some cross-cutting).* There is a strong need to improve the production, area, and yield data and look at profitability/competitiveness before making any decisions about other types of support for the sector.

### 3.7.3. *Shea*

*Evolution of Organization and Performance since early 1990s.* Shea (karité) is a perishable tree crop that grows wild in the agroforestry parklands of West Africa. In Mali, shea trees are mostly found in the areas of Bamako, Bougouni, Koutiala, San, Ségou and Sikasso. Women collect ripe shea fruit, remove the flesh and process the remaining nut. Oil extracted from shea kernels (known as butter) is used for cooking in West Africa, as a cocoa butter substitute in Europe, and in cosmetics in the US. In Mali, shea is known as "Women's Gold" because revenues from shea sales make an important contribution to rural women's cash income.

Estimates suggest that Mali is among the world's top three shea producing countries (along with Nigeria and Ghana), with a production potential between 80 and 250 thousand tons of shea kernels per annum. Demand for high-quality shea in Europe, Asia and North America is strong and growing. This is especially the case for shea used in natural or "green" cosmetics, soaps and lotions (Euromonitor 2009). Although shea production, consumption and export data are scarce and often based on the estimates of value-chain actors, it is believed that within the sub region Ghana and Burkina Faso have had the most success penetrating foreign markets.

Information flow along the value-chain is generally poor, and rural producers do not feel export-market product quality demands. This can be linked directly to the organizational challenges of the value-chain, namely the presence of two important marketing channels: the domestic and lucrative export markets. Industrially refined shea products from Mali are generally not competitive in either the domestic or export markets. Electricity costs are high, and there are anecdotes of industrial factories being built and then rarely operating, if at all, as a result of unreliable electricity supply.

*Growth potential and value-chain opportunities.* Globally there is a strong and growing demand for both conventional and fair trade shea through marketing channels destined for both the cosmetics and food industries (Chalfin, 2005; Euromonitor 2009). As a result of both the additional processing required to make shea butter and opportunities for product quality to be compromised (e.g., cleanliness of water used), many international buyers of Malian shea prefer to simply purchase the dried kernels and use industrial processing techniques abroad to extract and refine the oil. Therefore, even though shea butter has a much higher market value (per kilogram) than shea kernels, maintaining parallel marketing channels has proven quite difficult.

Value-chain participants have demonstrated initiative over the past decade to improve the organization of processing and marketing through cooperatives (and federated cooperatives) and through the recently established Malian "National Federation of Shea Professionals" (NFSP). Time will tell if the latter will lead to improved industry communication and strategic planning in order to overcome the value-chain's coordination problems. There appears to be good momentum in terms of both rural producers' enthusiasm to sell their goods abroad, exporters' initiative in financing investment and donors' interested in funding projects related to shea.

*Importance for Poverty Alleviation and Growth Linkages.* By some estimates, revenues from shea sales contribute up to ninety percent of rural women's cash income in shea producing areas. The shea value-chain has relatively strong rural growth multiplier effects, as shea is often sold in rural weekly spot markets for the purpose of earning cash to buy ingredients for sauces served along with processed cereals at mealtime, medicine, school supplies (including school fees), directly contributing to rural human capital accumulation.

*Key Constraints, risks and vulnerabilities.* Past research has identified the shea nut drying method as the main determinant of shea quality. Rural Malian women are the sole participants of this stage of the value-chain, which consists of two widely practiced methods. The first, "bury and roast" method is timesaving, while the second "boil and sundry" method is time and resource intensive, but required to effectively penetrate export markets. Technical information on the latter approach has been widely disseminated. However, women's time is valuable during the shea season, as it coincides with the period with the most pressing on-farm labor demands.

While shea quality depends primarily on the processing and storage practices of rural women, the predominantly male rural traders and exporters who comprise the remainder of value-chain participants, must then not only maintain it by keeping the different qualities separate, but also assure that market signals (e.g., prices) flow back to female producers. Without the transmission of market information along the value-chain, female producers do not have an incentive to adopt the time- and resource-intensive method. Producer organizations likewise may not have the incentive or managerial skills to monitor the quality of pooled shea products. As a result of these challenges, Mali has developed a reputation as a source of low-quality shea, which undermines value-chain promotion efforts and prevents shea from realizing its potential as a catalyst of empowerment and development through rural women's income growth.

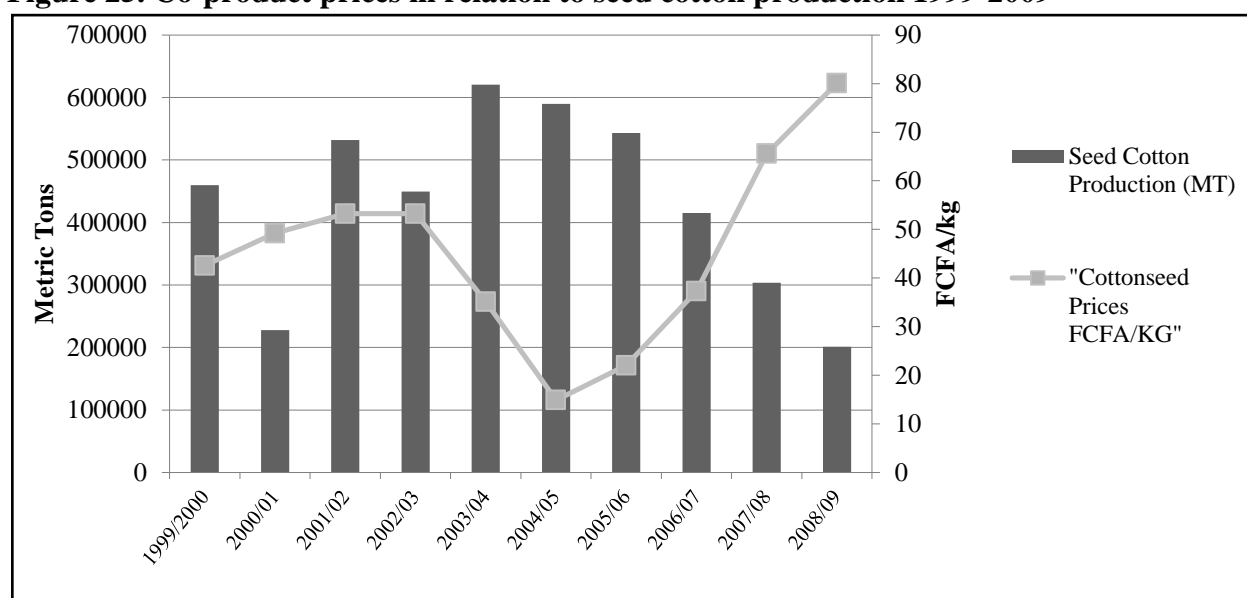
Both the health and age of Mali's agroforestry parklands have likewise emerged as areas of concern. Shea trees can take several decades to mature and reach their optimal production level. Related to this point, rural producers may over-harvest or even engage in detrimental harvesting techniques (e.g., hitting branches to shake fruit loose) if they are not faced with incentives to care for and protect shea trees in communal or family land.

*Potential Interventions (some cross-cutting).* USAID Mali could continue with current interventions in the shea value-chain including: 1) assisting with the development and financing of labor saving technologies (e.g. Multifunctional Platforms, MFPs) in order to free up women's time to participate in cash income earning activities and likely reduce the general child labor burden; 2) the ongoing USAID/Peace Corps partnership which involves tree grafting, linking farmers to markets and improved organization of processing and marketing through producer organizations; 3) general technical assistance to cooperatives through both Farmer-to-Farmer type programs and Peace Corps; and 4) technical assistance to inter-professional organizations in order to improve vertical coordination through support of the NFSP and for events like the annual Shea Day (with WATH).

#### 3.7.4. Cotton seed

*Evolution of Organization and Performance since early 1990s.* The 2001 Agricultural Assessment noted that the major constraint in the development of the cottonseed sector (oil, cake, animal feed) was the monopoly on processing cottonseed held by HUICOMA, a firm owned 53% by the CMDT, 40% by the government of Mali, and 7% by a variety of private shareholders. Despite paying below-market prices for cottonseed purchased from the CMDT, HUICOMA was unable to produce cotton oil that was competitively priced with other edible oils. Since 2001, the oil seed processing sector has been liberalized, with a large number of firms having entered the sector. HUICOMA was officially privatized in 2005, being sold to the Tomota group, but closed shortly thereafter as a result of financial difficulties stemming largely from increased cottonseed prices (their main variable input) (Hanson, 2009). Milling plants reopened in 2008/09 to crush cottonseed in addition to alternative oilseeds such as sunflower. Since the privatization of HUICOMA, there has been a tendency for the CMDT to sell cottonseed at more market-based prices, as shown by the increasing price trend graphed in Figure 25. This rising price trend is typical of cottonseed price movements in other West African cotton producing countries.

**Figure 25. Co-product prices in relation to seed cotton production 1999-2009**



The performance of the cottonseed value-chain is closely related to that of the cotton fiber sector because of the joint-product nature of cotton (lint and cottonseed). In Mali, producers sell their seed cotton to ginners, who give some seeds back to farmers to use for the following growing year and to sell the remainder through various marketing channels. These channels include sales: (a) directly to farmers or feed mixers to use as a high energy livestock feed, (b) to large crushing firms that process the seeds to obtain cottonseed oil and meal or (c) to artisanal oilseed crushing entrepreneurs. Most cottonseed is produced and consumed in Mali, although there is some cross-border trade within the sub region, mainly in response to livestock feed demand.

Several factors have come together to shape the performance of the cottonseed processing sector in Mali during the recent past:

- the financial problems of HUICOMA;
- the liberalization of oil seed processing activities, which has contributed to more market-oriented pricing of cottonseed sold by CMDT;
- the commodity price spikes of 2007 and 2008, which increased prices of vegetable oils worldwide and stimulated private sector investment in Mali's oil processing sector;
- the cotton crisis that began in 2007 and has resulted in a steady decline of cotton production since that time and, therefore, a drop in the availability of cottonseed for processing.

Following liberalization, HUICOMA was joined in the sector by a limited number of medium sized industrial processors and a large number of entrepreneurial small-scale artisanal crushers located primarily in cotton production zones (only 15% of registered processors were located in Bamako in 2008). Ministry of Commerce statistics listed 49 oil processors officially recognized by the government in 2007 and 34 in 2008. Of those listed in 2008, only HUICOMA could be considered a large-scale industrial plant (345,000 T seed capacity plus ability to process other products), while 7 fell into the category of mid-sized (40-60,000 T); the rest were all small scale.

*Growth potential and value chain opportunities*

The oilseed sector in general has strong growth potential given increasing demand for edible oils and high protein animal feeds in Mali as well as in the region. There is also dairy industry demand for cotton cake in Europe, a demand that Burkina and Benin have responded to; but given the very strong domestic demand for cotton cake in Mali, there has been no official effort by the CMDT to export to Europe or elsewhere.

*Gender Issues.* Oil processing is predominantly a male sector, although some of the artisanal processors are family or women-owned. As noted above, the peanut processing sector is more likely to afford women opportunities to increase incomes than the cottonseed processing sector.

*Sector's importance for poverty alleviation.*

Given the discussion below about the constraints facing the sector, we do not see a lot of scope for poverty reduction until the cotton sector is fully revived and producing again at peak levels. That said, it is important to note that all the processing firms generate some full-time employment and even more part-time employment that can contribute to economic growth. The Ministry of Commerce's listing of authorized processors for 2008 showed the total number of jobs generated by the 39 firms at 2090, with a minimum of 4 and a maximum of 811 (the latter for HUICOMA) (Primature du Mali, 2009). Although not specified, we believe this number is combined full-time and temporary jobs. Most of these jobs are being generated in rural towns and communities (e.g., Koulikoro, Koutiala, Sikasso, Bougouni) rather than in Bamako, which could be considered a plus in terms of increasing incomes of rural households and providing incentives for them to remain in rural areas rather than migrating to Bamako.

Although the cottonseed processing activities are providing income to a number of artisanal producers and employees who might otherwise be living in poverty, the wisdom of trying to develop the artisanal sector needs to be carefully studied given the difficulties that artisanal producers face in terms of producing a product that meets minimum health and environmental standards.

*Constraints, risks, and vulnerabilities.*

Across the spectrum of processors, production and marketing is more or less unorganized and suffers from serious environmental (uncontrolled discharge of processing wastes) and health concerns (gossypol contamination of oil). Complaints by some of the industrial processors about unsafe production methods used by artisanal processors have pressured authorities to shut down some crushing facilities in a given year, but the same facilities open up again the next, without adequate monitoring of quality.

In addition to being poorly organized as a stand-alone sector, the cottonseed processors are poorly integrated into the overall decision-making framework of the cotton sector in general. In the view of most processors, they should be allowed representation in the Interprofessional Council that has been recently formed to manage the cotton sector once privatization takes place. It is this council that will be making many of the decisions concerning cotton production levels and prices that will affect cottonseed processors, so it seems appropriate for them to have a seat at the table.

While the above-mentioned problems can be addressed through better implementation of government regulations as well as through more professionalism (i.e., internal monitoring by

members of oil processing professional associations), the greater threat to the development of the cotton oil sector is the decline in the cotton sector itself. Processing capacity in Mali is estimated to be 900,000 tons of cottonseed, while the production of commercial cottonseed since 2000 has not exceeded 284,000 tons and fell to a low of only 96,000 in 2008/09. Most cottonseed processors are already in or close to bankruptcy and indebted to the CMDT for past purchases of cottonseed. Only the firms that have developed capacity to process a variety of oilseeds have been able to continue processing at anything close to profitable levels during the cotton sector downturn.

In short, the outlook for cotton co-products (cottonseed, oil and meal) depends entirely on the more general performance of the cotton sector.

### **3.8. Horticulture**

#### *3.8.1. Overview*

We begin this discussion with a few observations that are of relevance for most, if not all, horticulture value chains in Mali.

*Documentation.* Documentation on the development of Mali's principal horticultural value chains since the 2000 study conducted by Yiriwa Conseil has been limited. Because the recent studies have been funded primarily by USAID/Mali (e.g., Abt 2007/2008 studies on regional shallot market prospects, on tomato processing prospects in Baguindea, and comparative work on rice, tomato, potato, and shallot value chains), this report has little new information to add to that already available to USAID/Mali. An exception is the recently released World Bank report on successes in the development of the mango sector, an activity to which USAID/Mali contributed.

USAID has also published a number of horticultural value chain "success stories", but these tend to be one- to two-page briefs that do not provide adequate information for use in assessing the overall performance of a sector or a particular type of intervention. We draw heavily on the Abt reports for the discussions of specific value chains that follow this overview.

It is important to note that the data series for specific horticultural crops are either spotty or non-existent in terms of production, area, and yield trends as well as export and import data. Much work is needed if Mali is to get reliable statistical series for horticultural crops in the future. There was an effort in the early 2000s to develop a standard methodology for collecting and reporting horticultural data in West Africa that was supported by FAO with Belgian funding. Despite various searches on the Internet, we were unable to find any evidence that the methods developed were actually applied.

Finally, we note that with the exception of the recent USAID-funded studies conducted by Abt Associates, information available on the competitiveness of most of the horticultural value chains is quite old, coming primarily from a FAO-funded study by Gergely published in 2002.

*Business Environment.* In addition to the USAID studies, there have been a number of broad studies covering the horticultural value chains in Senegal (Wade, David-Benz, Egg 2004), contrasting those in Burkina Faso, Ghana, Togo, and Benin (Nana and Mohamed 2006), and

contrasting those in Senegal and Mali (Matsumoto-Izadifar 2007). These multi-country reports focus primarily on the business environment aspects of developing horticultural value chains rather than the specifics of each particular crop or product, providing some cross-cutting insights on government policies and regulations that affect the horticultural sector. Three problem areas of relevance to Mali were noted by Matsumoto-Izadifar (2007):

- Gaps between government strategies for the development of horticulture value chains and private sector needs, and segmented policy design and implementation among various ministries has resulted in mismatched investment in the supply chain. Enhanced ministerial co-ordination as well as close consultation with private actors would remedy this mismatch.
- Despite a promising discourse and real efforts in both Senegal and Mali, infrastructure services such as transport, electricity, telecommunication and water remain costly and have limited reach, thus preventing a healthy development of agricultural marketing and agro-processing sectors. The provision of financial services is also insufficient and not adapted to the needs of small enterprises or the agricultural sector, depriving them of business opportunities.
- Third, market opportunities at national, regional and international levels remain under-exploited. In Senegal and Mali, emerging private entrepreneurs have expanded their production capacities, but made far less progress on their marketing skills. For instance, Senegalese cherry tomato and Malian mango exports to Europe account for a mere 2 to 3 per cent of domestic production. Formation of producer export clusters was noted as a positive step in both Senegal and Mali.

Research on horticultural market information systems (MIS) in Senegal may also be pertinent for Mali in that traditional approaches to radio announcements of prices used for other crops such as cereals were found to be inadequate for horticultural producers. Different approaches to MIS were recommended for different zones, depending on the importance of different types of intermediaries in the market (“coaxers”, in particular) (Wade, David-Benz, Egg 2004).

*Poverty alleviation.* Another source of useful information on the development of export value chains for high quality products in general is a series of discussion papers issued by LICOS Centre for Institutions and Economic Performance at the Catholic University of Leuven (<http://www.econ.kuleuven.be/licos>). Several of these papers deal with the challenges of integrating poor farmers into these value chains and the overall poverty-reducing effects of developing value chains for high-quality products when the exigencies of the international market call for highly integrated chains and commercial rather than smallholder production. One paper drawing on case studies in Madagascar and Senegal concludes that:

... increased high-value trade can bring about important positive effects for rural development and poverty reduction. Even with stringent standards, and consolidation and vertical coordination in supply chains, positive welfare implications can be found. Part of these effects comes through product markets but also employment and labour [sic] market effects are important, particularly for the poorest rural households. This implies that strategies to improve the welfare effects of high-value trade need to include strategies for creating inclusive food supply chains from which smallholders are not

completely excluded as well as strategies for the development and improved performance of rural labour [sic] markets (Maertens, Minten and Swinnen 2009).

The next several sections synthesize what we have been able to document concerning the mango, tomato, potato, shallot, and tiger pea value chains.

### 3.8.2. *Mangoes*

*Overview.* The World Bank's recent publication on the Malian mango sector (Sangho, Labaste, and Ravry 2010) provides a good snapshot of what has happened recently to spur growth in an export sector that has been in existence since the 1970s:

Mango trees grow naturally in Mali given the favorable agro-climatic conditions particularly in the southern regions of Bougouni and Sikasso, and mangoes have for long been collected and sold on the domestic market. In the 1970s, Mali developed a small fresh fruit air-freighted export sector targeting essentially the French market. This initiative was successful but remained limited in terms of volume due to the constraints of limited air cargo capacity and also market size.

The demand for fresh mangoes on the European market is strong and growing at more than 5% per year. More importantly, the market has changed drastically in recent years, becoming a volume market and sea-freight taking over as the main import channel through the major dispatching centers of the European ports.

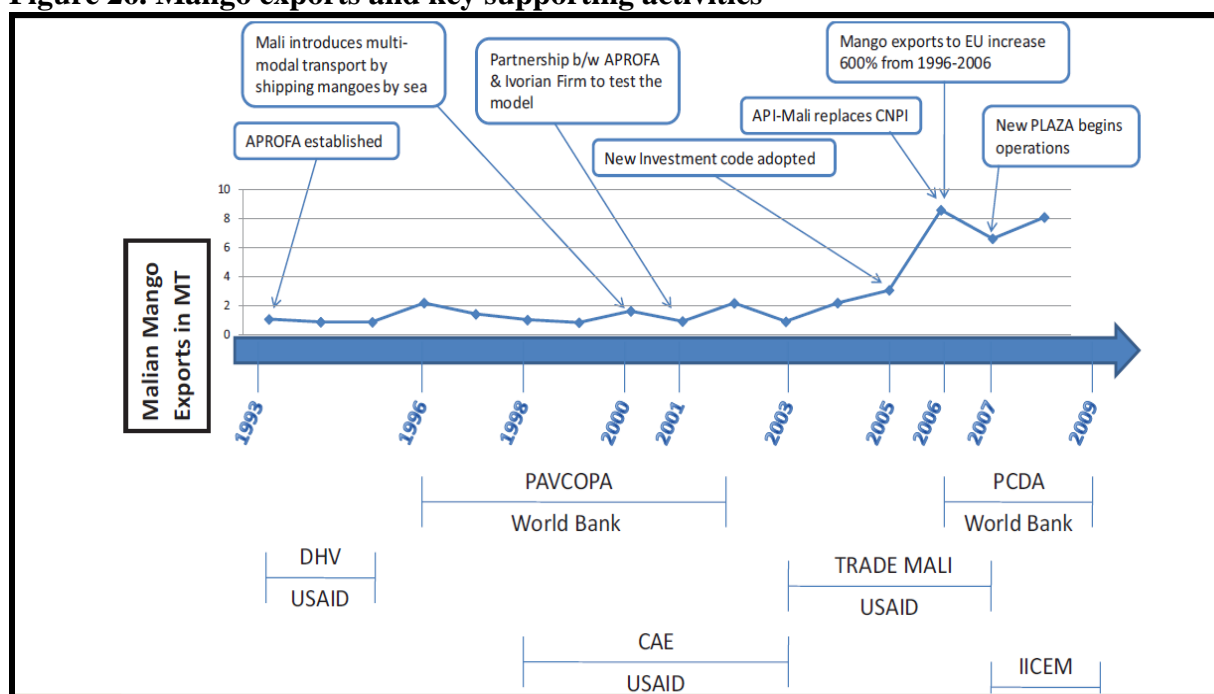
The key innovation that allowed Mali to overcome obstacles arising from its situation as a landlocked country and secure access to this market was the testing and implementation—through a partnership with private operators—of a multi-modal transportation system for the export of fresh produce that would provide an alternative to air freight. Thanks to project intervention, the feasibility and profitability of using refrigerated containers all the way to the destination market in Europe, with a combination of road, rail and sea freight, was demonstrated. This innovation basically opened the way to accessing the large and growing market of sea-freighted export of perishables. This new means of transport is also good from an environmental point of view by drastically reducing the carbon foot print resulting from this trade.

With the support of donors such as the World Bank and USAID, Mali was able to start building up its mango industry to serve export markets on a much larger scale that it had been able to do before, thus generating a growing stream of income and employment opportunities for the production areas. Once the initial innovation was tested and validated economies of scale could be achieved and the size of the potential market for Malian producers and exporters of mangoes changed dramatically. Creating the linkages between farmers and this market required the piloting of a new and stronger supply chain that has in turn brought innovative practices upstream and downstream.

*Structure and performance* The diagram below illustrates the trajectory of the mango export sector in terms of quantities exported and provides some insights on key supporting activities that enabled this export growth.



**Figure 26. Mango exports and key supporting activities**



Source: Sangho, Labaste, Ravry (2010).

The table below summarizes some of the key indicators of value chain progress during the recent past.

**Table 23. Mango export market changes, 1993 to 2008**

1993	2008	Impact
Mango exports were 1,050 metric tons	Exports are 11,995 metric tons	+1,042%
Sea-freighted mango exports are marginal; exports are not recorded as being sourced from Mali.	Sea-freighted exports are 4,600 metric tons	+460%
Mango revenue contribution to exports was USD\$460,000	Increased mango revenue contribution to exports by 484%	484%
Transit time from Sikasso to Northern Europe was 25 days	Transit time from Sikasso to Northern Europe was 12 days	-13 days
Farm gate price of 50 FCFA	Farm gate price of 125 FCFA	+150%
European imports were 237 metric tons	European imports increased to 4,560 metric tons	+1,824%

Source: Reproduced from Sangho, Labaste, Ravry (2010).

In addition to the quantitative improvements summarized in the table above, there have been important qualitative improvements that continue to be major problems in most of the other horticultural value chains reviewed in this section. Among the qualitative changes reported (Sangho, Labaste, Ravry 2010), we note:

- AHOLD, a major Dutch supermarket retail chain, has been present in Mali since the *Périmètre Logistique Aménagé en Zone Agricole* (PLAZA)—a conditioning station to prepare mangoes for export via sea— started operating and has been providing

technical assistance to Malian exporters and to the World Bank funded *Programme Compétitivité et Diversification Agricoles* (PCDA) during the last three campaigns;

- Mango is considered now as a production activity, not just a collection activity, and substantial work has been undertaken on the upstream/production level of the chain such as investment in mango orchard plantations;
- There is interest from financial institutions in the agricultural export value chains, as demonstrated by the increasing volume of credit to the sub-sector, the low default rates and the emergence of innovative financing instruments;
- A Mango Task Force has been established and has been active for some years to improve coordination in the sub-sector, develop an agenda for collective action between professionals and provide a platform to address issues of common interest with the public sector.

*Growth potentials, opportunities, and linkages.* European demand for mangos is projected to continue growing, but Mali will need to diversify its clients and the timing of its exports to fully participate in this growth.

Although the export market has experienced impressive growth, it represents less than 2% of total Malian mango production. There is a strong need to build on the lessons learned from export sector expansion to develop new value chains that satisfy domestic and regional markets for fresh fruit and, more importantly, for processed fruits (dried, juice, preserves, etc.).

*Gender aspects.* We do not have information on the gender breakdown of participants in the mango export sector. Women are, however, very active in domestic marketing of mangoes.

*Importance for poverty alleviation.* Most of the export market is supplied by larger farmers, so this market is not directly reducing poverty. To the extent that the export sector is creating employment in terms of assembly, packaging, etc., there can be contributions to poverty reduction. We have not seen any analyses of such linkages.

*Key constraints, risks, and vulnerabilities.* The World Bank report on the mango export market highlights the following areas as ones that will need attention in the future if the mango export sector is to expand and additional value added is to be built into the value chain.

- Improve/strengthen market positioning and diversify market outlets;
- Continue to invest on quality and product differentiation;
- Ensure compliance with standards and phytosanitary requirements;
- Control the fruit fly;
- Invest in production and secure higher volumes of high quality fruit;
- Attract capital;
- Diversify the offer to better utilize the PLAZA terminal created to facilitate export;
- Further invest in marketing infrastructure;

- Pursue other value-added options such as dried mangoes for both domestic and export markets;
- Improve transport infrastructure (e.g., the rail line to Dakar to facilitate exports);
- Foster cluster development in related industries and services (certification, packaging material, inputs, laboratory capacity);
- Join forces at regional level; Mali and a number of countries in West Africa, including Cote d'Ivoire, Burkina Faso and Senegal, have an inherent interest in coordinating both their production and export of mangoes in order to fully benefit from the economies that such cooperation could provide.

### 3.8.3. *Potatoes, Tomatoes, Shallots*

We combine these three products in the same section, as we found the comparative analysis of the three value chains done by Abt Associates more informative in terms of developing future strategies than relying strictly on a sector-by-sector description. That said, we make a few introductory remarks about each individual value chain before turning to the comparative analysis.

*Potatoes.* Demand for Malian potatoes has increased markedly ever since the 1994 CFA franc devaluation, which made West African production much more competitive with imports from Europe, both in Mali and in coastal countries such as Côte d'Ivoire, which emerged as major export destinations for Malian production. The sector is shaped, however, by the fact that improved seeds must be imported (largely from Europe) due to disease issues with local production and that the marketing season is relatively short due to storage problems. This leaves a large share of annual demand for seed potatoes satisfied by imports. At present, farmers send orders for seed potatoes in July or August, get them by October and harvest the potato crop from December to March. If they could improve storage – with inexpensive ventilated storage – they could buy potatoes in March at 200 FCFA/kg and sell them in July at 400 FCFA/kg wholesale, competing with imports at that time of year. Currently cold storage is not economic; however, ventilated storage is an option. Controlling seasonality is the key to increased potato revenue. Variety choice as well as storage can improve seasonality. Credit is a major constraint for inputs (seed and fertilizer) and storage. Credit was greatly expanded to the sector in 2005, but was followed by massive defaults, making lenders reluctant to renew lending to the sector.

*Shallots.* The local market appears to be close to saturation, as production is expanding faster than demand. There appears to be unmet demand in regional markets such as Côte d'Ivoire; the Senegalese already have a good hold on the global market, so it is not a promising prospect for Mali.

Upgrading opportunities include simple processing (slicing, drying), branding Malian shallots as being better quality, improved varieties, and improved coordination through better organized producer and marketing cooperatives. Financing is needed to improve transport (vehicles often break down and result in heavy losses), storage, and processing equipment.

It appears that there is tremendous opportunity for improving methods – better quality slicing machines, better dryers – to expand production. Producers in Ségou/Niono have been drying

perhaps 10 percent of their shallots, but this percentage is increasing. Producers in the Dogon Plateau are drying perhaps half of their shallots.

The market structure differs for producers/sellers in the Dogon Plateau and the Niono production zones. The Abt Associates study found that sellers in the Dogon Plateau appeared to have more market power due, in part, to a higher share of drying, which gave them more flexibility in terms of their marketing of fresh onions. Drying the shallots and establishing good market linkages horizontally among sellers and vertically to the wholesalers in Bamako gave the plateau farmers more market power. In Niono/Ségou there are many buyers and sellers in a mostly fresh market. This puts strong pressure on the farmers to sell quickly, and reduces their market power. Producers in the Niono region will probably develop more market power as they increase drying of shallots. More drying of the highest quality also increases prospects for year-round selling.

*Tomatoes.* At the production level, farmers can save their seeds, but the imported seeds are treated with fungicide and sometimes pesticides and perform much better than local seeds.. Farmers can use manure or buy fertilizer. There is also a tendency to use cotton pesticides on tomatoes, which raises serious health issues. There has been some research into biotech varieties of tomatoes to reduce virus problems, but we have no recent information on progress in this area (Kelly et al. 2005). There is no organized credit for production and little enthusiasm for it because of lack of organization, lack of processing and value added, and high perishability.

The local market is the end market for tomatoes that are sold on local spot markets for fresh produce. There is currently no domestic market for locally processed tomatoes. The major constraint is that the shelf life of fresh tomatoes is only three days due to consumer preferences for vine ripening. Producers are price takers with no prior contracts. Given perishability, farmers are forced to sell at prices offered. Men dominate the trucking and therefore tend to set the purchase prices. There is no good market information system on prices, which fluctuate widely.

Upgrading possibilities include exporting dried tomatoes to Europe or the region and exporting fresh tomatoes or concentrate to Senegal. There is currently a subsidized Dutch experiment trying to sell some dried tomatoes to European supermarkets. There is also some hope of selling tomato concentrate to Senegalese tomato paste factories and potential for marketing fresh tomatoes in Senegal if the train is functioning well. The Abt study concluded that "...it is difficult to see an upgrading strategy that will clearly have a major impact." The study noted, however, that it does make sense to:

- Improve price information so farmers can decide when prices are too low to justify transporting tomatoes to market;
- Try to develop regional markets for dried tomatoes;
- Test local markets to try to change consumer demand in terms of product ripeness, varieties, and preferences for dried tomatoes.

These constraints and proposed solutions are similar to the ones mentioned in Gergely 's 2002 study of the competitiveness of Mali's tomato sector:

- Need to spread out production;
- Better price monitoring and information;

- Group marketing;
- Increased artisanal processing.

The similarities lead us to conclude that there has been little change in the production and marketing situation during the past decade.

*Pertinent points concerning competitiveness.*

The following tables and notes are summary comments from the Abt PowerPoint *Development & financing of selected value chains in Mali*, Research & Workshop Summary, May 31 2007.

- *Tomatoes* There are a few small market niches to explore in regional and markets.
- *Shallots* Great market – production going way up – drying increasing. Challenge is to improve quality of drying with better slicing machines, better packaging and marketing.
- *Potatoes* The market is for fresh products, and Mali can sell what it produces. Major problem is credit and credit defaults.

**Figure 27. Mali's competitiveness by market**

VALUE CHAIN MARKET	Tomato	Shallot	Potato
GLOBAL	Possible market in Europe for dried	Possibly fresh, dried	Not competitive
REGIONAL	Modest possibilities in Senegal for concentrate, and fresh. Regional market for dried uncertain	Good current market for fresh, future market for dried.	Good market demand if Mali has supply
LOCAL	Fresh – good market Canned – competition from imported Italian paste imported	Strong demand for shallots (other onions not a substitute)	Excellent domestic market Imported in off season
SUBSISTENCE / GROWER CONSUMPTION	Strong demand for fresh tomatoes but not cherry or dried.	Strong demand for fresh and dried shallots -- used in 2/3 of sauces in Mali	Fresh potatoes are an important source of food

Source: Adapted from Pomeroy et al. (2007).

*Pertinent points concerning opportunities.* There are a couple of product upgrades possibilities – new varieties for tomatoes and shallots, but most of the upgrades are process upgrades.

- *Tomatoes* There are several small export opportunities to pursue, that could evolve into something bigger. But it is a long shot. Minor improvements are possible, particularly education on use of dangerous cotton insecticides – danger for farmer and danger for consumer if used improperly.
- *Shallots* There are wonderful marketing opportunities. Unclear whether these opportunities to improve and market dried shallots can be done by small women's

coops or whether you need a bigger organization, possibility working in cooperation with them.

- *Potatoes* Some cultivation and storage upgrades could increase production or profits.

**Figure 28. Horticulture opportunities**

	<b>TOMATO</b>	<b>SHALLOT</b>	<b>POTATOES</b>
<b>PROCESS</b>	<p><b>Explore dried tomatoes</b></p> <p><b>Improved chemical choices, application, and handling.</b></p>	<p><b>Better quality slicing machines, drying, packaging, branding.</b></p> <p><b>Cost effective storage to extend shelf life</b></p>	<p><b>Stagger plant/harvest timing. Disease &amp; water control</b></p> <p><b>Cost effective storage to extend shelf life.</b></p>
<b>PRODUCT</b>	<p><b>Use new varieties such as cherry tomatoes or varieties suited to processing</b></p>	<p><b>Government is developing new seed bulbs with desirable color and size.</b></p>	
<b>FUNCTIONAL</b>	<p><b>Better information on consumer demand &amp; incentives at all levels.</b></p>	<p><b>Women's processing coops expand to high value urban marketing.</b></p>	<p><b>Need improved logistics, to optimize use of transport and warehouses.</b></p>
<b>CHANNEL</b>	<p><b>Explore regional market for fresh, dried, concentrate.</b></p>	<p><b>Use channels for other products.</b></p>	<p><b>Increase regional marketing</b></p>

Source: Adapted from Pomeroy et al. (2007).

*Pertinent points concerning constraints.* Investments in processing, improving contracts, and developing product standards are inadequate. Improving trust is crucial in the potato sector, but also is very important in the other sectors to expand credit, improve cooperation and lower costs.

**Figure 29. Horticulture constraints**

Value Chain Actor	Tomato	Shallot	Potato
Retailers & Wholesalers	Build relationships / trust. Increase flow of end market price information and shipping costs.	Build customer relationships & organized markets. Improve storage. Develop product standards for contracts.	Explore upgrading premiums. Ventilated warehouses to prolong shelf life
Processing	Explore consumer receptivity for processed products, including regional & international markets.	Better slicing machines. Packaging and branding for dried product. Stress regional marketing	Explore storage techniques, sprout control, ventilated storage.
Production	May improve with better market info & organized marketing	Extension Incentives for upgrading, Continue organized market days.	Disease control. Coordinated planting times, Build trust & cooperation
Input Supply	Enforce controls on seeds to be sold. Pesticide education.	Expand seed bulb development & multiplication	Fix snafu in credit system Regain and build trust

Source: Adapted from Pomeroy et al. (2007).

*Pertinent points concerning finance.* The table below presents a thumbnail sketch of some investments, credit, and other changes needed at each level of the value chain. One important factor is the different interest rates at the different levels of the value chain – 10 percent for an industrialist, 16 percent for a wholesaler, 24 percent for a farmer.

**Figure 30. Finance needs by value chain**

Value Chain Actor	Tomato	Shallot	Potato
Retailers & Wholesalers	LT finance for trucks, warehouses.	LT finance for trucks, warehouses. Product standards for storage financing, contracts	LT finance for trucks, warehouses, info systems. Product standards
Processing	MT to LT financing for drying and other processing equipment, if competitive opportunities found.	MT finance for slicing, drying, packaging equipment	Few processing opportunities are evident.
Production	ST finance, as well as MT for farm equipment	MT-LT loans for equipment, warehouses	MT-LT loans for equipment, warehouses, water control.
Input Supply	Distributors get credit from suppliers. Rice and cotton chemicals used on tomatoes.	Fertilizer may be diverted from rice.	Rebuild trust in seed potato import credit.

Source: Adapted from Pomeroy et al. (2007).

### 3.8.4. Tiger peas (*pois sucré*)

The only information we were able to find on tiger peas was in the 2002 competitiveness study by Gergely (2002). We synthesize and translate his findings here, but note that the data and analyses presented need to be updated.

*Production.* Tiger peas were introduced to Mali after WWII and are cultivated primarily in the Sikasso Region. Area planted to the crop increased slowly but regularly from 1995 to 2001.

**Table 24. Tiger pea area, production, and yields**

Criteria	1995	1996	1997	1998	1999	2000	2001
Area (ha)	1200	1250	1300	1736	1953	1960	1990
Production (tons)	5400	5600	5850	4534	6285	6370	2490
Yield (t/ha)	4.5	4.32	4.5	2.6	3.2	3.2	1.25

Source : Gergely (2002).

Yields are variable for reasons that are poorly understood. Producers are primarily women. Production is usually done on small plots (average of 0.2 ha) primarily due to labor constraints at harvest time.

Producers are organized into associations (*l'Association des Producteurs de Pois sucré des de Sikasso et de Kadiolo* or APPSK).

*Marketing and prices.* The market is both national (consumed raw) and for export. Exports are destined entirely for Spain, where tiger peas are used to make Horchata (a drink).

*Conclusions/recommendations.* Gergely offered three overall conclusions concerning the tiger pea value chain:

- At the producer level, yields are very low and need to be improved through applied research if production is to become profitable;
- Export market demand is good in Spain, but will also be influenced by trends in Spanish production. New markets will eventually need to be developed if the sector expands;
- Export values could be substantially improved through improvements in quality (low moisture content and no impurities) and dealing directly with processing firms in Spain rather than through intermediaries, which could double export price.

To obtain higher export prices it is recommended that Mali develop partnerships with the firms that process tiger peas and improve technologies used in harvesting and post-harvesting operations to improve quality.

## 3.9. Sugar

Sugar is a capital-intensive irrigated crop. Current levels of output from Mali's sugar sector, at 35,000 tons annually, are low compared to annual consumption of 174,000 tons. The planned Markala Sugar project will enable Mali to satisfy domestic sugar consumption and export to



neighboring countries in the region.

After a many delays, on December 6, 2010, the Government of Mali signed a loan agreement with the African Development Bank for a private-public partnership with Illovo Sugar Corporation to implement the Markala Sugar project. Several other banks are co-financing the investment. According to the African Development Fund's Appraisal Report, at full development this \$215 million investment should produce 190,000 tons of sugar annually, from cane produced on 14,130 hectares, as well as 15 million liters of ethanol and 30 MW of electricity. Approximately 40% of the sugarcane area will be farmed by 560 independent out growers. The project will employ 8000 workers directly and create a further 32,000 jobs indirectly. Factory construction should commence by end 2012 and take two years to complete. The original feasibility study for the project was completed in 2002.

In terms of the overall goals of the PNIP-SA and USAID's Feed the Future strategy, the main potential significance of the new sugar sector investment is whether there may be any scope for combined fertilizer procurement to lower costs for fertilizer use in irrigated rice production zones. Sugar cane is a water-intensive crop, so the new project also adds to the competition for the Niger River's water at a time when irrigated rice areas along the river are also projected to expand rapidly.

### **3.10. Biofuels – Jatropha**

Although most of the cooking fuel in Mali is biologically produced (wood), the term "biofuels" in most policy discussions in Mali refer to non-conventional biofuels, such as jatropha.

#### *3.10.1. Structure and organization of the Jatropha value chain*

Development of the formal *Jatropha curcas* value chain in Mali is in its infancy. What exists is organized around a limited number of pioneer investors, each employing a variant of a core business model based upon the production of a liquid biofuel fuel(s), and the sale of one or more co-products (seedcake and glycol). None of the current processors currently manage their own commercial plantations. The vast majority of the commercial production is based upon small-holder producers who have integrated Jatropha planting as an intercrop in their existing agricultural fields, or use Jatropha as a hedgerow to protect their primary field crops. To reduce transaction costs and concentrate production, processors have invested in organizing producers through cooperative structures and higher unions, grower contracts, or informal producer-buyer relationships. The different buyers offer seeds and seedlings (free of charge, for sale or on credit), technical assistance and purchase all of the seeds produced. Partial ownership in the processing enterprise or profit sharing is used by at least two processors.

#### *3.10.2. Performance of the value chain to date*

Early experimentation with Jatropha in Mali is reported to have occurred as far back as colonial times, though the first major effort to establish Jatropha production, oil extraction and utilization stems from GTZ project activities in the 1990's. These initial introductions are responsible for establishing the base of Jatropha hedgerows that are found throughout the southern part of the country, and the indigenous utilization of Jatropha seed extracts in local soap and medicinal products. The sharp rise in oil prices, concerns over global climate change and opening of

biofuel and carbon offset markets post-2000 provided the economic stimulus for the current investments in developing the commercial potential of *Jatropha* production in Mali.

The first commercial investments in *Jatropha* began in 2006/07. The most advanced of these is MaliBioCarburant (MBC), which, through its main production facility in Koulikoro, is capable of producing both a high-quality *Jatropha* pure plant oil (PPO), and a refined *Jatropha* bio-diesel, both sold in local markets as a petrol fuel replacement. The MBC is the only facility in Mali capable of producing a true bio-diesel, which can also be produced using other vegetable oil feed stocks, such as palm oil that is currently sourced from Côte d'Ivoire. The transesterification process used in biodiesel refinement nets a significant volume of glycol that is sold and used in the manufacture of soap. The other initiative with significant processing capacity is the MalifolkCenter (MFC) facility located in Garalo. The Garalo facility employs the same extraction technology as the MBC, but does not have bio-fuel processing capabilities. All of the PPO produced is sold to an on-site electrical generation unit and burned to generate electricity for a local subscription-based rural power grid. At the time of a technical assessment mission in October 2009 (Simpson and van Peer, 2010), the only other enterprise in Mali with oil extraction capability was the *Jatropha* Mali Initiative (JMI) based in Kita. The JMI was piloting oil extraction equipment similar to MBC and MFC, and selling small volumes of PPO to the local market, as well as the seed cake for use as an organic fertilizer. The extent of processing capabilities in other *Jatropha* initiatives is not known, but can be assumed to employ the same technologies as those currently operating.

### *3.10.3. Growth potential, opportunities, and growth linkages*

Overall, development of the *Jatropha* value chain in Mali is currently constrained by an inadequate supply of feedstock (seeds). Contrary to the debate over biofuel production in Africa, and the fear of massive conversion of land use from food to fuel production, in Mali the converse is true; there is currently not enough land under feedstock production to support a commercial biofuel industry relying on *Jatropha* seeds. None of the major initiatives are able to source sufficient *Jatropha* seeds to operate at anywhere near their productive capacity. There are no large-scale commercial *Jatropha* plantations in Mali, nor is there suggestion that this type of investment will be forthcoming in the near future. The entire volume of seeds produced and sold comes from small-holder producers. Given current the value for *Jatropha* seeds of 50 - 70 FCFA/kg, and production levels of under 1 MT/ha, a major conversion in land use from food crops to biofuel feedstock appears unlikely. The surface areas reported by the different projects total 5000 ha, with stated plans for an expansion of several times this over the next few years.

As a petrol diesel replacement, the market value of *Jatropha*-based biofuels (PPO or biodiesel) will always be gauged in comparison with petrol pump prices (e.g., FCFA 500/l for bio-diesel vs. 526/l for petrol Oct '09, and FCFA 405/l for PPO). It would be false, however, to assess the profitability of *Jatropha*-based processing investments on biofuel values alone. The commercial systems being pursued are all based upon the development and sale of multiple products. Common examples include: PPO, bio-diesel, glycerin, glycerin-based soap, seed cake, and carbon off-sets, with compost, animal feed, methane and charcoal briquette production under experimentation, among others.

For small-holder producers, the major benefit is realized at the point of sale of the seeds. To the

extent that an oil extraction unit is located in closer proximity in comparison to petrol fuel sources, producers may also realize gains in a cheaper fuel type (offset in part by the need for increased maintenance in burning PPO in diesel engines) and reduced transportation costs in moving fuel to points of consumption. Use of Jatropha seed cake as an organic soil fertilizer (3-5% nitrogen, similar to poultry manure), which currently sells for 35-85 FCFA/kg, is cost-competitive with inorganic fertilizer (350-400 FCFA/kg for 15-15-15). At the field level, Jatropha yields under typical rainfed conditions in Mali are around 1 MT/ha (assuming intercropping density of 1,111 plants/ha), with a market value of 50-70 FCFA/kg for Jatropha seeds, making Jatropha non-competitive when compared with most other cash and food crops. Positive yield gains to other crops grown in association with Jatropha have been noted, and unlike field and cash crops, Jatropha hedges provide excellent protection against livestock around field boundaries. The total value of these marketed and non-marketed benefits will need to be included in carrying out a financial analysis.

#### *3.10.4. Gender aspects*

As a perennial tree crop, the potential for women to gain direct benefit from Jatropha production will be tied to their access to land, and land allocation decisions. Land and tree tenure conflicts have already emerged in some areas where Jatropha has been planted on lands for which individuals had customary usufruct access. For Jatropha used in living fences, women may be in a better position to benefit depending on their ability to negotiate harvest rights of the fruit. As potential beneficiaries of increased local access to cheaper liquid fuel sources, women stand to gain the most. Most of the important labor-saving technologies for threshing and grinding grain are powered by diesel engines suitable for use with Jatropha PPO, as are the small pumps used for supplemental and dry-season market garden irrigation. The multifunctional platforms being promoted through the UNDP target women as the primary beneficiaries. A small network of multifunctional platform installations, using Jatropha PPO and bio-diesel for part of their fuel needs, has been established in cooperation with MBC. Other technologies, such as the Fullbelly de-huller, exist and are able to reduce labor demands of women in preparing harvested Jatropha seeds for sale.

#### *3.10.5. Importance for poverty alleviation*

Often overlooked in commonly cited poverty metrics, low levels of per capita energy consumptions are closely linked with economic poverty, and Mali is no exception. As a development hypothesis, the increased availability of a lower cost liquid fuel source would generate significant gains in terms of greater utilization of labor savings and increased income earning potential among rural households, and would especially benefit women. Conversely, as post-peak oil prices continue to trend upwards, liquid fuel consumption in rural areas will bear the double burden of higher base prices and higher transportation costs, pushing technologies that rely on these sources of energy further out of reach of the rural poor. Proponents of biofuel technologies, and Jatropha in particular, point to a future of decentralized systems of feedstock production, fuel extraction and utilization. Technologically there are few remaining barriers; what remains is a careful calculation of switching points which make such investments viable.

### *3.10.6. Key constraints, risks and vulnerabilities*

Much rests on the commercial success of the few enterprises responsible for leading developments of Mali's fledgling *Jatropha* biofuel industry. If these enterprises fail, it is safe to assume that the existing in-field plantings of *Jatropha* will rapidly disappear. (*Jatropha* planted as a hedge rows will likely remain, as they provide immediate value in crop protection.) The viability of current *Jatropha* investments will continue to rest upon how well they are managed, the soundness of their basic business models, and future crude oil prices. The emergence of 'bad press,' related to the inability to eliminate or safeguard against the presence of *Jatropha*'s known toxic constituents (esp. *Phorbol esters*), or other unforeseen factors, could have significant negative impact on the future of *Jatropha* cultivation and processing. Initial analysis of results being conducted at Michigan State University has found the presence of *phorbol esters* throughout the biodiesel processing chain and all by-products. Treatment methods are currently being tested.

### **3.11. Agricultural Inputs**

This section begins with an overview of how the principal input using crop sectors acquire inputs in Mali and a description of the input subsidy program in place since 2008. More detailed discussions of the structure, performance, constraints, and opportunities of the fertilizer, the seed, and the pesticide sectors follow. Concerns and opportunities related to gender and poverty issues are reviewed in the last sub-sections.

#### *3.11.1. Overview of how principal input-using sectors acquire inputs*

Although input supply has been liberalized since the early 1990s, the structure of input demand and supply are heavily influenced by the extent to which the Malian government remains involved in the management of the agricultural sub-sectors that use most of the purchased inputs: cotton, irrigated rice, and horticulture.

Traditionally, input supply for horticultural crops has been based on market transactions between farmers and input retailers, with very little government involvement. Most seeds and some pesticides are imported and sold by firms having links to foreign suppliers. Fertilizers are acquired on the open market, often from traders who have developed their stocks by purchasing fertilizers "leaking" from the cotton and irrigated rice sectors. There is also some leakage of cotton pesticides which are used on horticultural products, raising health and safety issues.

Input supply for the irrigated rice sector was managed by the Office du Niger until 1993 and has been managed by producer organizations (with assistance from diverse donor and government funded projects) since then. A combination of direct negotiations and bidding procedures is used for grouped purchases by producer organizations having access to credit (estimated to cover about 60-70% of farmers). Seeds and pesticides represent a relatively small component of input supply in the zone compared to fertilizer. Pesticides are generally obtained on the open market through private retailers.

The situation in the cotton zone is more complex. Historically, the CMDT obtained inputs for all crops via international tenders and sold them to farmers on credit, using the cotton harvest as the collateral for the credit. As part of the cotton sector restructuring process, CMDT transferred

responsibility for “non-critical” inputs used for cereals to farmers in 2000 while it continued to manage cotton inputs. In 2008, preparation for the privatization of the CMDT and general dissatisfaction with the systems put in place for “non-critical” inputs led to the creation of a *Groupeement d’Intérêt Economique* (GIE) to procure all cotton and non-cotton inputs. The GIE is managed by representatives of OHVN, CMDT, the cotton producer organization (UN\_SCPC) and the Groupeement des Syndicats Cotonniers et Vivriers du Mali (GSCVM). It has been procuring inputs (pesticides, and fertilizers) since 2008 through international tenders. It is not yet clear how input procurement will be handled in the cotton zone after the CMDT is privatized, although the GIE is expected to play a role.

There is little use of purchased inputs in the coarse grain and pulse sectors outside the cotton zone. In these sectors farmers produce millet, sorghum, fonio, peanuts and cowpeas largely for home consumption and do not have income sources adequate to cover input purchases unless they participate in projects promoting these crops (e.g., seed multiplication projects or INTSORMIL). Farmers in this group who do have cash usually obtain fertilizers in local markets, often from supplies sold by cotton farmers who were able to purchase more than they needed on credit.

### *3.11.2. Input subsidy program*

The most significant development in terms of agricultural inputs since 2000 has been the return of input subsidies, which began with the *Initiative Riz* in 2008/09 and was expanded in subsequent years to cover inputs for maize, sorghum, wheat, and cotton. Fertilizer is the main component of the subsidy, but seeds, pesticides, and agricultural equipment are also affected. Decisions about the future of this subsidy program will have major implications for the future of the input sector in Mali.

The 2008/09 subsidy program was implemented with very little lead time as a response to concerns about rising commodity prices. Consumer prices of rice were stubbornly high in Bamako (well over 350 FCFA/kg compared to around 250 FCFA/kg in 2007) and showing no sign of declining. Concerns about farmers being able to afford fertilizers and their willingness to undertake the risk of doing so given uncertain yields were also heightened, as market prices of fertilizer rose 50% or more above 2007/08 levels. The introduction of the subsidy enabled farmers to pay only 12,500 FCFA/50 kg sack for eligible fertilizers at a time when market prices were in the 17,500 to 20,000 FCFA/sack range.

The program has been controversial, not because of the decision to re-introduce the subsidy (which is applauded by most of the program critics) but because the precipitous manner in which the program was designed and implemented. The program has been criticized for having used inappropriate procedures for selecting suppliers, for late deliveries of fertilizers in 2008/09, poor controls on the movement and distribution of stocks to farmers, excessive costs, delayed payments to several suppliers in 2009/10 that increased interest payments, and failure to develop adequate monitoring systems to measure program impacts (interviews with fertilizer suppliers and Bureau de Vérificateur Général 2010). Nevertheless, an independent report by the Malian *Bureau de Vérificateur Général* concluded that the overall program contributed to the following positive outcomes:

- 20% increase (over 2007/08) in fertilizer utilization in the Ségou Region;
- 48% increase in rice area in the Mopti region and 16% increase in the Ségou Region;
- An unquantifiable increase in producer incomes due to the combined effects of relatively high rice prices, increased production, and lower input costs.

Despite the high costs of the program, it is not addressing the need for extension and adoption research on increasing farmers' use of cost-efficient soil fertility practices. Techniques for improving the cost-effectiveness of fertilizer use include micro-dosing, combining fertilizers with compost or manure, and soil and water conservation practices. Much research and some extension has been done on these techniques, but there is still not enough effort being put into their promotion, despite their demonstrated potential for decreasing fertilizer costs and increasing yields.

### *3.11.3. The fertilizer value chain*

*Evolution of the value chain* Private firms began importing and distributing fertilizers in the first half of the 1980s, but the fertilizer sector really began to grow in the early 1990s when the Dutch-supported import program ended, the Office du Niger transferred input procurement entirely to farmer organizations, and the CMDT stopped providing cereal fertilizers. There are approximately 20 firms that have been identified in various reports and surveys as having participated in fertilizer tenders and marketing activities in Mali during the past two decades, but fewer than half of these firms are considered "professional" fertilizer dealers who supply the market regularly and have established business relationships with international suppliers (Diarra 2002, IFDC 2004, IFDC 2007).

Although the number of firms involved in fertilizer supply did not change during the past decade, some actors have changed and the number of "professionals" with connections to international manufacturers and a good understanding of fertilizer products and markets has declined. Diarra 2002 identified nine "professional" fertilizer suppliers active during the late 1990s. A 2004 IFDC report described the sector as having only four professional suppliers. At that time, the estimated number of input wholesalers was 15 to 20, and retailers numbered approximately 200. Over time, the sector has changed but not developed into a coherent, competitive national supply system. At present, two fertilizer importers supply an estimated 97% of the Malian market (Toguna Agro-Industries and Yara Mali). The distribution and wholesale sector comprises a small number of professional fertilizer distributors/wholesalers who stay in the market year after year (for example, Arc en Ciel, SMIAS, Agri2000, Gnoumani, PROFEB, and Nantoumé, which has become Toguna) and a larger number of actors who enter and exit the market when they see an opportunity for quick turn over (usually by responding to a tender).<sup>35</sup>

The sector is now compartmentalized into three different procurement channels: organized farmers in the irrigated rice zone, organized farmers in the cotton zone, and all other farmers (with or without access to subsidized fertilizers). The next section describes each of these

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<sup>35</sup> GDCM, SAD, SAT, Daff et fils, Here Distribution, Haidara et Fils, ITAB, MaliPaysan, Faso Jigi, and Somadeco, are the names of firms that have participated in fertilizer tenders yet their principal activity is something other than fertilizer (e.g., transport, cereal trade). The list is drawn from IFDC 2007 and unpublished documents on recent fertilizer tenders.

procurement channels and is followed by a section on the key actors involved in the different channels (see Fuentes et al. 2011 for more details on structure and procurement channels).

*Procurement channels.* Fertilizer procurement is most centralized in the cotton zone, where CMDT and OHVN continue to play an important role by assisting the input supply GEI created by farmers in assessing needs, obtaining and repaying input credit, and managing a single fertilizer tender that covers all cotton producers. Firms winning the tender must deliver supplies to designated CMDT warehouses; CMDT transports the fertilizer to producer organizations and local warehouses when they collect cotton. The producer organizations distribute supplies to members, eliminating the need for retailer involvement.

In the Office du Niger rice zone, the Commission Centrale pour l'Acquisition d'Engrais (CCAÉ) is the principal consolidator of needs and organizer of tenders. The Office du Niger provides assistance. In addition, individual producer organizations such as Faso Jigi have experience with negotiating directly with importers or other suppliers to obtain fertilizer for their members (Konon 1998, PACCEM 2009). Orders placed through the CCAÉ or individual co-ops are delivered to the co-op warehouses and distributed to members by the cooperative, thereby eliminating the need for retail distribution. The key issue in the ON is that an important share of farmers has outstanding debts; these farmers do not qualify for fertilizer through their cooperatives and must rely on the third supply chain.

The third procurement channel serving commercial farmers and those in unorganized sectors such as coarse grains and horticulture has historically been a cash-and-carry business structured on informal business arrangements between a small number of importers and independent wholesalers and retailers who sell a variety of agricultural inputs as well as other products. In 2008/09, when the Government of Mali (GOM) began to subsidize fertilizer heavily, first for rice and then for other crops, the quantities of fertilizer moving through the 3<sup>rd</sup> channel increased, but the increase was managed by the government rather than by the commercial sector. Most of the fertilizer for unorganized, non-commercial farmers is now obtained through a tender process managed by the National Directorate of Agriculture, which orders and distributes fertilizers for the subsidy program. Although officially considered a tender, the allocation of the market is determined more through government-supplier negotiations (*consultations restreintes*) than through strict tendering procedures. Fertilizers procured through the subsidy program tenders are delivered by the selected suppliers to designated government warehouses and distributed to farmers by government agents and local committees, thereby eliminating private sector involvement at the retail level. The only part of the fertilizer distribution chain that involves private retailers is that which serves commercial farmers (e.g., the sugar company), the large number of rice producers who do not have access to credit or subsidized fertilizer, and horticultural producers who purchase small quantities of fertilizer and other crop inputs.

*The actors.* While the three procurement systems differ in terms of support from government agencies, amount of and processes used to acquire credit, and organization of the distribution system, all currently rely on imports from the two giants accounting for an estimated 97% of all consumption: Yara Mali and Toguna Agro-Industries (established in 2007).

Yara Mali has connections to Yara (formerly HydroChem) in Côte d'Ivoire, which supplies bulk-blended fertilizers and assists with clearing imports through the Abidjan port. Toguna Agro-

Industries (formerly Nantoumé) is a Malian firm with some French financing. While Yara is strictly an importer, Toguna imports but also operates a bulk-blending facility in Bamako and has been awarded a concession to develop Malian phosphate deposits at Tilemsi. Toguna announced that a feasibility study for producing TSP from Tilemsi phosphates in Ségou is in process. Toguna's supply chain is primarily through Dakar, where the firm has very good relationships with ICS, Senegal.

A third importer, La Cigogne, an affiliate of the French firm SCPA-SIVEX, International, supplies commercial agricultural enterprises, the horticultural sector, and cereal producers who are not covered by the more organized rice and cotton systems because of their location or due to past credit defaults that make them ineligible. The Chinese firm Datong Enterprises has also been mentioned as having a representative in Mali and importing on behalf of Malian distributors.

When the fertilizer sector was initially liberalized, there were a number of Malian enterprises that attempted to import but most were undercapitalized and lacked the necessary business acumen to import efficiently. Some of these initial "importers" are still active in the fertilizer sector under different names and in the capacity of distributor rather than importer, relying on Yara, Toguna, or La Cigogne to procure the imports. In general, the international firms doing most of the importing do not participate directly in the various tenders because of the complexities of dealing with government institutions.

Some of the more prominent distributors in recent years operating in the rice zone and responding to the tenders are Arc-en-Ciel, SOMADECO, Gnoumani (closely allied to Yara), and Faso Jigi (a cereal producer organization that has developed fertilizer procurement and distribution capacity). In the cotton zone, the most active distributors include those mentioned for the rice zone as well as Partenaire Agricole (dealing primarily in pesticides), and Société Africaine de Distribution. Arc-en-Ciel and Gnoumani can be considered fertilizer professionals, but many firms who intermittently enter and exit the tendering process have little fertilizer expertise. The 2007/08 cotton zone tender provides a good illustration, as the firm winning the largest share of the CMDT market was GDCM (a cereal trader and transporter), which supplied 39% of the NPK and 50% of the urea not because of expertise in inputs but because of access to finance and transport enabling the firm to satisfy the tender requirements. GDCM obtained the fertilizer by linking up with importers, who did not want to participate directly in the tender process. These types of alliances tend to add an extra layer of transaction costs that would not be needed if those participating in the tender process really were importers as well as distributors/wholesalers (a model observed in other African countries such as Malawi).

A recurrent characteristic of the three fertilizer distribution channels is the tendency to have producer organizations or government institutions/agents perform functions that would normally be performed by private-sector retailers in a fully liberalized market. While this hampers the development of a vibrant input retail sector in Mali, it also allows producers to reduce out-of-pocket input costs by performing some of the distribution functions themselves. As government subsidies decline and demand for fertilizers in non-organized sectors increases, the need for a broader network of input suppliers will likely increase. CNFA (Citizens Network for Foreign Affairs) is trying to develop such a network.



In 2008, CNFA began a program to develop Mali's retail network, with a focus on the identification and training of agro-dealers and a credit guarantee program designed to encourage importers/distributors to extend credit to retailers. The program operates in the regions of Koulikoro, Ségou, and Bamako. By early 2010, CNFA had trained 1129 agro-dealers and provided credit guarantees to Toguna, Yara, and Faso Jigi; these suppliers then extended the credit to independent agro-dealers of their choice. The value of CNFA guaranteed sales in 2010 was miniscule (\$132,921) compared to the total Malian fertilizer market valued at \$31 to \$41 million during the recent past. CNFA argues that since the advent of the subsidy program, there is very little demand for fertilizers sold at market prices through the agro-dealer networks because one can find fertilizers resold by cotton and rice farmers on the market at much lower prices. The share of subsidized fertilizer being sold into commercial markets has not been documented.

At present, there is little direct investment by importers/distributors to set up their own network of retail sales points, relying instead on a variety of formal and informal arrangements with local traders in zones of high fertilizer demand. Toguna is an exception, with 3 regional outlets owned by the firm and contractual relationships tying them to 3 other regional outlets. A consequence of the current retailing arrangement is that few retail outlets provide technical advice to farmers on fertilizer use.

*Performance highlights and constraints.* Overall it is difficult to say that Mali has developed a vibrant commercial fertilizer sector since liberalization began in the early 1990s. Many of the participants in fertilizer tenders are opportunistic firms with no particular interest in developing a fertilizer sector. The types of vertically integrated import/distribution/retail systems that one sees in other countries have not developed in Mali. This increases the number of times that a bag of fertilizer changes hands and the number of times that another actor adds his/her margin to the overall cost.

While part of the problem could be attributed to the continued role played by government institutions in the organization of the procurement channels, efforts to reduce that role have generally been unsuccessful (see Box 1 and Box 2). Lack of producer capacity to fully assume input procurement responsibilities and lack of willingness on the part of suppliers and bankers to invest and assume a share of the risk inherent in fertilizer procurement have often thwarted these efforts.

### **Box 1. Reducing government's role in Office du Niger input supply**

Since transfer of input supply responsibilities from the ON to producers, a variety of approaches has been used to assist farmers with purchasing inputs, including bank credit (for farmers who are members of organizations with good credit repayment records), warehouse receipt programs that use rice as collateral for input loans (Trade Mali 2005), and reducing costs through direct negotiations between farmer organizations and foreign suppliers (Konen 2008, PACCEM 2009). It is estimated that in any given year, approximately 30% of rice farmers do not have access to formal-sector fertilizer credit because they personally or their producer organization has not repaid past loans. Some prefer to purchase for cash from local suppliers (economizing on the 12-14% interest payments). Others often obtain supplier credit, which can lead to total costs that are 30-50% higher than those of farmers procuring fertilizer through the formal credit system. After almost 20 years of experimentation with different approaches to credit and private-sector fertilizer supply, the ON appears to “get by”; but every year there are significant problems that arise in terms of suppliers not fully honoring their contracts (late or incomplete deliveries, non-conforming products, and not delivering at agreed-to prices), farmers not repaying their credit, and some questions about the quality of fertilizer supplied.

In general, the private sector suppliers operating in the ON have not shown the type of professionalism in terms of honoring contracts and offering competitive prices that one would have hoped for after 20 years. The perspective is more one of rapid turnaround and profits than of longer term investment and building a solid reputation.

### **Box 2. Reducing CMDT's role in cotton sector input supply**

Chipping away at the closed, integrated system that had long been credited with keeping inputs flowing in the cotton zone has not had the desired results in terms of lower-cost, reliable input supply and high credit repayment rates.

Efforts by farmer organizations to procure maize fertilizers as well as other non-cotton inputs included a test tender by the *Syndicat des Producteurs de Coton et Vivriers* in San and Koutiala in 2001/02 and the creation of the *Groupeement des Syndicats Cotonnier et Vivriers du Mali*, which organized a tender covering all of the cotton zone in 2002/03. The latter effort encountered serious management and financing problems following supplier demands that the CMDT and BNDA guarantee the orders; deliveries were late and less than required. The result was unusually low yields of both cereal and cotton as farmers, shifted cotton fertilizer to cereals to compensate.

In 2008, the CMDT transferred the responsibility for organizing cotton inputs procurement to a GIE created for that purpose. Since the 2008/09 production season, this organization has managed cotton fertilizer acquisition and is expected to continue in this role until the privatization is completed. Since the GIE took charge, there has been little analysis of its performance (D'Jim 2009). During these reforms, fertilizer prices have continued to rise as a result of world market prices, smaller size of individual orders, and the declining ability of CMDT to indirectly subsidize fertilizer transport by using cotton transport backhauls to deliver fertilizer.

The recurrent problem affecting both fertilizer supply and demand is an effective credit system for actors at all levels of the value chain: farmers, retailers, distributors, wholesalers, and importers. The large fertilizer quantities recommended for cotton and rice (150 to 400 kg/ha) and the high transport and handling costs associated with Mali's landlocked location contribute to input costs that can represent as much as 35-40% of gross income per hectare for these crops. In periods of unfavorable input/output price ratios, input costs can exceed the net returns per hectare for the previous year, making fertilizer use for rice and cotton highly dependent on access to credit (section 4.7 discusses credit issues in more detail). At the other end of the value chain, the Director General of Toguna identified access to credit from the BNDA as a major issue blocking his firm's development as well as agricultural development in general (Diallo 2009).

Whether the subsidy program represents a constraint or an incentive for private sector investment in the fertilizer sector remains an open question. The first year of the program, which allocated the entire market to Toguna, was clearly an incentive for that firm (perhaps a reward for having made a substantial investment in 2007). On the other hand, it was a disincentive for Yara and its partners because their share of the market declined. In subsequent years, the playing field was enlarged to such an extent that many operators participating in the tender process have been found to lack the capacity to deliver, which caused a different set of problems. The other disincentive to investment relates to delayed payments by the Government of the subsidy portion of the fertilizer; Yara, for example, complained in May 2010 that it had not yet received full payment for the 2009 campaign.

Another risk concerning fertilizer is the problem of quality control for both domestically blended and imported fertilizers to ensure that farmers can be certain that they are purchasing what they think they are purchasing. Farmers have complained about Toguna's bulk blend distributed as part of the subsidy program, but to date there is no reliable system in place for testing and disseminating test results. This makes it impossible to know, for example, if declining yields in the ON are due to inferior quality fertilizers or to fertilizer formula and doses that are no longer appropriate because of changes in soil quality. Related to this issue is the lack of legislation concerning fertilizer quality and labeling.

*Opportunities.* Investments in expansion of the irrigation infrastructure and commercial farms in the ON, rising world prices for food staples and an improved outlook for world cotton prices all suggest that Malian fertilizer demand will increase in the future. While the negative effects of climate change could have the opposite effect over time, for the next five to ten years, increasing fertilizer demand is probably more likely.

The recent arrival of Toguna Agro-Industries is an important development for all three procurement channels, after 20 years of no substantial investment by the private sector in fertilizer production or distribution systems. With only four years of operation to date and numerous "assists" from the government, it is too soon to tell how sustainable Toguna's effort will be.<sup>36</sup> Most fertilizer industry specialists consulted find it unlikely that Toguna can be more cost-effective producing bulk-blend fertilizer in Mali than operators in coastal locations like

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<sup>36</sup> We are referring to "assists" such as having been the sole supplier of subsidized fertilizers authorized by the government in 2008/09 and having received a concession to develop phosphate deposits at Tilemsi.

Dakar and Abidjan, yet the financial weakness and export focus of ICS in Senegal has permitted Toguna to compete successfully in the cotton sector tenders in that country, and the political turmoil in Côte d'Ivoire may give the firm a slight edge over Yara in Malian markets for the near-term.

Although Toguna represents an opportunity at present, there is always the danger that it could develop into a fertilizer monopoly that does not serve its Malian clients well. As the GOM moves forward on its subsidy program, it needs to take steps to ensure that adequate competition remains in the sector. Given the important share of the fertilizer market now covered by the subsidy, the GOM needs to be timely and equitable in making payments and in announcing its program every year so that suppliers have adequate time to develop their strategies and obtain low-cost supplies not only for the subsidy but also for meeting other demand. The GOM also needs to be very careful about developing an appropriate subsidy exit strategy that does not result in a sudden, massive decline in fertilizer demand that would severely harm those who have invested in the fertilizer value chain or discourage those interested in investing in the future.

Given the current structure of procurement channels, where producer organizations or governments provide services that substitute in large part for the fertilizer retail function, the opportunity to develop private agro-dealer networks seems limited. Some analysis of the relative costs and benefits of a private-sector retail distribution network compared with a system based on producer organizations handling the retailing functions could help Mali develop a better system and donors better direct their project support.

Finally, to realize the best results from the fertilizer subsidy and from investments being made by Toguna (and hopefully others in the future), the GOM would do well to increase investment in fertilizer research and extension, preferably in partnership with Toguna and Yara, which should be interested in promoting their products and having them used effectively.

#### *3.11.4. The seed value chain*

Because there is no single seed value chain for Mali, the different crop value chain sections of this report contain information about seed demand and supply issues when seed has been identified as an important issue for that value chain (the most extensive discussion is in section 3.2.5 concerning millet/sorghum). This section synthesizes some of the broader issues associated with the supply and demand of improved/certified seeds in general, drawing on a variety of studies (WASA March 2011, Diakité et al. 2007, Diakité and Diarra 2000, Diakité et al. August 2005, and Abdoulaye et al. 2009). These studies tend to focus on the regulatory environment and the government and donor roles in the production and use of certified seed for cereals (particularly millet and sorghum) but do not contain much specific information on private sector actors.

*Evolution of the value chain.* A key characteristic of Mali's seed sector is its dependence on government and donor projects, as illustrated by the milestones in formal seed sector activity shown in Box 3.

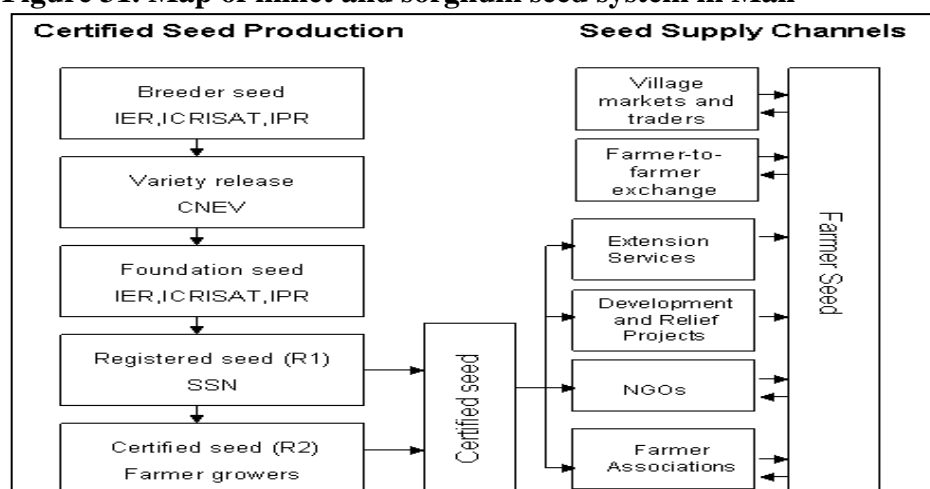
### Box 3. Timeline of formal seed sector activity

1974	Beginning of formal seed sector activities with the intervention of a UNDP project that created national seed farms in Babougou and Samé
1977	Creation of seed production operation with support from UNDP and FAO to promote improved millet, maize, sorghum, and cowpea seeds
Project MLI/86/005	Creating a rice seed multiplication center
Project PNUD/FAO/74 034	Creating a cereal seed multiplication center
Project PNUD/FAO/MLI/86/005	For the multiplication and spread of improved seeds ( <i>semences sélectionnés</i> ) for coarse grains
1991	National Seed Plan elaborated with FAO assistance. Called for eventual coverage of 30% of millet, maize, and sorghum seed needs by improved or certified seed and 85% coverage of rice seed. Called for the creation of a seed fund and addressed legal, institutional and operational issues of the sector
1991	National Seed Service (NSS) created by Ordonnance 91--052/P.CTSP. Financing from UNDP/FAO for the <i>Programme d'appui à la mise en œuvre du SDDR</i> (PAMOS). NSS was to serve as the center for implementing the National Seed Plan, with key responsibility for production of base seed
1993-2003	Implementation of PAMOS, which served as a transition project between the 1993 end of PNUD/FA/MLI/86/005 and the actual beginning of the PAFISEM project in 2003
1996	Planned start of the African Development Bank-financed program <i>Soutien à la filière semencière</i> (PAFISEM project)
2003	Actual start of PAFISEM project
2009	End of the PAFISEM project
2010	Passage of new seed legislation designed to resolve a number of issues thought to have been hampering the development of the formal seed sector and its relationship to the informal sector.

Source: Drawn from WASA March 2011

*Production and marketing channels.* Figure 31 further underscores the predominant role played by government agencies in formal-sector certified seed production activities for millet and sorghum while also showing the informal seed supply channels (farmer-to-farmer and village markets on the upper right side of the diagram), which account for an estimated 90-95% of the millet/sorghum seed supply (Diakité et al. 2007). The system for other crops is similar, with the major difference being the share of seed going through the formal sector. The share tends to be greater for maize (about 20% according to Abdoulaye et al. 2009) and rice (about 85%), but none of these estimates are rigorously quantified in any reports we reviewed. Figure 31 also illustrates that demand for certified seed is dependent on formal-sector actors (extension services, development projects, NGOs, and farmer associations), which act as conduits for moving seed to farmers.

**Figure 31. Map of millet and sorghum seed system in Mali**



Source: Diakité et al. 2007, adapted from Touré et al. (2006).

Diakité et al. 2007 note that neither agro-input dealers, nor grain traders, nor shopkeepers are active in supplying certified seed of sorghum and millet, although they are active in rice and horticultural crops. Thus, at present, the formal seed value chain for millet and sorghum has almost no interface with village markets where farmers are active as sellers and buyers. The formal seed production and supply chain is still heavily state-based, linked to farmers through agricultural projects, NGOs, and farmer associations. Also, there is no clear relationship between the formal seed chain and the formal grain marketing chain—a link that is needed to transmit market-related signals to farmers, such as seed-to-grain price ratios. The only known interface between grain and seed channels occurs in village markets, where farmers and small-scale, part-time vendors sell grain that is suitable as seed in periods of acute seed shortages.

*The actors.* Although various documents reviewed talk about seed production at the R1 and R2 levels being in the hands of the private sector (individual farmers or farmer associations), we found little documentation on the number of producers, names of producers, etc. Nevertheless, most documents confirm a movement toward more private sector production and marketing over time. A survey of major seed firms conducted by IITA in 2008, determined that for maize there were only 2 professional seed firms operating at the time and four other actors (government or producer organizations) active in some aspect of maize seed production and marketing (Abdoulaye et al. 2009). The 2011 WASA report notes that there are currently more than 130 cooperatives and a few private enterprises involved in seed production and distribution.

Most of the information available that names specific actors comes from Diakité et al. 2005 and Diakité and Diarra (2000); more recent assessments do not contain specific information on active producers and suppliers. Various actors mentioned in earlier reports included:

- **National Seed Service (NSS):** the most important vendor of registered first-generation (R1) seed for cereal crops in 2005, despite the fact that the disappearance of the NSS was planned for 2002; During the late 1990s, an estimated 36 percent of NSS production was bought by NGOs and 31 per cent by official agricultural organizations (irrigation projects, extension services); 20% was divided between development agencies (other than NGOs) and private users (Diakité and Diarra 2000).

- *Cellules Semencières Villageoises* (CSVs): Initially established to produce registered second-generation (R2) seed as autonomous groups or parts of development projects, the CSVs became farmer co-ops under PAFISEM and were expected to sell their production. In the past, CSVs R2 production was collected by the management committees and stored in the village. Seed producers delivered an estimated 30-40% of their production to the management committees of the formal channel, distributing the remainder directly to other farmers instead of through the formal channel. R2 seed produced by the CSVs is now purchased mainly by NGOs and other development agencies<sup>37</sup>.
- Niégué seed farm, in the ON zone, was providing about 70% of R1 demand during the late 1990s, and the GIE Shi 2000 was supplying Office Riz Ségou (both noted in Diakité and Diarra 2000; not mentioned in more recent reports).
- The Association des Organisations Professionnelles Paysannes (AOPP—a farmer professional organization) and some extension structures (Office du Niger) produce foundation and certified R1 and R2 seed through the AOPP’s *Programme des semences améliorées* (<http://semences.aopp-mali.org/>).
- Programme d’Appui aux Services Agricoles et aux Organisations Paysannes (PASAOP), which is attached to the Ministry of Agriculture, supports the seed sector through various research and extension activities.
- Importers and distributors providing agricultural inputs for vegetable seeds in the late 1990s included: Coop. Ouvrière de service, La Sikassoise, Modibo Diarra, Bakary Yaffa et frères, Maliprimeurs, MATS TS, Sté Négoce and Trade, Sté Agrumes et oléagineux, Deguessi Groupe SA, Tropica Sem Mali, Cikéla Jigi, Ets Mamadou Keita, and Agri Mali Service (Diakité and Diarra 2000).
- Two private-sector actors active in seed production/marketing in Mali include Faso Kaba and Comptoir 2000; others probably exist, but there is no complete census.

A more recent entrant is Faso Kaba, “a small, but rapidly growing Malian Seed Company producing and delivering affordable and quality seeds to rural Mali and educating farmers about improved seed and use of other farm inputs” (<http://www.agra-alliance.org/content/story/detail/1035>). The firm has received \$208,000 in financial support from the AGRA Programme for Africa's Seeds Systems (PASS), which seems to be the principal source of seed sector funding at present (<http://www.grain.org/briefings/?id=205>). While AGRA considers this enterprise a promising model, it is too soon to tell if it really represents a sustainable example of private sector initiative in the supply of improved seeds for traditional cereal crops.

In addition to producers and distributors, a number of professional associations are active in Mali. The Seed Producers Association of Mali (ASSEMA) was created in 2003 through the initiative of the African Seed Trade Association, which is a member of the West African Seed

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<sup>37</sup> CSV information from Diakité et al. 2007, but these estimates were drawn from earlier work and not updated.

Network (WASNET). The Malian Network of Agri-Input Dealers (Reseau des Operateurs d’Intrants Agricoles du Mali, ORIAM) has also tried to represent seed sector actors, but remains primarily an association of fertilizer suppliers.

*Performance highlights and constraints.* Despite the public-sector and donor support and the various attempts over time to make the sector more commercial, the WASA report for Mali (March 2011) was quite circumspect in its assessment of the sector, stating that despite all of the efforts to foster change, the seed market in Mali remains poorly developed. Data on production of improved seed for commercial sales for 2007/08 through 2009/10 showed a significant decline (from 644,800 tons to 334,700 in 2009/10). PAFISEM ended in December 2009 without having attained key objectives, particularly the transfer of seed production and marketing to the private sector. The existing sector targets only the needs of zones that are supported by government development offices (CMDT, OHVN, ON, Office Riz Ségou), intermittent project and NGO demand, and occasionally emergency relief needs (e.g., WFP, Initiative Riz). Unsold stocks are a common problem. Despite years of legislation and policy discussion about the liberalization of seed markets, no certified sorghum or millet seed is as yet visible in weekly village markets (survey results summarized in Diakité et al. 2007). Most farmers have no access to the varieties bred by research and multiplied within official diffusion channels (Diakité et al. 2007).

WASA (2011) describes the situation as a market paradox: an important share of seed produced is not sold, while the needs for improved seed appear to be enormous. This situation results from a combination of factors identified by WASA:

- Limited presence of professional private-sector actors in the value chain;
- Inadequate information for seed users about production sites, types of seed, and their quality;
- Poor knowledge of improved varieties and their performance;
- Low levels of training and organization skills of seed producer organizations;
- Relatively high costs of certified seed production (inputs, certification, etc.);
- Absence of strategies to ensure that the increased production likely to come from the use of improved seeds will have a market (a serious problem for coarse grains following years of good rainfall);
- Absence of a strategy to ensure continuity in funding for seed sector support activities;
- Legal and regulatory weaknesses.

In regard to the last point, WASA is optimistic that the recent legislation (2010) will address most of the legal and regulatory weaknesses if its enforcement is funded and the laws applied as intended.

*Opportunities.* The seed multiplication sector seems to be best positioned among the input sectors for generating local employment and incomes IF effective demand for improved seeds can be increased. A major factor in developing this demand will be developing the value chains to increase the marketing of crops such as millet, sorghum, and maize, which have traditionally been grown more for home consumption than for sale. The much higher use of



improved seed in the rice sector than in the coarse grain sector underscores the link between use of purchased inputs and producing crops for the market.

Improved markets alone, however, will not be adequate given the very limited means currently being employed to help farmers learn about new varieties and the benefits of production packages that combine improved seed with appropriate fertilization and crop management techniques (including soil and water conservation). Public-private partnerships that improve the marketing skills of seed producers and traders and promote joint extension efforts similar to those that have been used in East and Southern Africa represent models for Mali to consider. For example, the Malawi Starter Pack Programs (Levy 2005) and the FIPS (<http://fipsafrica.org/>) programs in Kenya promoted low-cost seed/fertilizer packages that led to relatively fast adoption of improved inputs by smallholder farmers. If better managed, the seed part of the Malian input subsidy program could be used to contribute to such an effort.

Important areas of intervention recommended by the IITA study focusing on maize seed included increasing seed processors and marketers access to microcredit, educating farmers, and increasing the awareness of the potentials of new technologies as well as the releasing of new varieties more quickly (Abdoulaye et al. 2009).

#### *3.11.5. Pesticide sector performance and constraints*

Although much better organized in terms of regional coordination and identification of approved pesticides than either the fertilizer or the seed sectors (see Section 4.8.2), enforcement of pesticide regulations remains a problem. A walk through any market serving farmers (particularly horticultural producers) will reveal a very eclectic supply of pesticides brought into Mali without official declarations or clear labeling and instructions on use. The problem here is not making pesticides available through commercial channels but improving the professionalism of those channels so that consumers receive appropriate instructions on the choice and use of the different pesticides available. In addition, the Malian government needs to play its appropriate role in terms of enforcement of the rules and regulations that are already in place. In many countries, professional organizations of agricultural chemical suppliers have been able to develop their own fund for self-policing activities—that too could be an option in Mali. CNFA efforts to train agro-dealers to be able to offer customers product information and use instructions seems particularly relevant for the pesticide sector, where the dangers of misusing a product are more than simply economic.

#### *3.11.6. Gender and inputs*

In general, women do not have as easy access to inputs as men. This is partly a function of the way crop production responsibilities are organized at the household level, with men in charge of producing the crops that require more inputs (cotton and rice). Another factor is the way the credit system (and more recently the subsidy system) is organized, with household heads (overwhelmingly men) being the primary recipients.

As is commonly the case when it comes to questions of gender equity, there is a need to understand better how inputs obtained through credit or the subsidy program are allocated to different household members and different crops. Another issue is whether women's choice of

crops is based on true preferences or due to limited access to inputs. Some women's crops (fonio or cowpeas, for example) do not require large amounts of purchased inputs. Foltz (2010) has recommended that women be encouraged to move into hybrid maize production on household garden plots; one challenge to making this idea work may be the perception that hybrid maize requires not only purchased seed but also lots of fertilizer. Moving in this direction would require some serious rethinking about how input credit and supply is organized.

#### *3.11.7. Poverty Alleviation and Inputs*

While access to productivity-enhancing inputs can increase incomes, the ability of very poor households with land, labor, and cash constraints to acquire and efficiently use purchased inputs is limited. The section on extension (4.2.3) discusses this issue from the angle of targeting different technical packages to different types of households in a manner that takes into account the inability of poor household to adopt some of the more expensive and risky technical packages.

Lower-cost subsidized fertilizers delivered on time and properly used by farmers have the potential to increase rural incomes, but the Malian government's failure to put in place any systematic monitoring and evaluation of the subsidy program makes it impossible to know to what extent poorer farmers are benefiting from the program. In many other African countries, the experience has been that input subsidies tend to be largely captured by the better-off farmers most engaged in market-oriented production.

A major weakness in the documentation available is the thinness of information about private-sector participation in the seed supply chain. In part, this lack of information reflects the central role that government services and donors continue to play in the sector. It also is likely the result of how difficult it is to document who is involved in seed production and marketing for the full range of crops grown in Mali without investing substantial time in rural surveys and market studies.

### **3.12. Agro- and Rural Tourism**

Many developing countries have managed to increase their participation in the global economy through development of international tourism. Tourism development is increasingly viewed as an important tool in promoting economic growth, alleviating poverty, and advancing food security. The potential of tourism development as a tool to contribute to economic growth and poverty reduction is derived from several unique characteristics of the tourism system. First, tourism represents an opportunity for economic diversification, particularly in marginal areas with few other export options. Tourists are attracted to remote areas with high values of cultural, wildlife and landscape assets. The cultural and natural heritage of developing countries is frequently based on such assets, and tourism represents an opportunity for income generation through the preservation of heritage values. Therefore, tourism enables communities that are poor in material wealth but rich in history and cultural heritage to leverage their unique assets for economic development.

In a country like Mali, where most of the tourism sites are in rural areas (such as the Dogon country), tourism generates rural employment and expands the tax base of local governments

(thereby expanding their capacity to finance agricultural as well as non-agricultural development efforts). It also creates a demand in hotels and restaurants for high-value local agricultural products, such as horticultural products, poultry, and red meat, and provides non-agricultural income to farm families, which they can use to help finance investments in their farm or in agricultural trade. A key challenge is to increase the local content of the tourist industry—for example, encouraging hotels to serve local produce rather than imported goods and to decorate with local art and building materials. For this to happen, local providers of these goods must adopt best practices to ensure that their goods meet quality and safety standards required by foreign visitors. Incidences of food poisoning, for example, will quickly kill the demand for a hotel's services even if they do not kill the tourists!

Tourism is the only export sector where the consumer travels to the exporting country, which provides opportunities for the poor to become exporters through the sale of goods and services to foreign tourists. Tourism is also labor-intensive and supports a diverse and versatile labor market; it provides small-scale employment opportunities, which also helps to promote gender equity and helps address the critical need to generate productive employment for Mali's rapidly growing rural labor force. Finally, there are numerous indirect benefits of tourism for the poor, including increased agricultural market access for remote areas through the development of roads, infrastructure, and communication networks.

Several strategies for tourism development have been found to be effective in creating employment and income opportunities for vulnerable groups and communities. Tourism projects that have been most effective at contributing to poverty alleviation include those that promote training and employment in tourism (particularly for non-educated women), promote the establishment of micro- and small tourism enterprises, promote the supply of goods and services (including agricultural goods) to tourism businesses by enterprises that are owned by or employed by the poor, involve partnerships that fund road construction, communication networks, rural schools, sanitation or health improvements, and facilitate voluntary donations and support from tourism enterprises and tourists.

Economic benefits of tourism include the expansion of business opportunities for the poor, expansion of employment and wages by ensuring commitments to local jobs and training of local residents, and the development of collective community income. Non-economic benefits include capacity building, training, improved access to services and infrastructure (such as health care, telecommunications, water supplies, and transportation), and mitigation of environmental impacts and natural resource conflicts. Many of the physical and environmental benefits may have been motivated by tourism development, but they indirectly benefit local communities. The overall economic impact of tourism is maximized through enhancing linkages with other local economic sectors. Strong economic linkages with tourism and other sectors (such as agriculture and small enterprises) will enhance the multiplier effect, thus contributing to increased revenue retention and creation of employment opportunities for local people.

Although the potential benefits of tourism development have been well documented, tourism has also been associated with negative impacts, for example as a delivery mechanism for health pandemics and terrorism. Tourism has been criticized as a development strategy for reasons related to the distribution of economic benefits. In some cases, high levels of financial leakages of tourism revenues have resulted from large-scale development of capital-intensive

development projects, propagation of enclave tourism, and the appropriation of control over resources to powerful external interest groups. The presence of significant leakage (when financial revenues from tourism leave the area or are remitted to other countries—for example, through serving largely imported food to tourists or through construction of hotels that use mainly imported materials) reduces the economic development impact of tourism. The main causes of leakage include foreign ownership, employment of foreign nationals, and imported materials and food.

There have been several initiatives strengthen the link between tourism and food security in Mali. The United Nations World Tourism Organization (UNWTO), through its Sustainable Tourism–Eliminating Poverty (ST-EP) initiative, implemented a project to help protect the health of female artisans in Djenné by raising awareness of the risks of inhaling toxic smoke from plastics, improving working conditions, and providing protective equipment and tools. The Netherlands Development Organization (SNV) is presently conducting a value-chain analysis for tourism in Pays Dogon to map where the rural poor participate and to identify opportunities for increasing the benefits for the poor.

The Global Sustainable Tourism Alliance (GSTA) has been working in Pays Dogon to provide training for local guides, to build capacity among employees in the campements, and to develop marketing materials to promote tourism in the region. This group has also developed projects to promote biodiversity conservation and support reforestation. They have engaged communities in the region to collect and plant euphorbia cuttings to stabilize the sand dunes and reduce wind erosion, and they have developed small tree nurseries that sell seedlings to communities for tree planting projects. These initiatives could be replicated in other regions throughout Mali to achieve greater benefits.

Tourism in Mali is presently based on its endowment of cultural assets, including four sites inscribed by the United Nations Education, Scientific and Cultural Organization on the World Heritage List. They include the Old Towns of Djenné, Timbuktu, the Cliff of Bandiagara (the Dogon cliffs), and the Tomb of Askia. In addition to these designated World Heritage sites, there are nine other cultural properties submitted for consideration for the World Heritage List, which may provide future potential for tourism development.

There are also numerous other tourism resources based on the diverse cultures of the empires and kingdoms that have flourished in Mali over the centuries. Mali is gaining increasing notoriety among jazz and blues enthusiasts, who are drawn to events such as the Festival on the Niger in Ségou, and the Festival in the Desert, a large music event near Timbuktu. The Deegal cattle crossing festival and other such events have been used to spread other development messages by promoting AIDS awareness and good citizenship. A rich arts heritage provides a range of tourism development opportunities through the development of museums and galleries and the promotion of arts and crafts products, including indigo and mud dyed cloth, wood carvings, gold and silver work, and ethnic musical instruments. Mali's cultural assets are also described as including Malians themselves, who personify the concept of "diatiguiya," which embodies hospitality, openness, and a quality of sharing and listening. In addition to cultural assets, Mali is also endowed with an extensive natural heritage that includes vibrant landscapes, the Sahara desert, and the wetlands of the central Niger Delta that host thousands of water birds.

The cultural uniqueness of Mali among its neighbors provides the basis for a comparative advantage for tourism development in the region. Mali has promoted tourism by structuring the nation's cultural heritage as the engine of economic and social development. The government has also updated policies relating to the organization of the profession of travel organizers and guides. Investments directed at enhancing economic linkages with tourism (i.e., capacity-building to promote entrepreneurship among micro-enterprises, small farms, and craft artisans) are likely to direct some of the benefits of tourism development to the poor. Among the food security plans of 685 rural communes, 103 report tourism assets, but only 13 include tourism as part of their food security planning (see **Table 25**)

**Table 25. Rural communes with tourism assets**

Category	Count	% of rural communes
# communes with undeveloped tourism assets	70	10.2%
# communes where tourism exists	33	4.8%
Total # of communes with tourism assets	103	15.0%
# of communes where tourism is part of food security plan	13	1.9%

Source: Commune Food Security Plans, PROMISAM Phase I

According to data from the World Travel and Tourism Council, international visitor arrivals to Mali more than doubled during the decade of 1997 to 2007, and has now reached approximately 200,000. The direct economic impact of travel and tourism in Mali is estimated at US\$223 million (or 2.1% of gross domestic product [GDP]), and direct industry employment is approximately 33,000. The economic outlook for tourism in Mali is positive. The contribution of the travel and tourism economy (including direct and indirect impacts) to GDP is expected to rise from 4.9% (US\$523 million) in 2010 to 6.1% (US\$1,090 million) by 2020. The contribution to employment is expected to rise from 80,000 jobs (3.9% of total employment or 1 in every 25.6 jobs) in 2010, to 129,000 jobs (4.8% of total employment or 1 in every 20.8 jobs) by 2020. Mali ranks 9<sup>th</sup> among sub-Saharan African countries in WTTC's growth forecast (WTTC, 2010), and far higher than other countries in West Africa.

The combination of cultural assets with high economic value, abundant labor resources, a bright outlook for tourism growth, and critical development challenges provides Mali with an opportunity to integrate tourism into its strategy for rural economic growth and poverty reduction. A tourism policy that builds upon the existing foundation of cultural heritage, respects social and cultural traditions, minimizes economic leakages, and adheres to pro-poor tourism development strategies is likely to produce economic benefits that contribute to food security in Mali. There are significant opportunities for capacity building in tourism, including the development of national tourism marketing materials and information and strengthening of economic linkages between tourism and other sectors.

## **4. CROSS-CUTTING CHALLENGES AND THE BUILDING BLOCKS OF AGRICULTURAL DEVELOPMENT**

### **4.1. The Nature of Cross-Cutting Challenges**

The review of constraints affecting individual value chains in section 3 revealed a number of recurrent challenges that pose problems for the development of all or most value chains. In effect, there are some key building blocks required for the development of all the value chains, and these building blocks will generally need to be put in place directly rather than using a value-chain-by-value-chain approach. By investing in these cross-cutting building blocks, USAID can have a catalytic effect on the effectiveness of investments by the Malian government and private sector, which tend to be oriented primarily along value-chain lines but which require a conducive environment in which to be productive. These cross-cutting investments help provide that environment.

### **4.2. Institutional Design and Capacity Strengthening**

#### *4.2.1. Institutions for Agricultural Sector Management and Advocacy*

*Producer Organizations.* Mali's agricultural growth strategy calls for producer organizations to play increasingly important roles in the management of input procurement, credit, extension, and output marketing. Historically, producer organizations have been created through government programs and played key roles in the cotton and irrigated rice sectors. More recently, legislation has encouraged the creation of smaller GIE and cooperatives of independently associating producers across the full spectrum of agricultural activities, though organizations in the cotton zone and the Office du Niger continue to dominate.

Given that many of the key elements to succeeding in a more competitive agricultural market involve capturing economies of scale and scope and providing "public goods" (high-exclusion-cost goods or those with large scale economies), there is a potentially important role for farmer organizations in Mali's agricultural strategy, particularly if smaller family farms that cannot achieve scale economies or improved coordination on their own are to benefit fully from Mali's agriculture growth strategy.

The areas of Malian agriculture where some of the greatest growth potential lies in terms of generating more employment and value added in labor-intensive activities (dairy, horticulture, fish farming and marketing, and irrigated agriculture) are areas where collective action tends to be very important due to the highly perishable nature of the goods (and hence potential "hold-up" problems) and the need to coordinate individual actions among many actors to effectively exploit common infrastructure. Yet there is a lot of confusion, even among the organizations themselves, about what role(s) farmer organizations should or can play in Mali. Possible roles include:

- Commercial operations aimed at improving the competitiveness of input and output markets, like "competitive yardstick" farmer cooperatives in the US;

- Bargaining organizations that seek to get more favorable input and output prices for farmers by pooling demands (for inputs) and supplies (for outputs) and bargaining for better prices;
- Political organizations, aimed at lobbying for policies deemed more favorable to farmers as a whole or for the producers of particular commodities;
- Rural arms of political movements (e.g., parties) aimed at mobilizing rural voters.

A lack of clarity about which roles the organizations are attempting to play can lead to a lack of strategic focus within the organizations, and the roles can, at times, conflict with one another. For example, being an effective commercial operation may be enhanced by being perceived as a non-partisan organization. Management skills, leadership and accountability to members remain problems in many of these organizations. Recent assessments available for the cotton and the irrigated rice zones provide some insights into these problems.

For the cotton sector, as many as one-third of the local farmer unions recently created were considered too small to be viable, and the fracturing of many village-wide AVs into very small “neighborhood” groups creates a greater problem of management capacity. The capacity of union leadership to carry out its assigned functions at all levels was viewed as deficient in all but a limited number of cooperatives, which were led by members that had benefitted from participation in earlier capacity-building programs (e.g., USAID-funded CLUSA programs, *Projet de Gestion Rurale* (PGR) and the *Programme d’Amélioration des Systèmes d’Exploitation en zone cotonnière*). Weak areas included business management functions (due, in part, to the lack of an established management system), communications functions (both internal among the various levels of the union and outreach communications), and a variety of functions specific to different levels of the union. Cooperatives based in villages that had not benefited from previous rounds of training need to start from a much more basic level of capacity-building, beginning with heavy investments in functional literacy training.

For the irrigated rice sector, the Faso Jigi experience of 13 years of support to the development of a cooperative marketing union for rice and shallot producers in the Office du Niger and coarse grain producers in Bla and Ségou offers several lessons (PACCEM 2009, Konen 2008). Comparative studies of members and non-members determined that members were generally able to spend more on productive inputs, get better yields, and earn more money per hectare of crop cultivated due to the services offered by Faso Jigi (input credit and procurement, advance payments on their future production, and output marketing, among others). Nevertheless, major management and organizational challenges remain, several of which relate to additional cross-cutting concerns such as the business environment and government policy decisions:

- It is still difficult for farmers to act in group rather than individual interest:
  - Failure of farmers to meet sales quotas to the cooperative;
  - Poor quality of products delivered;
- Government programs (e.g., import duties, subsidies) fail to anticipate negative impacts on producer organizations and pose major problems for those organizations;

- Producer organizations need strong programs to control fraud and cheating by members, but without adequate enforcement mechanisms, such programs will not help;
- There is a need to design rules that take into account the different motivations and incentives of different types of members (for example, surplus producers behave differently than deficit ones);
- There is a need to improve member understanding of marketing decisions in order to improve their ability to monitor effectively the performance of their organizations in this domain.

Building viable business cooperatives is an area where the US may have some comparative advantage in providing assistance, given (a) the US history with grass-roots cooperative movements that in some cases have been very successful in building strong business organizations and (b) a well-respected track record for previous USAID-funded work by CLUSA in the OHVN. There is a strong contrast between the US model, which focuses on cooperatives primarily as business organizations, and the French model, which has strongly influenced Mali's approach and is closer to a farmers' union engaged in bargaining with government over agricultural policies and prices.

*Professional Organizations.* The development of professional organizations to represent the interests and improve the performance of individuals and firms providing upstream and downstream services that contribute to farm productivity and profitability has been advocated since the beginning of market liberalization. In Mali, a number of organizations have been created by input suppliers as well as transporters and traders of agricultural produce.

On the input supply side, these organizations have tended to be created in response to offers of donor funding and have generally not lived up to expectations. ORIAM (Network of Agri-Inputs Operators of Mali), created in 2000, is barely functioning at this point, with members representing mostly the smaller players in the fertilizer sector and most not willing to pay dues and other fees required to make the organization operational. ORIAM tried to broaden its scope from fertilizer to inputs in general, but the seed and pesticide firms preferred creating their own organizations. Another problem is that ORIAM leadership has been characterized as often pursuing personal rather than group interests.

*Interprofessional Organizations.* Increasingly, in a world where consumers (including Malian consumers) are demanding more differentiated products and in which international competitiveness has increased, the competitiveness of different agricultural activities depends more and more on the competitiveness of the vertical systems (value chains) in which they are embedded, not just the competitiveness at a firm or industry.. In the past in Mali, parastatals such as the ON and the CMDT attempted to assure such vertical coordination, which deals with system-wide problems that are beyond the scope of any single actor to address. With the demise of such organizations, such coordination is lacking or it falls to the hands of very large private actors, who may build private systems that tend to exclude smaller actors, thus affecting the pattern of agricultural growth and how widely its benefits are spread. Horizontal organizations, such as farmer organizations, alone cannot address these vertical issues (such as aligning quality produced by farmers to the quality demands of final consumers), although they can be part of the solution.



What is needed are **voluntary** structures that foster collaboration of actors at different levels of the value chain to address such issues. This is the notion of creating *interprofessions* in rice, cotton, and other value chains. Lessons learned from similar experiences in other countries (in developing “value chain participant councils”) identify key design elements for such efforts to succeed (Staatz and Ricks, 2010):

- *Identifying an impartial organizing entity* It is critical that someone or a core group in the interprofessional council (frequently the convener-coordinator) be perceived and accepted by the participants as an objective, impartial, and contributory organizing entity. The role of the organizing entity includes helping to frame the debates and, ideally, helping to provide unbiased information to illuminate the discussions, problems, and performance-enhancing alternatives. For example, a public research organization like IER might play this role in Mali.
- *Membership structure.* The membership of the councils needs to include individuals who are acknowledged industry leaders, “broad thinkers,” and those who are open to exploring possibilities for working with other value-chain participants for needed improvements. To the extent possible, it is also important that these people also be leaders of stakeholder organizations within the value chain, such as farmer or processor associations. Including such participant organization leaders in the councils allows these key individuals to link back to their memberships effectively, leading to broader discussion, input, and information into the issues the council is addressing and broadening the ownership and implementation of its proposed solutions.
- *Financing.* A critical issue is whether the organization should seek dedicated funding for its activities. While obtaining external “core” funding for the activities of the council may allow it to act more quickly on key decisions (such as to undertake consumer testing of a new product), a possible disadvantage is that such funding may attract participants to the council who are mainly interested in gaining access to the funding for their personal benefit. In order to avoid this sort of rent seeking, it is often preferable to rely on in-kind contributions of time and resources by the council members for the council’s main ongoing activities, complemented with applications for small grant funding for specific information-gathering or outreach activities (Chitundu *et al.*, 2009).

For the cotton sector in the major West African producing countries (Mali, Burkina Faso, Benin and Chad—collectively known as the C-4 countries), two other issues have been raised with respect to the structure of the *interprofessions*:

- (1) Burkina experience suggests that farmers having shares in the cotton companies improves their ability to understand sector-wide issues (as the farmers then have, for example, access to the accounts of the ginners) and thus to play a more effective role in the management of the *interprofession*.
- (2) There can also be questions about how broad the membership of the *interprofession* should be. Should, for example, cotton oil processors be members of cotton *interprofession*? To date, they have been excluded from them in the C-4.

#### 4.2.2. Government Institutions

*Local Government.* As described in section 2.5.2, communes are well-positioned to play a critical role in rural development and food security initiatives. Many of the key challenges surrounding rural development converge at the commune level: agricultural development, education, land and natural resource management, health and nutrition, and food security. Despite the ongoing decentralization effort in Mali, decision-making autonomy at the local level is still very limited. In order to further the rural development and food security initiatives, communes will need to play an increasingly important role. However, in order for communes to take on these responsibilities, Mali must continue to make progress in the following areas: 1) Increased decision-making capacity among local elected officials; 2) increased flow of information, transparency and accountability between and across all levels of government; 3) the purposeful integration of local food security plans with national strategies; 4) a clearly articulated plan for transferring some decision-making authority explicitly to local elected officials and 5) reforming rural public finance systems to provide the revenue to implement the activities that are in theory part of the mandate of local governments.

*National Government Technical Ministries and Units.* As agriculture becomes more dependent on externally provided inputs, output markets (particularly those farther away from the farm), and more differentiated in its outputs, it becomes more influenced by a range of government actions spanning the domain of many government units. Box 4 illustrates the large number and wide range of technical ministries and units that have responsibilities related to agriculture and food security.

#### **Box 4. Ministries and technical units involved in agriculture and food security**

##### **Ministries directly responsible for agriculture:**

- Agriculture
- Livestock and Fisheries
- Environment and Sanitation

##### **Other technical units directly involved in agriculture:**

- Commissariat de Sécurité Alimentaire
- Secrétaire d'Etat auprès du Premier Ministre chargé du Développement intégré de la Zone Office du Niger

##### **Ministries with responsibilities that influence agriculture:**

- Health
- Tourism and Handicrafts

##### **Ministries/units that affect the overall economic environment:**

- Industry, Investments and Commerce, esp. DNCC
- Equipment and Transport
- Ministry of Expatriate Malians and of African Integration (particularly for regional trade/CAADP)
- Territorial governance and local governments (decentralization)

To achieve a Malian “all of government” approach to agricultural and rural development, it will be necessary to increase the coordination across all these ministries and units. Such coordination will require leadership from the Prime Minister’s office. In practice, actions have not always been coordinated, as illustrated by the long time it took to merge the national CAADP process

with the parallel *Plan de Passage à l'Approche Sectorielle* effort (see section 2.5.3).

One of the big challenges in promoting this coordination will be reconciling the setting of priorities at the national level (e.g., the target of achieving 10 million tons of cereals by 2012) and the priorities established at the local level—e.g., through local development and food-security plans at the commune-level. Whose priorities will take priority? Without sufficient monetary resources to custom-order services, it is unlikely that the communes will be able to exert their priorities.

Another key challenge is the technical capacity at all levels within the government units. Although the Initiative Riz and subsequent initiatives has led to some hiring of new staff, there is still a problem of an aging set of government officers, the result of many years of budgetary restraint and government restructuring, which limited recruitment. As the private sector grows, the government will also need to provide competitive salaries and benefits to retain qualified staff.

#### *4.2.3. Institutions for Knowledge Generation and Transmission*

Improving knowledge transmission is fundamental to Mali's capacity to move from an agriculture based on extensification and resource extraction to one that is environmentally sustainable and capable of generating the productivity increases necessary to support increased rural incomes and agricultural transformation. Strengthening the capacity of Malians to tap into the enormous wealth of scientific knowledge now available in the world and adapt it to Mali's conditions is one of the two basic challenges facing Malian agriculture (the other being improved governance, which is necessary to create the incentive structure to use this knowledge productively). We review the current situation with respect to agricultural statistics, policy analysis, agricultural research, extension, and higher education in the next sections.

*Agricultural Statistics.* A basic knowledge about the current levels and trends in key agricultural sector performance indicators is the foundation for any planning, investment, and policy decisions by the private and public sector. This has been recognized by the Malian government and its partners as they have worked together over the years to develop statistical data bases that respond to evolving demands. In the early post-independence period, agricultural statistics were used to support Mali's centralized approach to development planning, to estimate GDP for national accounts, and to monitor the impacts of government programs. After the droughts in the 1970s, the driving force became food security monitoring. Beginning in the second half of the 1980s, a market information system was created to report commodity prices and flows in order to monitor impacts of market liberalization. The market information also served as an indicator of potential food security supply problems. During these transitions, statistics focused on cereals production, with secondary emphasis on ruminant numbers (which could be estimated from vaccination campaigns). Relatively little attention was given to developing accurate statistics on other value chains except peanuts (in the 1960s) and cotton (which was handled by the cotton parastatal)

If agriculture is to be an engine of much broader economic growth, further reforms and strengthening of the agricultural statistics system will be necessary. Recent interest in understanding how agricultural productivity growth is transformed into poverty reduction is

putting new demands on the system, as are the needs of private sector operators who are becoming increasingly vocal about their needs. During a cereals marketing retreat organized by Food Security Commission in 2009, private sector operators identified unreliable agricultural statistics as their most important constraint, explaining that because government does not know what is going on with respect to production, stocks, and market flows, it panics and takes ad hoc actions with little advance notice, which undermines the stable and predictable environment needed for the private sector to flourish. In addition, the lack of consistent, reliable crop and farm budgets hinders the analysis of the profitability of potential agricultural investments and of new varieties and agricultural practices. The lack of such information thus may lead to serious misallocations of resources in agricultural research (e.g., continuation of research on unprofitable technologies) and slower promotion and adoption of promising technologies.

Since 1988, the centerpiece of Mali's agricultural statistics production system has been the annual *Enquête Agricole de Conjoncture* (EAC or Agricultural Outlook Survey), which provides data for crop forecasts in May and final estimates of crop production by the end of the year for use in national accounts. The EAC also collects information on livestock ownership, farm assets, input use, and demography of farm households, but the exact nature and quality of these data vary from year to year. From 1988 to 2004, the EAC was conducted jointly by DNSI (now INSTAT) and the CPS for agriculture, with DNSI playing the lead role in managing the survey and producing the annual report. In 2004, following several years of FAO and World Bank training and capacity-building efforts at CPS and simultaneous with the implementation of the first *Recensement Générale de l'Agriculture* (RGA or General Census of Agriculture), the CPS assumed the lead role. INSTAT continues to collaborate with the CPS, providing primarily technical support on statistical and sampling issues, while CPS implements the annual survey and carries out the analyses using interviewers assigned to the regional statistics offices. Although the EAC report covers all crop sectors, the EAC survey covers only the "traditional" sectors, with the CMDT and the ODRs (*Opérations de développement rural*) that manage irrigated rice production providing the statistics for the "modern" sectors. This situation raises questions about how cotton sector statistics will be handled following privatization of the cotton sector. The CPS has been working with the various agencies in the rice sector to ensure that the methods used are consistent with estimates produced by CPS for the rice produced outside the "operations", but there is apparently substantial room for improvement in the Office du Niger.

Appendix 1 describes the various surveys and data bases that are relevant to agricultural productivity and policy analyses, presenting them in five categories:

- Crop (area planted, production, yields) and livestock production (numbers);
- Living conditions, income, and expenditures;
- Market information (prices, flows, stocks);
- Trade (official import/export statistics);
- General census/demographic data.

There are also a number of data bases that supplement the core set of government surveys and data bases, such as the climate and weather data managed separately by the meteorological services and data collected by the famine early warning system. Presently, anyone wanting to do

agricultural policy analyses needs to go to a multitude of offices (INSTAT, CPS, meteorological services, customs, etc.) to collect the basic data needed. Greater efforts to encourage use by others could lead to user feedback and gradual improvements in the data bases and also contribute to building stakeholder support capable of lobbying government for more regular funding.

Following a 2004 assessment of the system and subsequent reforms, annual reports on each cropping season were issued regularly for several years, but there now seem to be bottlenecks, with the last report officially issued in 2007. As noted in the discussion of the *Initiative Riz* and subsequent input subsidy programs (Section 0), there have been conflicting estimates of aggregate production and debates about “best practices” in collecting and analyzing production and yield data (Ministère de l’Agriculture 2009a, Bureau du Vérificateur 2009, Dave 2008). Key concerns at present include:

- The need for adequate funding to increase sample size and achieve a more representative sample in the EAC at more disaggregated levels; sample size is currently about 2500 observations, but 5000 are needed to extrapolate to the administrative level of the *cercle*; the *Initiative Riz* report called for 10,000 observations in order to get accurate rice production estimates by production zone.
- Providing protection to those collecting and reporting the data to give objective numbers.
- Expansion of the types of data collected such as:
  - Cereal stocks held at different levels (farm, traders, etc.);
  - Production and price data on perishable, labor-intensive products that have high growth and employment potential (horticulture, dairy, fisheries).
- Lack of a single, longitudinal data base that would permit policy analysts to conduct time-series analyses on the EAC or the general census of agriculture (RGA) data using household-level observations. At a minimum, the various data bases should be organized in a manner that facilitates combining data from different years or surveys (e.g., OMA price data and EAC production estimates from multiple years).
- Documentation of the data bases is also an issue. Policy analysts or scholars wanting to work with the EAC data will generally need assistance from INSTAT/CPS staff to understand the files.

The lack of cereal stock information is particularly problematic because of the fear among policy makers that the country may be “exporting too much of its cereals”. The policy response has been trade bans. The issue of price data for horticultural products will not be easy to resolve both because of the lack of widely used grades and standards and the issue of timeliness for highly perishable goods, which (in terms of market news) may be beyond the capacity of a public MIS to provide.

*Non-political Policy Analysis Units.*

There is a need to develop a tradition of non-partisan policy analysis in Mali, both inside and outside of government. Currently, within government structures, the line between political appointees whose mission is to support the

policy decisions of government, and objective, non-partisan staff analysis is not clearly drawn. Those charged with doing objective analysis are often under pressure to modify results to conform to the policy options already announced at a political level.

This issue of political pressure on agricultural policy analysts has increased as agricultural development has increased as a political priority in Mali and as investment opportunities have increased, particularly for larger-scale irrigated operations, as a result of Mali's more open, pro-agriculture economic policies.

The general weakness of the higher education system, particularly for agriculture, discussed earlier in this report, has limited its capacity to play the role of a source of objective policy analysis.

On the private-sector side, given Mali's political culture, there is often a suspicion that policy analyses are done in order to advance a particular political agenda. There is nothing wrong with advocacy groups carrying out policy analysis to support their positions (that may strengthen the design of the policies they advocate), but the lack of independent, non-partisan policy analysis means that there is not a reference point to which policy makers and the general public can go to put the private-sector analyses in perspective.

There have been some efforts, with mixed success, to build such non-partisan analysis units:

- The *Observatoire du Marché Agricole* (OMA) has structures in place (technical and advisory boards) that act as a "firewall" to protect the market analysis from political pressures to bias the results. Government seems to appreciate having access to such non-partisan analysis, as it draws heavily on OMA analyses in making market policy decisions.
- The *Système d'Alerte Précoce* (SAP) is generally regarded as providing objective information on local food security conditions in "vulnerable zones" of the country.
- The recent grant by Hewlett Foundation to the *Groupe de recherche en économie appliquée et théorique* (GREAT) at the University of Bamako as part of the Foundation's effort to support non-partisan think tanks throughout Africa.

Examining the factors that have fostered the creation of independent, non-partisan think tanks in other parts of the world would be helpful in fostering such a tradition in Mali.

*Agricultural Research.* During the past two decades agricultural research in Mali has gone through a number of institutional changes designed to make research more responsive to clients and more cost-effective. Key changes in the early 1990s included placing plant and animal research activities into a single institution, decentralizing research activities through the creation of regional centers, and improving management and planning. By 2001, Mali's national agricultural research institute, the *Institut d'Economie Rurale* (IER) had become an *Etablissement Public à caractère Scientifique et Technologique* with budgetary autonomy and a management system based on performance contracts signed with the Malian government. A *Comité National de la Recherche Agricole* (CNRA) was created as well as a regional CRU (*Commission Régionale des Utilisateurs des Résultats de la Recherche*) and a CNU (*Commission Nationale des Utilisateurs*) to improve coordination between researchers and their

clients. More recently, the *Système Nationale de Recherche Agricole* (SNRA) has been created to improve research coordination across multiple research and teaching establishments and further increase responsiveness to stakeholders. The SNRA now includes the *Institut d'Economie Rurale* (IER), the *Institut Polytechnique Rural de Katibougou* (IPR), the Central Veterinary Laboratory (LCV) and the University of Bamako (see <http://www.cnra-mali.org/>).

The SNRA is managed by the *Comité National de la Recherche Agricole*, which has the responsibility to assist the ministries in charge of rural development in the design, implementation, and evaluation of activities in support of the national agricultural research policy. The CNRA consists of representatives of technical services, producer organizations, processors, the scientific community, and development partners. The CNRA manages the bidding process for allocating agricultural research funds as part of two programs financed by the World Bank beginning in 2002: the PASAOP (which ended on December 31, 2009) and the Programme d'Appui à la Productivité Agricole au Mali—PAPAM—that succeeded PASAOP in 2011.

Prior to the creation of the SNRA and the integration of IPR and the University of Bamako into the system, a USAID-funded report (Kelly et al. 2005) identified competition between institutions such as IPR and IER (spurred by their different capacities and abilities to access the PASAOP funding) as a problem that was reducing incentives for inter-institutional research collaboration. Institutions that were weak in research (e.g., IPR relative to IER in the PASAOP bids and the University of Bamako relative to IPR in the Ministry of Education bids) were unable to capture enough funding to improve their research standing. Furthermore, IPR was not recognized as a research institution by PASAOP and therefore not eligible for the types of non-competitive institutional support that PASAOP provided to IER and LCV. The SNRA has played a key role in improving this situation and fostering joint research by IPR and IER.

The key financial partners of the SNRA include the World Bank, USAID, Swiss and French assistance programs, and the Syngenta Foundation for Sustainable Agriculture. Technical partners and related supporting institutions/projects include *Le Programme Compétitivité Diversification Agricoles* (PCDA) funded by the World Bank, *Assemblée Permanente des Chambres d'Agriculture* (APCAM), and the *Commissariat de Sécurité Alimentaire* (CSA) as well as the CGIAR system (ICRISAT and Africa Rice in particular) and some private-sector research conducted through NGOs (e.g., Sassakawa Global 2000; Millennium Villages). In addition to USAID/Mali financial support there has also been substantial training support through centrally funded USAID CRSP programs (SANREM, Soils, INTSORMIL) that work with IPR and IER. Despite the progress, the system continues to face the following problems:

- Over-reliance on donor funding, which poses problems for research continuity and the setting of research priorities;<sup>38</sup>
- An aging group of researchers with few well-trained replacements in the system capable of waiting succeeding them;

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<sup>38</sup> In theory, CAADP should help if all stakeholders, including the PTF, agree on the main foci of the PNISA and if research priorities are aligned with that plan.

- Gaps in qualified personnel for disciplinary areas of growing importance, such as water management, agricultural economics and business management;
- Weak training institutions, with inadequate human and financial resources to rebuild and expand human capital;
- Weak links to the global research system;
- Continuing weak links to extension despite institutional reforms described above, such as the creation of user advisory groups for the research system.

Total public spending as a share of agricultural output is a common indicator for cross-country comparisons of government support to agricultural research. Studies in the early 2000s recommended that African countries allocate 2% of their agricultural GDP to research. Mali's public spending on agricultural research in 2001 was 1.03% of agricultural GDP, significantly higher than Africa in general (0.85%), but a reduction in share from 1981 (1.62%) and 1995 (1.07%). National budget data indicate that as of 2007, agricultural research in Mali as a share of agricultural GDP had fallen to 0.7%.

Mali made significant progress in building human capital for conducting agricultural research from 1991 to 2001, generally outperforming its neighbors. For example, R&D spending per researcher increased approximately 20%, the share of researchers with MSc training increased from 13% in 1990 to 48% in 2001, and the share with PhDs increased from 17% to 26%; women researchers increased from 5 to 11%. Unfortunately, we do not have comparable numbers on growth in researchers for the 2000-2010 period, but a number of factors suggest stagnation or decline in the number of **qualified** researchers:

- Weak training of junior staff after a 15-year hiatus of support for external training;
- Limited capacity of IPR, which trains bachelor-level agriculturalists;
- Increasing retirements;
- Increasing voluntary departures or extended leaves of absence to take better paying jobs, particularly in key disciplinary areas (e.g., the USAID-funded PRODEPAM hired top IER researchers to work with it, and the Prime Ministers' office has recruited two IER economists with doctoral-level training).

The Mali Long Term Training and Capacity Building Needs Assessment conducted for USAID in 2003 identified several cost-effective means of responding to these needs through both short- and long-term training. The list of priority long-term training areas identified by the assessment was broad, including biotechnology, agricultural trade and finance, agribusiness, irrigation management, food processing, animal health and nutrition, natural resource management, environmental impact assessment, biometrics, policy analysis, information systems management, geographic information systems, biodiversity and agronomy. A subsequent review (Kelly et al., 2005) looked more closely at the relative importance of different disciplinary areas for the implementation of Mali's rural development programs and recommended that priority in long-term training be given to building capacity in water management, agricultural economics, and agri-business management. Short-term priorities included improved biotechnology awareness for agricultural researchers so that they can understand the issues, provide policy makers and the general public with reliable information about the topic, and participate in the development of



national and regional strategies for biotechnology research and applications. Some progress has been made in this area through (a) a Cochrane fellowship to the person in charge of food safety for the Ministry of Health (Mamoudou Sako), who spent several months in training at Michigan State University and drafted new food safety legislation regarding GMOs and (b) activities funded under the West Africa Cotton Improvement Program (WACIP) related to cotton breeding and the introduction of Bt cotton. More investment in training of researchers in biotechnology issues as well as outreach to the public is needed.

Another of the 2005 assessment's recommendations, the twinning of IPR with other universities, is currently being supported by USAID in a limited manner through collaborative efforts enabling IPR/IFRA to call on faculty at two US universities (Michigan State and Montana State) to assist with course design and teaching. In addition, USAID has provided support to IPR in terms of computers, internet access and support in developing its degree programs in agricultural economics/food policy analysis. Given the magnitude of the challenges faced by IPR after years of neglect and the growing need for qualified staff at various levels in the government and private sector (policy analysts, researchers, extension agents, agri-business managers, etc.), continued support to IPR will be important. The benefits of these investments will also go beyond Mali, as about 20% of IPR's students come from other countries in the region.

There are additional challenges of linking Malian researchers to the global research system and developing partnerships with researchers around the world. At present, most partnerships seem to be donor-driven and related to specific projects (e.g., the SANREM, INTSORMIL, and Soils research supported by US CRSP funding, scholarship and research support provided by the French and CIRAD) or the results of continued collaboration between Malian graduates and their former professors. The Internet is an underutilized resource that could contribute a great deal more to research partnerships. Although there have been efforts to encourage Malian researchers to make better use of the Internet both for giving their work a higher profile and for accessing work by others (e.g., INSAH's nascent electronic library on agricultural research in West Africa and training in the use of the FAO-supported AGORA platform, which gives Malian researchers free on-line access to hundreds of scientific journal in agriculture), progress is relatively slow—often hindered by irregular and slow internet access (exacerbated by failure to invest in adequate virus protection software) as well as researchers' reluctance to put papers on the Internet for fear of them being “captured” by others without proper attribution.

*Agricultural Extension.* Box 5 describes the general structure of extension services in Mali and provides a brief history of how government programs have evolved.

### **Box 5. Overview of Mali's Agricultural Extension Structure and History**

Agricultural extension and advisory services (EAS) in Mali can be divided into three primary clusters: Governmental and parastatal extension providing the bulk of the services, non-governmental organizations and projects providing temporary or occasional EAS, and EAS offered through private-sector entities.

Governmental EAS can be further divided between the services of principal Ministries that coordinate and provide services in their specific technical domains (crops, livestock, etc.), and the various *Offices du développement rural*, which usually dominate extension in a particular zone and focus on a specific crop (e.g., CMDT for cotton, ON for irrigated rice) or cropping system (OHVN).

There is very little information available about the numbers of actors and their activities for the NGO and private extension programs. Although separate from governmental EAS services, those offered through non-governmental organizations are usually funded by international donors and often work through the governmental field programs, providing additional training and operational support to governmental field staff in targeted geographic areas concerning crops and activities focused on by the project. Some of the Malian NGOs providing extension and advisory services to farmers organizations during the past 10-20 years include *Groupe de Formation, Consultation et Étude* (G.FORCE), the *Institut Africain de Gestion et de Formation* (INAGEF), and *Association Conseil pour le Développement* (ACOD).

In the *Offices* and the *CMDT*, it is difficult to separate extension from the general *filière intégrée* approach to subsector management where extension services were built into the overall development programs for the targeted crops. Despite a substantial body of literature praising many aspects of the vertically integrated systems that provided inputs and credit and reliable output markets to farmers as well as some of the better research-extension linkages observed in Africa (Tschirley et al., 2009), Mali was forced to abandon the approach during the structural adjustment period and to reduce the scope of government-provided extension services for farmers.

For the more generalized governmental extension services outside the *Offices* and *CMDT*, there was significant downsizing of programs under structural adjustment. This led to the World Bank supported Training and Visit (T&V) approach being introduced in the early 1990s as part of an efficiency measure. T&V was accompanied by efforts to transfer greater responsibilities to rural producers through development of Village Associations, assisted by an unpaid cadre of village *animateurs*, with the target of establishing *Villages Auto-Encadrés* (self-provisioning villages). Funding of Mali's T&V experience ended in 1999, at which time support for national agricultural extension was transferred to a new World Bank financed project, the *Programme d'Appui aux Services Agricoles et aux Organisations Paysannes* (PASAOP I & II). Under PASAOP, there was a period of experimentation with a user-fee approach to advisory service provision and added support in creating *Centres de Gestion*, and contractually engaged private EAS providers. The general impression from those involved in implementing the user-fee approach was that it was a failure, with essentially no buy-in by producers, now interpreted as being due to a lack of market integration.

The current major World Bank funded agricultural program, *Programme d'Accroissement de la Productivité Agricole au Mali* (PAPAM), reportedly does not include any direct financing for extension, nor was any significant core funding for the provision of EAS from other donors identified.

Note: This text draws heavily on Simpson and Dembélé, December 2010.

Although many extension models have been tried over past 20 years, the general perception is that Mali's agricultural extension system is "broken". The key cross-cutting challenges with respect to extension include:

- Institutional design of service delivery:
  - Who does what, and should this vary by cropping system or zone?
  - Role of rural communities vs. centralized extension services in the design and implementation of services;
- Developing a system to deliver the services in a manner that ensures continuity;
- Targeting messages so that poor farmers and women receive appropriate extension services;
- The need for an "information clearing house" providing agricultural production, marketing, processing information and linking researchers to extension agents and farmers.

The following paragraphs provide some insights on Mali's recent experience in dealing with these issues in the Office du Niger and the CMDT, the zones where there has been the most investment in agricultural extension programs.

Extension in the ON is now a hodge-podge of different systems supported by various donors and NGOs trying to operate in large part on a fee-for-service basis. The PNIP-SA currently advocates this type of private-sector approach, but there is not yet strong evidence that it can provide the quality and quantity of services needed, particularly for the poorest of farmers in zones where there are no strong cash crops to anchor the system. A variety of studies on privatization of extension services is skeptical about (a) farmers' willingness to pay and (b) the availability of qualified agents willing to work in situations with low wages, no benefits, and no job security (Farrington et al., 2002; PACCEM 2009). In addition, extension reform discussions in Mali often take place independently of governmental decentralization discussions, raising questions about the role of rural communes in the rural development process (Bingen and Dembele, 2002).

As part of the reform process, the CMDT was forced to focus its extension services on cotton only, transferring support for cereals and other crops to the national (and largely unfunded) extension services, which are also responsible for extension to the large number of farmers not supported by ODR (*Opération de Développement Rural*) structures. Solid analyses of the impacts of this change are not available, but there appears to have been a general decline in input use on cereals and cereal yields since the change was made in 2000. Once the CMDT is privatized, it is anticipated that the new owners will continue to provide extension for cotton only. With World Bank support during the 1990s, the non-ODR part of the system serving farmers without rice or cotton cash crops experimented with the Training and Visit approach (T&V), but this too was abandoned as too costly and was criticized for its poor links to research.

In our view, Malian extension needs to go beyond the goals of technology transfer that have been a focus in the past, taking into account rural livelihoods and incorporating training in farm management, marketing, on-farm storage and processing if progress is to be made in reducing rural poverty. In addition, successful extension programs need to establish a two-way flow of information so that the information being "extended" responds to the felt needs of the intended

recipients.

The Malian government's focus on poverty reduction is an important reason for broadening the goals of extension programs as the poorest farmers tend to have a different set of issues than better-off farmers. Widespread rural poverty also calls into question the usefulness of fee-for-service approaches to extension for the poorest farmers. ODI research on this topic in a number of countries suggests a need for different approaches to extension based on type of zone (integrated/not integrated into markets) and type of farmers, defined more in terms of overall livelihoods than in terms of crops and technology levels (Farrington et al., 2002). An approach that takes these factors into account would also benefit from more involvement in the design and implementation process from decentralized units of government.

An exception to Mali's tendency to focus extension on technology transfer has been the *conseil de gestion* promoted by AFD/CIRAD in both the ON and the cotton zone, which taught improved management techniques. A recent assessment of the *conseil de gestion* experience found the approach was too expensive and impossible to scale up (Havard, Coulibaly, and Dugué 2006). Additional problems of governance, inadequate farmer financial contributions, and keeping training materials current were noted. AFD funding was stopped in the ON in 2004, putting the *Centres de Prestations de Services* in financial difficulty. A major factor reducing the cost-effectiveness of the approach was the lack of farmer literacy and numeracy—the basic skills needed to deal with marketing and agribusiness management challenges.

Stop-and-go funding from donors such as that described above for the *conseil de gestion* program is a major problem in Mali, given lack of government resources devoted to extension. Another example of this problem is the World Bank's stopping its support of the T&V program, leaving the *Direction Nationale de l'Appui au Monde Rural* (DNAMR) with virtually no operating funds for several years.

Most extension programs in Mali continue to target men, in large part because they are the primary producers of the crops for which extension services are provided (rice and cotton). Focus on farm-level production rather than marketing and processing reinforces this bias, as women are more strongly represented in the latter activities. Donors often call for increased numbers of women extension agents as a first step to removing this bias, but increasing the numbers without having a well-conceived program, well-qualified agents, and funding to implement the program will not improve the productivity and incomes of women farmers. The need for programs that are carefully designed to meet the needs of women farmers is well illustrated by the Faso Jigi expansion to shallot storage, processing and marketing activities as a means of including women in the cooperative movement and providing them with extension services (see Box 6).

### **Box 6. Faso Jigi Experience with Women's Extension Programs**

Faso Jigi is a large cooperative initially founded to encourage group marketing of cereals. It has a strong record of training members not only in marketing and input procurement skills but also in basic production and storage techniques. Given that all its members were initially men because they are the primary cereal producers, Faso Jigi created a shallot cooperative in 2002 to attract women members. This activity proved much less successful than their work with cereal producers.

Faso Jigi started with 2 shallot cooperatives and ended with 21 in 2008/09. In terms of the number of women members, targets were exceeded up to 2005/06, but female membership declined after 2006/07 due to unacceptable performance that resulted in the exclusion of two cooperatives for non-delivery of promised product and non-payment of debts. By 2008/09, female membership was only 79% of targets. An evaluation report describes the problem as one of many women members not being able to measure up to the rigorous standards required of the Faso Jigi cooperative movement in general—with particular inability to adhere to the principal rules for cooperative marketing such as delivering promised quantities and qualities at designated times. Overall performance in terms of marketing was only 32% of targets, and after 6 years of strong support in terms of credit, training, etc., the shallot operations were far from self-sustaining financially.

The primary difficulties encountered in working with women farmers stemmed from their extremely low levels of literacy and numeracy as well as issues of their ability to manage time and ensure quality production. Some of the women members of the shallot cooperatives did, however, stand out and became members of the general board of members managing the overall Faso Jigi cooperative.

Despite all the variants on extension and *appui conseil*, there has been a failure to develop a single institution where farmers and others in the value chain can access the range of information needed for them to make informed decisions. This type of information clearinghouse could provide:

- Technical information on varieties and on cultural practices (fiches techniques, in either written or visual form (for the illiterate));
- Market information – prices, outlets- buyers, etc.;
- Information on availability of inputs;
- Information on financing;
- Information on organizational/institutional support – e.g., NGO's that can help individuals or groups make financing plans.

There has also been very little formalized community-to-community learning (or farmer-to-farmer learning) based on organized exchanges, field days, etc. The Farmers' Week organized by APCAM has become a popular activity, but there is room to improve the quality of the information sharing that takes place as well as the frequency of the exchanges. The utility of doing these types of exchanges at a more local level, perhaps organized by communes, should also be explored as well of ways to make better use of new information and communication technologies.

### *Agricultural Higher Education.*

Many education and training institutions are involved in the agricultural sector in Mali. They range from public primary formal and informal education to tertiary education. There are also private technical level training institutions and two graduate-level training schools, the High Institute of Training and Applied Research (*Institut Supérieur de Formation et de Recherche Appliquée* or *ISFRA*) and the Mandé Bukari private university. IPR/IFRA (*Institut Polytechnique Rural et de Recherche Appliquée*) is the lead Malian Agriculture School and provides training to both Malian students and international students from francophone countries in West Africa. It is under the Ministry of education and is headquartered in Katibougou, 70 km north east of Bamako. The school is going through institutional and academic reforms. IPR/IFRA is restructuring into a public institution with a status that is expected to offer some autonomous authority to implement the school strategic plans. Moreover, the school is moving towards the L-M-D model (Licence-Masters-Doctorat). As mentioned in section 2.3.5, it is anticipated that IPR will also develop links with the newly created Université de Ségou, which is also likely to have a strong orientation towards agriculture. Through the funding from USAID, Michigan State University is helping the school develop academic and practical curriculum in agricultural economics and policy analysis. Despite its commitment for institutional and academic reforms, the school faces many constraints.

#### Key constraints on the Agriculture School at Katibougou (IPR/IFRA):

- *Human resources.* The lack of qualified personnel at all levels in both the public and private sectors in Mali is the main constraint to economic growth and development in Mali. Although IPR has a good number of well-trained faculty members in some areas, the majority of its staff is nearing the age of retirement. A survey conducted in 2003 found that 90% of the faculty members of the IPR hold at least a master's degree, but 80% of them were above 45 years of age (Edwin et al., 2003). The school also lacks a sufficient number of required faculty and relies heavily on visiting personnel from the agricultural research institutes and the private sector.
- *Obsolete curricula.* The majority of academic staff of IPR/IFRA hold degrees in traditional disciplines related to agricultural production like agronomy, animal science, soil science, and crop protection, and few have degrees in specific fields like natural resource management, biotechnology, or agribusiness. Student interest in agricultural education waned during the 1990s and early 2000s, in large part because the degree is designed mainly to the needs of Government employment, which is declining. At the same time, new opportunities exist for employment in the agribusiness sector, as revealed by recent discussions with private-sector agribusiness firms in Bamako, but until recently, the curriculum has not provided the skills needed for those positions.
- *Inadequate teaching methods and facilities.* The teaching methods focus heavily on the use of classroom lectures. Due to the lack of an active learning environment, opportunities for students to develop technical competencies, problem-solving, communication and organizational skills are minimal. Furthermore, operating budget offered by the Mali's Government to acquire teaching materials is insufficient. The lack of supporting teaching resources leads to deficiencies in quality of the agricultural programs.
- *Weak agricultural statistics.* and farm budget data (discussed in the agricultural statistics section above) give instructors and students a poor empirical basis of

information on Malian agriculture on which to base their teaching, learning, and research.

- *Unattractive working conditions of IPR staff.* The lack of efficient incentive structures in higher agricultural institutions in Mali has led to multiple strikes and delays in implementing curricula at these institutions. Government incentives, such as providing competitive salaries, together with staff retention measures, such as transparent promotion procedures, are needed to attract and retain better-quality staff.

The above key constraints faced by IPR/IFRA are common to other agricultural education institutions in Mali. These constraints represent investment opportunities by USAID in agricultural education in Mali.

- *Investing in long-term training.* The current situation of faculty members of IPR/IFRA calls for a staff development plan to train the next generation of faculty members and upgrade its existing staff to be able to provide quality agricultural education. Mali's agricultural development can only take place when there are enough trained personnel to carry out research and find solutions to challenges that mitigate agricultural and rural development.
- *Supporting curriculum reforms and active teaching methods.* Reforms should aim to align curricula to national development priorities and create new career paths that offer a wide range of employment opportunities. Curricula need to be linked to the market for graduates, particularly the needs of the private sector. Curricula and teaching methods should focus on analytical skills, problem solving, agribusiness and post-harvest technology concepts, communication, and teamwork.
- *Investment in facility enhancements at IPR/IFRA.* Financing the facilities and equipment such as laboratories, computer facilities and networks, and expanding access to international sources of knowledge through electronic resources (TEEAL, AGORA, etc.) is essential to improve the efficiency and the sustainability of the training offered by IPR.

#### **4.3. Land and Water Tenure and Markets**

Land tenure and water rights are already a source of conflict in parts of rural Mali, and such conflict is only likely to grow as demand for water and land increase with growing population, migration, and increased desire by both Malians and foreigners to invest in irrigated agriculture. Climate change will accentuate both the demand for resources and the potential for conflict.

Climate change effects are expected to be most severe at the interface between humid and arid zones, and will hence potentially affect a large share of Mali's geography and population unless effective adaptation strategies are designed. In the higher potential rainfed areas of the southwest part of the country, the relentless southward drift of rainfall isohyets continues to push rural migrants toward it from the central and eastern parts of Mali, meeting northward migration from neighboring countries to the south that are experiencing, or have recently experienced, civil strife. At the same time, pastoralists need to move their herds southwards sooner due to reduced availability of dry-season grass. The local populations in the areas receiving increased human and animal migration resent the intrusion on their ancestral resources. Clearly, improved

definition of land use rights, along with impartial adjudication procedures, is an important part of the solution. Updated cadastral surveys, for example, can help identify emerging hotspots and guide infrastructure development to facilitate more even settlement patterns to areas where underutilized land resources remain.

Land and water use rights are inevitably linked in the irrigated areas, but not necessarily in fixed or optimal proportions. The scale of new and planned investments by Libya, UEMOA, the Alatona scheme, and the Markala sugar development could result in reduced water availability of water for existing users. Additional investments to reduce water losses in primary and secondary distribution channels could avoid, or at least greatly reduce, potential tradeoffs between new and existing users, but it is not clear who should bear the cost or how to enforce payment of fees to finance the additional investment. Meanwhile, existing users of land in the Office du Niger are prevented by the absence of a market (for title or rental) from adjusting their landholdings to changing family size. The only way that change in access can take place, officially at least, is termination of use rights for non-payment of water fees – hardly an efficient exit strategy for anyone.

Apart from helping to avoid and/or reduce conflicts among resource users, more secure and exchangeable rights to water and land are a key foundation to stimulate public and private investment, and make them more profitable, thereby fostering rapid agricultural growth in Mali. Secure land tenure allows land to be used as collateral for loans, improving farmers' access to capital, while a reliable land registry allows national and/or local governments to use land taxes as a source for efficient financing of critical public services. Tradable rights to water and land also facilitate the access to these resources by those most able to use them efficiently, thereby spurring economic growth.

The design of land and water tenure rules also need to protect the current rights of local populations so that they are not disenfranchised by water or land “grabs” by powerful outside interests. Rural communities derive livelihood benefits from a wide range of land and natural resources in addition to the land they cultivate. These resources include forest zones for firewood and collection of wild fruits, areas in extensive fallow, and seasonal water sources. A documented and registered inventory of these resources is necessary for local communities to defend and/or negotiate the use of such resources when other economic agents are interested in establishing a claim on them.

There are important gender dimensions to be considered in strengthening land and water rights. At the family level, the allocation of land use between the collective and individual household members lies with the head of household, and this responsibility generally passes to the next oldest male family member. Women do not generally inherit land use rights if their husbands die. More important in a development context, perhaps, is guaranteeing economic access to land and water resources for women when investments raise their value. For example, if investments in access to and/or improved water systems increase the profitability of *bas-fonds* rice, will women still retain rights to cultivate those areas and have control over the produce? In such circumstances, the engagement of local government and traditional authorities must be sought prior to the investment to monitor and ensure access by intended beneficiaries and not rely solely on statutes.



Mali has begun to lay the foundation for strengthening land and water use rights, and their exchange, through the *Loi d'Orientation Agricole* and other pieces of legislation. But much remains to be done to develop a coherent and actionable legal framework that assigns clear responsibilities between central and local government, as well as traditional authorities (ARD, 2010). The US has much experience from its own history on these issues, as well as through the design and implementation of programs to strengthen land rights in developing countries funded by USAID and MCC, which it can contribute to the debate, while also supporting the processes needed (e.g., policy discussions, research, consultative forums, and institutional design and Climate Change and Environmental Sustainability

Mali's natural resource base is already under stress as a result of population growth and the southward march of rainfall isohyets, driving outmigration from the center to the south and south-west parts of the country. Fortunately, a great deal is known already about what needs to be done to mitigate the effects of population pressure on the natural resource base. A key question for the Malian government and USAID is how will climate change affect these pressures, and how can rural populations and food systems adapt to minimize the negative consequences? The answers to these questions depend to a great extent on the location-specificity of climate change effects, about which little is known at present for Mali.

The available evidence on climate change implications for Mali's agricultural sector has been reviewed by Foltz (2010). His principal conclusion is that uncertainty concerning climate change prediction models is so great that no clear trend emerges. Rather, what Mali's agricultural sector needs to prepare for in regards to climate change, is greater *variability* in weather. This variability will manifest itself through inter-seasonal changes in a wide range of variables: vegetative cover, surface and groundwater availability, growing season length, frequency of droughts and floods, and disease and insect pressures on crops, livestock and people (e.g., malaria).

The studies reviewed by Foltz have been carried out at a relatively low level of resolution. Recent studies by the Climate Land Interaction Project at Michigan State University (<http://clip.msu.edu/>) indicate that, for East Africa, when the effects of climate change on vegetative cover and crop growth are studied at a high level of resolution (20 km X 20km), there can be significant spatial variation in the effects of climate change within a country or region. Where a household or production system is located within a country therefore matters a great deal as far as the magnitude of climate change effects.<sup>39</sup> In general terms, the interface between sub-humid and semi-arid is expected to be the most vulnerable. This interface is geographically significant in the case of Mali, although no high resolution climate change land interaction modeling has been conducted in West Africa to date.

At a technical level there are two strategic responses to greater variability. First, the more flexible agricultural production and marketing systems are, the more they will be able to absorb shocks. For example, since the droughts of the 1970s, crop breeding research in Mali has worked to provide farmers with a portfolio of cultivars with a variety of maturity dates, giving farmers greater assurance of some production no matter what the length of the rainy season. Second, because asset-poor populations cannot absorb shocks very easily, greater attention needs

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<sup>39</sup> Dr J. Olson, CLIP Principal Investigator, personal communication, October 2010

to be given to safety nets and to other tools to manage risk. Clearly, the specific types of shock, and the kinds of flexibility needed to accommodate them, will vary according to agro-ecology and the production and marketing systems over-laying them. Having a better understanding than available currently as regards the location-specific nature and extent of impacts would be very useful in focusing resources on the most vulnerable production systems and populations.

#### **4.4. Climate change adaptation and management for crop-based agricultural systems**

There are a number of ways that cropping systems can adapt to a higher risk of drought or temporary inundation. These include varietal tolerance to moisture stress and a mix of cultivar cycles as mentioned above. Soil management practices such as contour plowing and incorporation of organic matter can also protect plants at vulnerable stages in their growth cycle. Farmers will need to retain more seed for re-planting in the event that climatic events are too extreme for crop survival, and be in a position to re-sow the field to a crop with a much shorter growing cycle (such as fonio) if the weather event occurs too late for re-seeding to be successful. There is evidence that farmers are aware of changes in weather, but additional reinforcement through radio and extension programs could be helpful. One potentially important source of risk as a result of increased weather variability that needs to be monitored carefully is aflatoxin contamination in peanuts and coarse grains. Drought stress during the pod-filling stage greatly increases the vulnerability of the peanut plant to aflatoxin infestation, while late rains increase the likelihood of contamination in cereals.

##### *4.4.1. Climate change adaptation and management for livestock-based systems*

The potential for climate change adaptation clearly depends on the type of livestock system – pastoralist, transhumant or mixed farming. Anticipation of the carrying capacity for different systems under different weather regimes, and careful monitoring during the season, will be important to enabling livestock owners adapt to climate change. Improvements in the efficiency of livestock marketing systems will help livestock owners preserve wealth when they need to reduce herd size in response to lower carrying capacity. Increased market availability of oilseed cake and milling by-products would also help maintain herd value in the face of temporary reductions in vegetative cover. Clarifying land access rights along transhumance routes, and sensitization of resident populations and herders to minimize crop damage, will also help minimize social tensions. High resolution modeling of climate change impacts on vegetative cover in Mali would be helpful to target climate change resources on the most vulnerable livestock production systems.

##### *4.4.2. Climate change adaptation and management for marketing systems*

Marketing systems are vitally important for managing variations in crop production and livestock off-take in response to greater variability in weather. Improvements in marketing system efficiency can be achieved through the removal of cross-border trade restrictions and associated rent seeking, improved financial services for traders, and improved market outlook analysis at national and regional level. The key to improved market outlook information to help farmers and traders make informed storage decisions is accurate agricultural statistics and effective organizational linkages between the agricultural statistics unit and price analysts. Reduction in the risk of crop storage losses through the diffusion of improved crop storage techniques will

also encourage farmers to store additional quantities of grain for consumption or for seed inter-seasonally.

#### *4.4.3. Implications for Mali and USAID agricultural sector investment portfolio*

At an organizational level, given that climate change will manifest itself in greater variability in resource availability and production system outcomes, it will be important to mainstream climate change adaptation strategies within existing sectoral and inter-sectoral bodies rather than setting up a dedicated unit for this purpose. When problems are given to a dedicated unit, there is a tendency for everyone else to assume that the problem has been taken care of. Such units are also very dependent on the personality leading them, making effectiveness vulnerable to personnel changes.

Although a dedicated unit is not recommended, a dedicated project to support mainstreaming of climate change within sectoral and inter-sectoral bodies could be very helpful. Such a project would need to identify the specific types of shock that different agricultural production and marketing systems are vulnerable to in Mali, the tools available to manage those shocks, and the organizations that need to be involved in adopting and using those tools. This information could then be disseminated to provide raw material for mainstreaming climate change concerns. For such a project to be able to provide detailed guidance to sectoral and inter-sectoral bodies, a high resolution study of the impacts of climate change in Mali is needed. This study could be funded as a regional activity, since there would likely be similar effects in a given agro-ecological zone regardless of country borders.

A second function of the project would be to identify critical bottlenecks to improving the flexibility of production and marketing systems, and working with government, civil society and donors to encourage the development of specific strategies to resolve them. For example, financial systems will need to be able to manage fertilizer credit default following a severe drought. Could this be accomplished by mandatory weather-based crop insurance, or by farmers paying an additional amount to the bank each season that is deposited into an individual or association escrow account to be drawn on in the event of crop failure?

#### **4.5. Infrastructure**

Infrastructure is critical to economic development and to the structural transformation of agriculture that needs to occur as part of the broader development process. As smallholders sell a higher proportion of their output over time, and purchase a higher proportion of their inputs, infrastructure development helps reduce costs and improve profitability. Hence infrastructure development was always a key component of early cotton development projects in the CMDT and OHVN zones, and remains a key consideration for new agro-industrial enterprises. Infrastructure is especially important for Mali to help overcome the geographical handicap of being landlocked (Bamako is close to a thousand kilometers from the nearest port). Infrastructure development is a key pillar of the government's 2006 Growth and Poverty Reduction Strategy Framework and, while not a major focus of direct investment by either the PNIP-SA or Feed the Future, it is important that agricultural sector development investments are coordinated with infrastructure investment. In this section we briefly highlight the major recent trends in road, energy and communication infrastructure in Mali, and identify key synergies that

need to be exploited by investments to improve food security and reduce poverty in the agricultural sector.

#### *4.5.1. Roads*

The density and quality of the road network directly affects the feasibility and cost of exchange. Hence infrastructure has implications for the cost of trade at all levels: local trade between rural areas and towns, regional trade between surplus producing areas in the south and center, and major cities and the north, and trade with neighboring countries. The state of road infrastructure also affects the size and geographical distribution, and hence the cost, of maintaining emergency food reserves. Estimated at 1.04 km of road (all types) per 1000 population, Mali's road network is very underdeveloped compared to the average of 3.89 km per 1000 population for Sub-Saharan Africa (World Bank 2006 database). Only 1 in 8 kilometers of road is paved in Mali.

The main focus of road infrastructure development in recent years has been primary routes that link the capital city and regional capitals to each other and to coastal ports (e.g., Dakar). The second major focus has been maintenance of existing routes, including paved and unpaved roads linking administrative centers to regional capitals. These investments, together with improvements in mobile phone communication, have facilitated the development of new cereal trade routes (e.g., maize from Sikasso to Dakar), more efficient cereal trading routes (e.g. direct cereal exchange between Koutiala and northern towns, bypassing Mopti), and reduced marketing margins (Boughton and Dembélé, 2010).

For most rural households, the highest transportation cost per unit weight or volume per kilometer is to gain access to a secondary road. Because of the wide geographical dispersion of villages, the aggregate cost of increasing the density and quality of the tertiary road network is very high. In addition to the vast length of tertiary roads needed, there is also a high unit cost due to the number of culverts and/or bridges required to transit natural water courses. Strengthening the tertiary road network will also require close coordination between different levels of government to match local knowledge of priorities with funding sources at different levels. The ability of local governments to raise taxes to match central or regional or NGO funding sources will also depend on improved land registries.

#### *4.5.2. Energy*

The current situation and prospects for energy development synergies with agriculture have been well documented in USAID Mali's Energy Sector Discussion Paper (USAID/Mali, 2010). In brief, approximately 58% of urban dwellers and 13% of rural residents have access to electricity. The rapid increase in rural access in recent years has been made possible by a dedicated rural electrification program (AMADER). While urban areas rely primarily on imported energy or domestic hydro-electric power, current rural energy generation is diesel-based and hence very costly. Where rural electrification is available the discussion paper notes that it makes sense to promote value added processing activities.

Energy use in rural areas is and will continue to be primarily biomass-based in the medium term, especially wood and charcoal for cooking. Given high rates of deforestation, and heavy burden on women's time spent collecting firewood, the successful promotion of efficient wood burning

stoves would save women's labor, promote rural employment and reduce the over-exploitation of biomass reserves. The success of the promotion of such stoves, however, has been very mixed. The efforts have involved a wide range of actors, from Peace Corps in the 1980s and 1990s, to GTZ, to the World Bank and a large number of NGOs. Heavy direct subsidies to buyers through NGOs has undermined market incentives to develop private-sector initiatives in this area, have undermined users' sense of ownership of the stoves that are sometimes seen as "gifts" from the project sponsoring them, and led to failure of projects that tried to take a more market-oriented approach to promotion of these stoves. Yet many NGOs (and AMADER, the Malian energy agency) believe that subsidies are needed to reach the poor with this technology (Gaul, 2009). Current efforts, including those promoted by the Millennium Village project, aim at obtaining carbon credits as an indirect subsidy to producers of the stoves in order to lower their cost. Clearly, more work needs to be done to develop a viable strategy to promote this technology (Rai and McDonald, 2009).

#### *4.5.3. Communications*

Communications and ICT innovation provide enormous scope for delivering information to men and women farmers in timely and useable form. The dramatic expansion of cell phone coverage has already brought improved access to market information and the ability to coordinate transport at village level. Wireless coverage will continue to expand and become more competitive as additional operators are granted licenses. The expansion of cell coverage is largely private-sector driven by the two telecommunications companies in Mali, Orange and Malitel. Orange has been particularly aggressive in expanding coverage and has a clear incentive to champion the expansion of its services (such as the introduction of cell-phone-based money transfer) as a way of selling more air time. New approaches to extension will need to consider the feasibility of community wireless network devices that can complement radio to expand access to extension messages and help compensate for the critical lack of qualified women extension officers (even with planned accelerated recruitment and training).

### **4.6. Improving the Business Climate**

#### *4.6.1. Business Regulation, Transparency and Corruption*

Despite major progress in market reforms (liberalization) and changes in the investment code in the 1980s and 1990s, Mali still ranks low in international standards of ease of doing business (156 out of 182 countries in the World Bank's "ease of doing business" rankings). Despite the relatively low world ranking, Mali has improved in the recent past (up to 156<sup>th</sup> in 2010 from 162<sup>nd</sup> place in 2009). Mali's 2010 ranking is above those of neighboring Senegal (157), Côte d'Ivoire (168) and Benin (172), but below that of Ghana (92) and Burkina Faso (147). Of the six countries just mentioned, only Mali and Burkina improved their rankings from 2009 to 2010.

Key problems frequently mentioned about doing business in Mali include:

- Costly contract enforcement, with widespread perception that both administrative procedures and judicial rulings in business matters are slow, inconsistent, and corruptible;
- Lengthy administrative procedures to start or dissolve a formal-sector business;

- Labor legislation that makes it costly to employ and difficult to fire employees, lowering firms' flexibility to deal with many of the risks inherent in the food/agricultural industry in Mali;
- High costs of engaging in trade, both within the country and regionally, due to problems or corruption and ambiguity of trade regulations;
- Instability of rules governing trade—e.g., imposition of ad hoc trade bans, with little advance notice to the private sector—which increases risks and discourages the holding of inventories—augmenting market instability.

Doing Business rankings for some of these specific problem areas indicate improvements from 2009 to 2010 (contract enforcement, cross-border trade, and starting a business); but there is still substantial progress needed in these rankings and in other critical areas of doing business such as access to credit, taxes, and protecting investors.

**Table 26. Doing business rankings for Mali**

Indicator	2010 Rank (out of 182)	Change since 2009
Starting a business	139	Improved by 18 points
Construction permits	95	Improved by 17 points
Employing workers	100	Worsened by 2 points
Registering property	99	Worsened by 1 point
Getting Credit	150	Worsened by 3 points
Protecting investors	147	Improved by 4 points
Paying taxes	158	Worsened by 1 point
Trading across	156	Improved by 10 points
Enforcing contracts	135	Improved by 20 points
Closing a business	117	Worsened by 1 point

Source: The Doing Business Project, 2010 <http://www.doingbusiness.org/ExploreEconomies/?economyid=121>

Low rankings in all of these areas limit private investment in the food and agricultural system, both from domestic and international sources (including expatriate Malians) and force many firms to operate in the informal sector rather than the formal sector.

#### 4.6.2. *Grades and Standards*

The issue of grades and standards (G&S) usually arises in discussions of marketing agricultural products so that products of higher quality can be separated from those of lower quality and priced accordingly in response to differences in demand. In addition to the quality dimensions, food safety is often taken into account when setting minimum standards. For exports to overseas destinations, the issue of G&S and food safety become even more critical, as products must meet minimum standards to be allowed entry into most foreign markets. With the liberalization of input markets, there are also G&S issues, but more in terms of truth in labeling and enforcement regimes to ensure that inputs sold meet minimum standards established for seeds, pesticides, and fertilizers and that pesticides, in particular, are not used in a manner that compromises food

safety. We review recent developments in each of these areas below.

*Grades and standards for agricultural products.* Mali, as other countries in West Africa, is working towards establishing agricultural grades and standards (G&S) that are economically meaningful for domestic and sub-regional trade. The objective of G&S is to create incentives for producers to produce products with attributes that are valued by different segments of the market, thereby better meeting consumer needs and raising producers' incomes. Such G&S can be set by private agribusiness firms or retailers (as is increasingly the case with horticultural products exported from Africa to the North), by producers' associations, or by national governments. This section contrasts the experience of setting and enforcing official G&S in Mali's grain trade with the experience of establishing more market-oriented phytosanitary G&S for mango exports. The discussion of the grades and standards for cereals illustrates how donors (the William and Flora Hewlett Foundation and the EU, working with UNIDO) have helped to facilitate collaboration between the public and private sectors to move towards more economically meaningful grades and standards.

Recently, the external environment in the region has provided positive levers towards the strengthening of national G&S structures and capabilities as a gateway towards the elaboration more harmonized G&S in the sub-region. In 2005, the European Union (EU) and UNIDO collaborated closely in support of the standardization efforts of the West African Economic and Monetary Union (WAEMU). Key results of the partnership included the establishment of a regional system for accreditation, standardization and quality promotion for enterprises (Quality Program) in the sub-region. The goal of the Quality Program is to promote both regional and international trade through the strengthening of regional and technical capacities to provide the infrastructure needed. The governments of WAEMU countries benefited from legislative harmonization, the establishment of quality infrastructure, laws protecting consumers, national quality awards, quality awareness campaigns, and the establishment of regional technical structures on standards and regulations.

The Hewlett Foundation has supported work by Michigan State University and the agricultural market information systems and national grades and standards agencies of several West African countries, including Mali, to build upon the WAEMU initiative to develop more market-oriented grades and standards for grains traded within the subregion. (See [http://aec.msu.edu/fs2/wamip\\_II/index.htm](http://aec.msu.edu/fs2/wamip_II/index.htm).) The Hewlett-Foundation supported effort has involved staff from the market information systems in the region working with the private sector to identify the characteristics most valued by their customers and then work with national grades and standards agencies to incorporate these criteria into the official standards. Senegal's Grades and Standards agency is mandated by WAEMU to develop proposals for modifications of G&S in the region, and, as part of the Hewlett-foundation-supported effort, will synthesize the findings of the effort (covering Mali, Senegal, Guinea, Côte d'Ivoire, and Niger) into a proposal that will be transmitted to WAEMU. WAEMU, in turn, will develop draft G&S that will then be vetted with the member states.

The motivation for this attempt to revise existing official grades and standards for cereals in the subregion is the widespread non-use of these G&S by the private trade. In Mali, legal texts for grain G&S do exist and in principle are binding on all market participants. They are approved by

joint order of the Minister of Industry and Trade<sup>40</sup> and supervisory ministries or sectors concerned. Private operators, however, emphasize criteria in their transactions that often differ from official standards. Studies supported by the Hewlett Foundation covering the private grain trade in Mali, Senegal, Niger, Guinea, and Côte d'Ivoire (PRESAO, 2010) revealed that none of the private-sector actors involved in regional grain trade that were interviewed made reference to national legislation relating to standards. The lack of correspondence between official standards and what is actually rewarded by the market offers market actors no incentives to adopt the official standards. This therefore creates a need to develop G&S that are economically meaningful to market participants. Further causes of the non-application of national quality standards as identified by the PRESAO (2010) study included the overly detailed nature of the texts, causing application and verification difficulties; the non-involvement of market actors in the development of these texts, thus reducing the private sector's input into and ownership of the rules; and the absence of labels to certify compliance. Different market segments have different quality demands, which are not necessarily reflected in the official G&S. For instance, while retailers are more interested in the color of the cereal and year of production, processors are more concerned with the maximum rate of impurity, the rate of infestation and homogeneity. Determining the design of G&S therefore requires involving all major actors in the industry and deciding whose interest counts and with what weight in the system. Also important in promoting grain quality standards is the development of labels using grain quality standard criteria used by operators (in a language that operators can understand); and sensitization of the public to these G&S via television and radio.

In Mali, efforts at improving G&S for grains have been active since 1994, when a technical committee for standardization was created out of growing concerns about grain quality issues, which were seen as eroding Mali's position in regional grain markets. This committee participates actively in the revision and reinterpretation of old regulations and in the development of standards in accordance with Malian national and sub-regional reality. However, with the creation of the National Agency for Food Safety, the Committee is now chaired by this agency and has focused more on the introduction of sanitary quality issues in the concept of quality. Conforming to its program of activities adopted by the National Board of Standards and quality control, the National Committee for Standardization, inspired by the International Standards Organization (ISO), has developed and adopted a draft MALINORM which sets proposed G&S in conformity with ISO texts, the Codex text as well as texts of neighboring countries such as Senegal and Côte d'Ivoire. It is this MALINORM that would be modified if the proposals coming out of the Hewlett-Foundation-supported effort continue to move forward.

Other structures involved in quality control are: The Plant Health and Packaging division of the Ministry of Agriculture; the Advisory Committee on Packaging<sup>41</sup>; the Customs Service of the Ministry of Finance; the Hygiene Service of the Ministry of Health; the Verification/monitoring unit (SGS<sup>42</sup> in French); and national laboratories, which are classified into two groups: laboratories capable of conducting health analysis (microbiology, toxicology) in addition to the

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<sup>40</sup> The National Committee of Standardization and Quality Control is a consultative body to the Ministry of Industry and Trade. This ministry appoints National Committee members, whose Ministers acts as Chair as well as representatives to the Technical Committees.

<sup>41</sup> Consist of representatives from the Ministries of Agriculture, Trade and Industry, Health, and Finance

<sup>42</sup> La Société Générale de Surveillance is a global company that provides inspection, testing, certification and verification services to ensure that product, services and systems meet quality, safety and performance standards



physical and chemical analysis; and laboratories whose activities are focused primarily on the determination of physical and chemical parameters. However, most of these tests exist only in theory, as in practice little testing is ever carried out on most of the grain traded in Mali. The performance of these certification services is still generally weak. Although the disconnect between official national standards and those used in the market and the corresponding lack of incentives to adopt official G&S on the part of market actors remain a major problem, there is also a dearth of services involved in the application of these standards. Most of the services operate only in theory; in practice very little testing is done on grain that is traded in Mali and outside. These difficulties arise not only from a lack of technical expertise but also from a lack of appropriate equipment to run the system, such as computers, laboratories, and testing materials. The problems of grading equipment and procedures are themselves limits on G&S. Results from the 2010 PRESAO study indicate that retailers, processors, wholesalers and institutions proposed the provision of cleaning equipment as a step into ensuring desired quality. Although Malian standards are evolving in the logic of sub-regional and international standards, their application is a problem due to the reluctance of Malian grain operators/actors to follow the dynamics of improving grain quality in WAEMU and ECOWAS space and the weak involvement of the state in the effective implementation of these standards. This unwillingness reflects a lack of effective demand for such detailed G&S.

Standards are also being used for non-cereal crops in Mali, and some of these are more market-based, as they set standards for admission to high-income export markets. Mangoes<sup>43</sup> were one of the prime candidates for Mali's effort to promote agricultural diversification and develop exports of high-value commodities under its Poverty Reduction Strategy. As discussed earlier in this report, Mali has experienced a spectacular growth of its exports of fresh mangoes, which have increased six-fold in volume between 1993 and 2008. In 2009, Mali exported nearly 10,000 tons of mangoes to Europe, earning over FCFA 4.2 billion in the process<sup>44</sup>. Once the initial major challenge (transport infrastructure) to the development of Mali's mango supply chain was resolved<sup>45</sup>, Mali became preoccupied with difficulties in meeting the new demand for quality and quantity of mangoes exported.

A number of successive agricultural diversification projects stepped in during the 2000s to provide support in the area of quality improvement, such as USAID's *Centre Agro-Enterprise* (CAE), Trade-Mali, and IICEM projects, and the World Bank's *Programme Compétitivité et Diversification Agricoles* (PCDA) (Sangho, 2010). As a result of these efforts, the average quality of the fruit exported from Mali has improved. For example, the number of sea container rejections due to fruit flies has been reduced from 14 containers in 2007 to 5 containers in 2008 (Sangho, 2010). Exporters provide support services to the farmers to build trust that allows the exporters to obtain a higher quality product, because farmers are more willing to respect phytosanitary controls when provided assistance. In spite of the improvement in quality, the continuing tightening of the EU food safety regulations implies ever more stringent phytosanitary requirements, which coupled with demands for traceability, make it necessary to devise and seek specific interventions to meet quality demands. The private sector pursued certifications like GlobalGap, which is the level of certification required by supermarkets in the

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<sup>43</sup> Because of the excellent agro-climatic conditions in some regions of Mali.

<sup>44</sup> [http://www.phdeb.org.pk/topstoriesEvents/events\\_detail.php?id=3262](http://www.phdeb.org.pk/topstoriesEvents/events_detail.php?id=3262)

<sup>45</sup> Air-freight to refrigerated sea-freight.

EU. Collaboration along the value chain led exporters to assist producers to achieve certification through training, with the support of PCDA. Quality concerns are still an issue in Mali's mango export chain. In 2009, against an initial export program goal of 104 containers, the PCDA-supported export facility PLAZA could finally ship only 42 containers because of the lack of mangoes of exportable quality (Sangho, 2010).

*For agricultural inputs* As of 2004, the regulatory framework for inputs was considered adequate and well implemented for pesticides but either non-existent or obsolete for seeds and fertilizers (IFDC 2004). The *Direction Générale de la Réglementation et du Contrôle* (DGRC) of the Ministry of Agriculture had the responsibility for dealing with these issues.

For pesticides, the DGRC uses the services and procedures of the Sahelian Pesticide Committee, a unit of CILSS, and participates in the regional *homologation* program. Because the cost of getting a product on the approved list is relatively high, few horticultural pesticides are on the approved list. As a result, the need for horticultural pesticides is too often met through illegal imports or the use of cotton pesticides on horticultural products—a very dangerous practice with serious implications for the environment and human health. In addition, all pesticide importers and distributors must be licensed by the government, but this licensing process does not strictly enforce many of the requirements in terms of building codes, training of personnel, and respect of the norms required by the regional *homologation* rules (IFDC 2004).

Although there was no “fertilizer-specific” regulatory framework in place in 2000, the soil laboratory at IER was given the responsibility for controlling the texture, quality, and environmental impacts of fertilizers, while the *Laboratoire National de la Santé* (LNS) and the *Laboratoire Central Vétérinaire* (LCV) had the responsibility for controlling for fertilizer residues on food products (Diarra 2002). The absence of specific legislation for the fertilizer sector led to various proposals for drafting such legislation. The need for such legislation and budgets to enforce regulations is highlighted by recent complaints raised by farmers in the Office du Niger in response to a situation of declining yields. Of particular concern is the composition/quality of Nieleni bulk blend fertilizer that was distributed during the Initiative Riz program (Bureau de Vérificateur 2009). Discussions with soil scientists knowledgeable about the ON suggest that the declining yields could be a problem of changes in soil quality/fertility that warrant changes in fertilizer recommendations rather than a problem with the quality of the fertilizers. Regardless of the cause, there needs to be an effective service for monitoring the quality of fertilizers sold in Mali if farmers are to have confidence in the sector.

The situation concerning seed legislation was similar to that of fertilizer—legislation was being drafted in 2004 to deal with control and certification of all seed of vegetable origin. That legislation has recently been finalized and became law on July 12, 2010, replacing the previous seed legislation written in 1995. An action plan for the period 2009-2013 has also been developed. USAID (among others) is implicated in helping to develop funding sources for the creation of a unit for producing base seed. The plan calls for production and promotion of certified seeds using private seed producers and support to seed producers and their associations to improve the professionalism in the sector. It also calls for further fine tuning of regulations and legislation regarding seed, including patent rights, updating of seed catalogs, and the introduction of legislation concerning biotech seeds (traceability, labeling, etc.). Whether passing seed legislation will be able to revitalize the sector is an open question (see more discussion of

the seed sector issues in section 3.11.4 on the input value chain).

#### 4.6.3. Food Safety

*Challenges* Mali's ability to succeed in regional trade, as well as improve public health, depends in part on its ability to improve and certify food safety to potential customers. There are a number of serious food safety issues, such as aflatoxin contamination (particularly of peanuts and peanut butter), gossypol contamination of non-industrial processed cotton oil, pesticide contamination of fruits and vegetables due to use of cotton pesticides on these products, and sale of products that are unsafe due to exposure to unclean water and soil during production and marketing or to the lack of refrigeration. This is a particular problem in peri-urban horticultural production, where irrigation water is often unclean (risking the spread of diseases like cholera and typhoid fever from the consumption of the resulting produce) and land is polluted with heavy metals from the unregulated discard of batteries and electronic equipment. In order to address these issues, implementing the rules governing quality control, traceability, sanitary and phytosanitary of both imported and exported products, in harmony with the principles of international and regional organizations such as FAO, WHO, OIE, and Codex Alimentarius, are a stated priority of Malian authorities to ensure consumers' safety and expand exports. However, meeting the requirements of norms and regulations of regional and international markets relative to food safety is a big challenge.

In order to ensure that different stages of the food system are in compliance with hygiene standards, the Malian government and farmers' organizations has put in place a number of projects and created governmental agencies in charge of food safety. Food safety administration in Mali is strives for:

- The application of rules and regulations of quality control and safety at the production, processing and marketing levels;
- The traceability of all food products as well as the ingredients entering in their composition;
- The harmonization of procedures and networking of risk assessment at national, regional and communal level.

Achieving these goals in the context of a decentralized food system, low effective demand for food safety, and limited enforcement capacity, however, presents serious challenges. For example, in the Bamako area, the regional Chamber of Agriculture is working with farmers to improve the quality of irrigation water used in vegetable plots, but there is no effective system in place to ensure quality after the product is harvested.

*Institutional framework* There are state offices, non-governmental organizations, and socio-vocational organizations involved in putting in place techniques and procedures for good hygiene and quality control in the different regions, cercles and communes of Mali. The responsibility for food safety and quality control is shared between several governmental agencies: the National Office of Veterinary Services, Ministry of Health, Ministry of Agriculture, and Ministry of Trade. This separated responsibility leads to gaps and problems of coordination (as was historically the case in the US). The Malian network of consumer associations was established with the support of ANSSA (the National Food Safety Agency). This network is responsible for

raising public awareness about food-borne illness. ANSSA is the structure in charge of conducting risk assessment through (a) coordinating all actions related to food safety; (b) bringing technical and scientific support to the government agencies in charge of monitoring food safety; (c) assuring technical and scientific support for the development of new food safety regulations, (d) supporting food safety monitoring activities and the work of epidemiological networks that track food safety incidents, and (e) ensuring communication to the public concerning food safety risks.

In order to prevent food borne illnesses, monitoring services in establishments involved in the production, transformation and distribution of food are to take periodic samples. The law states that monitoring is to take place without distinction between national products and imported products prior to entry. In case of food poisoning, a team of monitors is to travel to the scene to assess the risk, identify the source of the contamination, and recommend actions to prevent similar cases in the future.

However, just as in the case of grades and standards discussed earlier, the gap between what food safety regulations are on the books and the capacity to enforce them is large. Constraints facing the various structures involved in food safety issues in Mali include:

- Weak financial and material resources;
- Insufficient staff, both in terms of numbers and training;
- Insufficient infrastructure (e.g., laboratories) to effectively monitor food safety.

Given Mali's rapid urbanization, an increasing portion of the population will be obtaining its food through the market in coming years rather than through own production. As incomes increase, people also increase their consumption of highly perishable foods, such as meats, fish, fruits and vegetables. Both these factors will contribute to increasing incidents of food safety problems in the future; addressing these will be important to ensuring health and food security of the population.

#### **4.7. Financing the Agricultural Sector<sup>46</sup>**

The development of agriculture requires technological changes throughout the chains to increase productivity and agricultural production. These technological changes require significant complementary state and private sector investments. Thus in order for Mali to achieve ECOWAP/CAADP's objective of a 6% annual agricultural growth rate, the country must increase its annual public investment in agriculture from 154.9 billion FCFA in 2009 to 248.7 billion FCFA in 2015 according to the simulations carried out in developing Mali's CAADP compact in October 2009.

The public-sector investments are focused on irrigation infrastructure, rural roads, the generation and dissemination of new technologies, training and the creation of an environment conducive to private investment. As for the private sector (including farmers, input suppliers, traders,

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<sup>46</sup> This section is largely inspired by Yénizé Koné's thesis on *Le Marché du Crédit face Aux Risques Agricoles : La Riziculture de l'Office du Niger*, the World Bank report on *Etude sur le financement rural au Mali*, and the report by the Ministry of Agriculture with IITA/ ReSAKSS on *Rapport sur l'évolution du secteur agricole et des conditions de vie des ménages au Mali*.

processors, and agro-industries), its main financing needs concern inputs, agricultural and post-harvest machinery, marketing infrastructure, and working capital..

The investment scale required to develop the agricultural sector raises the issues of mobilizing adequate financial resources and the availability of loans tailored to the needs of producers and other actors in the value chains. This section presents the evolution of financing mechanisms for the agricultural sector in Mali, describes the current situation as well as the supply constraints for financing, and identifies prospects for improvement.

#### *4.7.1. Evolution of public financing for the agricultural sector*

Public funding comes mainly from two sources: the national government's budget and development partners, as local governments finance very little in the agricultural sector directly<sup>47</sup>. Financing by development partners is through loans or grants. Thus, the overall budget for agriculture includes all expenditures anticipated by the national government's budget and external financing that serves to fund both operating activities and investment in the agricultural sector.

An examination of the overall agricultural sector budget from 1999 to 2006 shows that it averaged 95.6 billion FCFA per year. This amount is split between 15.5 billion FCFA for operating expenditures and 80.1 billion FCFA for investments. In terms of actual expenditures, the overall budget for the sector reached 68.9 billion FCFA per year on average over the period (71% of what was budgeted), with most of the shortfall in implementation coming in the investment portion, which averaged 54.5 billion FCFA annually (68% of what was budgeted).

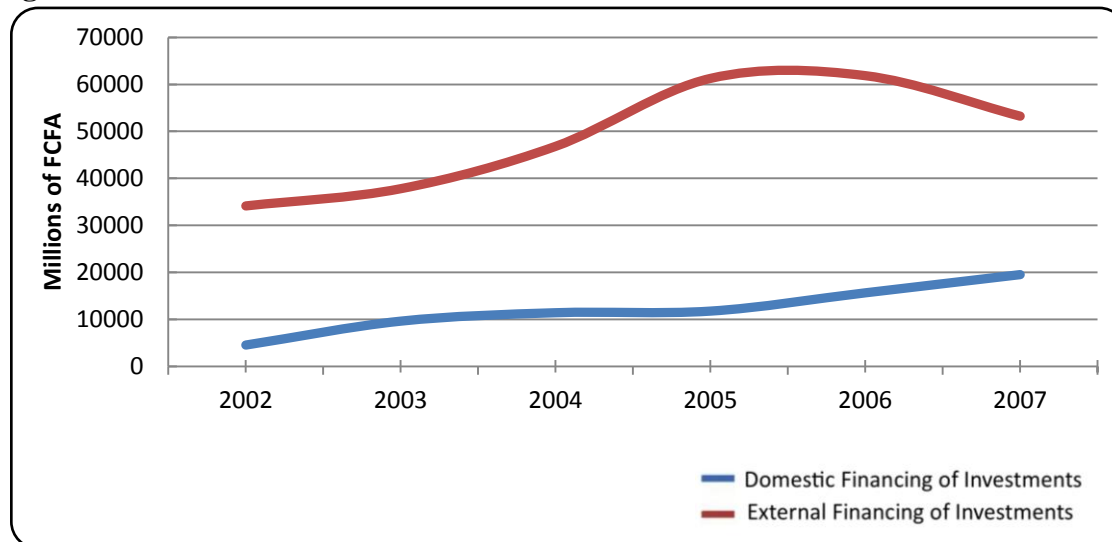
Operating expenses consist primarily of salaries and the routine activities of departments and structures in charge of agriculture. These operations are fully provided for by the state and represent 21% of total budget expenditures for the agricultural sector. The investments concern the acquisition and installation of agricultural infrastructure. The 54.5 billion FCFA for realized investments break down on average per year as follows: 9.4 billion FCFA by the Malian government (17.2% of the total) and 45.1 billion FCFA by development partners (82.8%). Loans make up 69% of the funding from the development partners, and this percentage is increasing.

Public expenditure for agriculture and the primary sector as a share of that sector's contribution to value added averaged 9.6% over the period 2002-2007, compared to 26% for the ratio of total government expenditures to the economy's overall value added. The ratio for agriculture peaked at 12.3% in 2002 and 11.7% in 2005.

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<sup>47</sup> Preliminary evidence by PROMISAM II from studies of the implementation of commune-level food security plans indicate that most of local projects being implemented under these plans are funded with resources external to the communes.

**Figure 32. Evolution of domestically and externally financed investments in the agricultural sector**



Source: CPS-agriculture, 2008

In 2007, the Ségou region received the largest share of public investment funding for agriculture, with more than 11 billion FCFA. This is explained by the significant investments that the country is making in the *Office du Niger* (ON) on irrigation. Ségou was followed, respectively, by the regions of Mopti, and the district of Bamako, Kayes and Sikasso.

#### 4.7.2. History of agricultural credit for producers

The creation in 1964 of the Agricultural and Equipment Credit Service (SCAER) marked the beginning of a genuine policy of agricultural credit for rural areas. SCAER was established as a state-owned corporation in 1971 with the main function of supplying equipment and agricultural inputs in rural areas. But it was disbanded in 1980 as a result of deficits related to the state's marketing of agricultural products and mismanagement.

From 1964 until the early 1980s, Mali pursued a supply-driven approach to credit disbursement through projects and development operations (ODR) aimed at enhancing producers' access to equipment and inputs. This approach favored loan distribution at the expense of loan recovery, rural savings mobilization and the development of financial services that are crucial to developing sustainable rural financial markets. The results were disappointing; many rural development operations went bankrupt, and the unpaid loans, just in the Office du Niger, reached over one billion CFA francs (\$40 million at the then-prevailing exchange rate).

In 1981, the financing policy evolved with the creation by the state of the National Bank for Agricultural Development (BNDA) as a banking institution specializing in financing agriculture. The BNDA is today the main public institution responsible for the implementation of agricultural credit policy.

The process of economic liberalization and disengagement of government from productive sectors to the benefit of the private sector led to the privatization of certain agricultural support

services including agricultural credit. Since 1987, the financial landscape has diversified with the appearance of decentralized financial systems (DFS) in a formalized partnership with the BNDA and, more recently, the creation of the Malian Solidarity Bank (BMS) to help assure better access to credit by farmers. Micro finance institutions (MFI), which are key components of the DFS and which own 72% of the BMS, disburse the greatest share of funding for the major value chains of rice and cotton and play a central role in rural savings mobilization. The DFS sector is dominated by two major networks, Kafo Jiginew and Nyèsigiso, which, in 2007 accounted for about 59% of deposits, 54% of credits and 43% of customers (World Bank, 2008). In 2006, microfinance included 53 different organizations, with over 850 retail outlets and 835,071 customers, corresponding to a 15% penetration rate of the total population (World Bank, 2008).

The law entitled “Support Project for the Mutual Network of Savings and Credit”, adopted by the WAEMU countries in 1993, defines the business conditions and supervision terms for micro-finance institutions. It sets the usury rate at 27%, exempts these institutions from most taxes or charges imposed on other financial institutions, and reserves the practice of micro finance activities to mutual structures.

#### *4.7.3. Current Status of the Supply of Financing*

As mentioned above, funding for agricultural development requires capable institutions and mechanisms to mobilize domestic savings. In fact, the focus of policy is no longer on direct interventions from the state, like industry-specific direct loans, subsidized interest rates and state ownership of banks. The current objective is the development of institutions capable of ensuring the sustainability of rural financial intermediation and providing various value chain actors, in both rural and urban centers, the financial services that they need.

The effective mobilization of savings by financial institutions aims to ensure efficient allocation of resources by diverting resources from less productive investments and directing them towards more productive investments. The mobilization of savings by financial intermediaries also guarantees the proper incentives and rigor required for good management. In fact, "financial institutions make little effort to mobilize savings or to recover loans if funds are available cheaply by way of government loans, rediscount by central banks or loans from international donors" (Norton, 2005). This was the case in the PRMC loans to grain producers and traders for the development of grain storage in 1986/87. Nevertheless, the mobilization of savings is incompatible with low interest rate loans (usually due to subsidies) because one cannot ask financial institutions to mobilize savings while providing loans with interest rates that cover neither interest payments to depositors nor the risk and management expenses.

Since the liberalization of the agricultural sector in the 1980s, financial intermediation has been carried out in rural Mali by two types of institutions: traditional banks and microfinance institutions. In addition to the Central Bank (BCEAO), which provides the management of monetary policy, the country has 17 banks or quasi-banks, including 13 commercial banks and four financial institutions with a financial deepening rate (M2 to GDP), that increased from 22% in 2000 to 28% in 2008. Despite this growth, this penetration rate of the financial sector into the broader economy is considered low when compared to the average of 35% for sub-Saharan Africa (World Bank, 2008).

The BNDA and the BMS provide for the bulk of financing for the agricultural sector, even though other commercial banks support the cotton sector through the mechanisms of a banking pool. It is primarily the BNDA that offers financial products that meet the financing needs of farmers and of other value chain actors, such as grain traders, input and agricultural equipment suppliers, and processors. The BNDA also refinances microfinance institutions in production areas. However, BNDA's credit authorizations to the rural areas have declined over the last 5 years from 39.5% of its total approvals in 2006 to merely 4.1% in 2008 (See **Table 27** below). This sharp decline is mainly due to the cotton sector crisis and the high indebtedness of actors in the two main sub-sectors, rice and cotton. For example, in 2006, the cotton sector alone accounted for 70 percent of BNDA's outstanding loans i (52 billion FCFA), whereas total outstanding loans to the entire rural sector had fallen to only 13 billion FCFA by September 30, 2009 (Kodio, 2010).

**Table 27. BNDA's evolution of credit authorizations to the rural sector (millions of FCFA)**

	2006	2007	2008
Authorization Total	125,310	102,781	122,523
Total Credits to the Rural Sector	49,455	28,556	4,978
Percentages	39.5%	27.8%	4.1%

Sources: Kodio, 2010

BNDA and BMS funding mainly concerns the production and marketing of cotton, rice, coarse grains, potatoes, shallots, and livestock (including poultry). However, their credit offering is essentially designed for the financing of the crop year, so the agreements are short term. These banks allocate very little credit for investment, which is hampering the development of various value chain links such as production, processing and marketing of products.

The geographical distribution of microfinance institutions shows their predominance in Bamako and the regions of Ségou and Sikasso, which contain 72.4% of the institutions' clients. The Northern regions of Kidal, Gao and Timbuktu only account for 0.6% of the clients. The distribution of microfinance activities between rural areas and urban centers showed a trend towards increased activity in urban areas to the detriment of rural areas, most likely due to the cotton crisis. Rural areas, which accounted for 59% of institutions' clients in 2003, accounted for only 48.8% of clients in 2006, while urban centers went from 41% in 2003 to 51.2% in 2006 (and 59.7% of total loans during that year). Thus, Kafo Jiginew, one of the oldest microfinance institutions that financed the agricultural sector, mainly cotton, is seeking to diversify its activities and has already established branches in the Office du Niger and Bamako because of the cotton crisis.

The financial services offered by microfinance institutions include savings and loan services in both rural and urban areas. In 2007, deposits totaled 31.36 billion FCFA, and outstanding loans totaled 35.48 billion FCFA. Thus, the mobilized savings funded 88.4% of loans. Unfortunately, the majority of deposits are short-term sight deposits, and Malian law prevents microfinance from using short-term savings to finance medium to long-term credit; thus, microfinance institutions have little capacity to finance agricultural equipment and marketing, which require medium and long-term loans. However, Kafo Jiginew grants equipment credit for a period ranging from 12-36 months at a rate of 18% per year and credit for grain storage for a duration of



6-12 months at an annual rate of 10%. In comparison, credit to finance the purchases of inputs for individual producers is granted for a period of about 9 months (the average duration of the cotton season) at the rate of 10% per year.

**Table 28. Performance indicators for micro-finance institutions in 2007**

MFI	# of Branches	Members	Outstanding Deposits		Outstanding loans	
			[billions of FCFA]	%	[billions of FCFA]	%
Kafo Jiginew	130	227,926	12.0	38	13.5	38
Nyesigiso	17	140,644	6.7	21	5.8	16
Kondo Jigima	74	48,369	4.9	16	3.4	10
Jemeni	33	45,240	5.4	17	7.1	20
CVECA-ON	50	28,214	0.5	2	1.9	5
FCRMD	61	17,368	0.6	2	2.1	6
Jigiyaso Ba	35	16,410	1.1	4	1.5	4
Karabara	8	5,152	0.1	0	0.2	1
			31.359	100	35.483	100

Source: World Bank, 2008

#### 4.7.4. *Financing— supply constraints and prospects*

According to a study by IRAM-GRET in 2008, several factors limit the supply and access to financial services to Malian agriculture:

- The geographic dispersion of borrowers, their low density and isolation as well as the small amounts per transaction. All these factors increase the costs of providing financial services and limits their accessibility to small farmers;
- The diversity of risks and the very high levels of risk, combined with the lack of insurance services and personnel qualified in the assessment of agricultural risk in MFIs and most banks;
- The lack or weakness of feasible safeguards at the legal, social or economic level in case a borrower defaults;
- Weak farmer organizations linked to the weakness of their human capital, which increases their management constraints;
- The difficulty of using financial institutions as a clearing house to domicile sales revenue from the sale of certain products such as millet, sorghum and maize (as is done with cotton) to guarantee the payment of credit.

To the constraints identified by IRAM-GRET, one should add that the debt of farmers has worsened with the growth of microfinance institutions that were engaged in tough competition among themselves to increase market share. Taking advantage of this competition and the increase in the number of these institutions, some farmers became heavily indebted. The recovery of unpaid debts and the stabilization of the agricultural sector's financial system have become major issues today. To address these issues, the creation of risk centers by banks and

microfinance institutions has become a necessity. For example, the BNDA and microfinance institutions in the Niger Office have set up a risk center that allows for dialogue, information exchanges and the adoption of common rules among financial institutions for the granting of credit and the recovery of unpaid loans. This institutional innovation enabled the repayment of 900 million FCFA in unpaid loans in 2002 (Koné, 2010).

The question of interest rates is still alive and recurring in discussions about the financing of farmers. This rate is capped at a maximum of 27% by UEMOA. The interest rates for fertilizer credits are around 12%. BNDA lends at a negotiated rate of 7 or 8%, to microfinance institutions. The MFIs add a brokerage markup of 4% to cover its expenses. For other activities (such as small businesses and livestock fattening), interest rates are higher, ranging between 15 and 25% depending on the financing system and community. These interest rates are considered exorbitant by farmers, small-scale processors and agricultural products traders who maintain that these rates do not take into account the risks associated with agricultural activities. This is not the point of view of the financial institutions, which estimate that these rates hardly cover their operating costs, risks, and the repayments of clients' deposits. Although many working with the rural sector advocate subsidizing interest rates, such subsidization tends to depress savings mobilization and create excess demand for loans, which are then rationed through higher transaction costs that tend to exclude the smaller borrowers.

Another constraint today is that the financing of the agricultural sector is increasingly left to microfinance institutions, but their ability to ensure the financing of farmers and other actors in the value chain is now strongly questioned. In particular, producers are concerned about the financial instruments offered by MFIs and whether these institutions really have the financial capacity to provide the enormous financing needed to modernize the agricultural sector, particularly in terms of medium- and long-term loans. To revive the agricultural sector financing, it will be important to:

- Develop weather and economic risk management tools for the different actors. These include better water management and control, the distribution of varieties resistant to climatic stress, and the establishment of risk management instruments such as crop insurance.
- Establish guarantee and calamity funds, as foreseen in the *Loi d'Orientation Agricole*.
- Develop the tradable warehouse receipt (*warrantage*) system and production contracts through the emergence of strong producer organizations capable of organizing collective marketing and ensuring the domiciliation of revenue from crop sale in financial institutions.
- Develop the agricultural risk analysis capacity within microfinance institutions as well as banks.
- Encourage the establishment of "credit bureaus" in rural areas to identify loan delinquents and to share this information between various financial institutions.

Mali should especially avoid subsidizing credit to farmers in order to avoid halting the current momentum of mobilizing local savings, which covers about 88.4% of microfinance loan funds. In addition, the mobilization of supplier credit through the development of agribusiness and its

association with well-organized farmers, as well as the establishment of an environment favorable to private foreign investment, should constitute important strategies that can expand financing to the agri-food system. In addition, efforts should be made to strengthen the complementarity between microfinance institutions and the commercial banking system through the development of a system where MFIs are refinanced by the commercial banks.

Possible USAID intervention could focus on the development of capacities within the banking system to analyze agricultural risks, the development of agribusiness supplier credit through the development of contract systems and value chains, support for land reforms to attract both domestic and international private investors and to allow land to be used as collateral for loans, and the development of "credit bureaus".

#### **4.8. Creating the Conditions for Agricultural Diversification, Market Development and Value Addition<sup>48</sup>**

Increasing value added to agricultural products has long been an objective of Malian policy makers. Examples include efforts to increase the percentage of cotton processed into cloth domestically (currently, over 95% of cotton is exported in raw form), promote exports of chilled meat rather than live animals, and expand production of high-quality horticultural exports. These efforts have frequently met with very little success. This section briefly describes the conditions that are necessary for Mali to achieve greater success in producing and marketing value-added products.

##### *4.8.1. Distinguishing between value addition and processing*

Many people mistakenly equate value addition in the agrifood system with processing. Value can be added to products without changing their physical forms, and processing (in the sense of changing the form of the product) does not necessarily add value to the product. Value addition does involve processing in the sense that the product undergoes some process (which can involve just cleaning, grading, or labeling), after which a buyer is willing to pay a price for the product that more than compensates the value of the inputs used in the process. For example, sorting a heterogeneous mix of mangoes into high-quality fruit targeted to the fresh-fruit export market and lower-quality fruit targeted to juice production for local consumption allows the firm undertaking this activity to separate markets and practice price discrimination, charging higher prices in the market with a more inelastic demand (in this case, the export market for high-quality fresh mangoes), thereby increasing earnings. In a market economy, this "added value" is typically manifested by the processor earning a profit.

In contrast, if processing uses resources that are worth more than the additional amount buyers are willing to pay for this processed product relative to the raw product, "value subtraction" rather than value addition occurs. A classic example in Mali and throughout the Sahel was the construction of refrigerated abattoirs during the 1960s and 1970s, with the aim of exporting fresh meat to the coastal countries. The motivation for their construction was to substitute the export of fresh meat for the export of live animals (cattle, sheep, and goats), thereby capturing the "value added" of processing in the livestock exporting countries. In practice, these efforts almost

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<sup>48</sup> This section draws heavily on Staatz (2011).

all failed, in part because refrigerated transport of meat from the Sahel to the coast proved more costly and unreliable than the transport of live animals. In addition, as discussed in section 3.3.1, coastal consumers were willing to pay a much higher price than Malians for the offal and other by-products of the slaughtered animal (hides, hoofs, horns, etc.)—the so-called “fifth quarter”. Because many of these by-products are very perishable, they are hard to ship from the Sahel to the coast without extensive processing—unless they are shipped as part of a living animal. As a consequence, traders involved in the export of live animals could afford to pay more for export-quality animals than could firms involved in the meat export business. Slaughtering animals in Bamako to export their meat to the coast (or to North Africa) became money-losing proposition—a value subtraction activity rather than value addition (Makinen, Staatz and Herman, 1981). Thus, in evaluating whether a proposed processing activity truly adds value, one needs to compare the profitability of the production and trade of the raw product with that of the processed product.

*Heterogeneity of agro-processing enterprises in Mali.* Just as farm enterprises are highly heterogeneous in Mali, so too are agro-processing enterprises. They range in size from large-scale textile mills to part-time operations by a single individual making peanut butter to sell to her neighbors. Ilboudou and Kambou (2009) propose a typology of agro-industry in West Africa that includes four categories of enterprises: artisanal (micro), semi-artisanal (small), semi-industrial (medium) and industrial (large). (Table 29). Their “artisanal and semi-artisanal” categories include the smallest scale firms that use the simplest technology and are frequently in the informal sector. Approximately 75% of the enterprises in West Africa (and probably a similar share in Mali, although precise figures do not exist) fall into Ilboudou and Kambou’s artisanal and semi-artisanal categories.

**Table 29. Characteristics of different types of processing firms in West Africa**

Characteristic	Artisanal	Semi-Artisanal	Semi-Industrial	Industrial
Scale	Micro-enterprise	Small enterprise	Medium enterprise	Large enterprise
Labor	Family or social	Family	Large and moderately specialized	Large and specialized
Products	Traditional products, often “humid” with a short shelf-life	More or less standardized products, stable shelf life	Diversified products with stable shelf life	Products that meet grades and standards; branded products
Organization	Informal enterprise. Little of no organization (embryonic)	Beginning to be organized	Formal; separated functions of employees; accounting systems	Very modern (Administrative units, divisions and departments)
Investments	Small to none. Operations are essentially manual	Some machines	Important mechanization	Important and modern

**Table 29. Characteristics of different types of processing firms in West Africa**

Characteristic	Artisanal	Semi-Artisanal	Semi-Industrial	Industrial
Production	Low level of production	Regular and larger level of production	More mechanized processes	High capacities for production
Types of Markets	Local and very targeted	Local distribution	National distribution and sometimes subregional	All markets (local, regional, overseas)
Distribution	Short distribution channels; direct sales to consumers	Direct sales and/or by intermediaries	Long distribution channels	Long and professional channels
Est. % of total processing firms in West Africa		75%	20%	5%

Source: Ilboudou and Ka (Ilboudou et Kambou, 2009)mbou, 2006, p. 1

The smallest of these enterprises, those in the artisanal (micro-enterprise) category, face severe constraints to their potential for growth and income generation, often serving as what de Janvry (2009) terms “sources of hidden unemployment.” Among the constraints are their very limited market access (focused primarily on low-income consumers within the village or neighborhood where they are located), reliance on agricultural raw materials that are of highly variable availability and quality (a function of the production constraints facing the small farms that produce these goods), poor access to inputs such as appropriate machinery and packaging and to financing, inadequate access to appropriate information on technologies and market demand, and weak managerial capacity. Many of these constraints are linked to weak organizational capacity of the firms for joint action, both at a given level within a value chain (e.g. small-scale grain milling) and vertically among different levels in the value chain.

It is likely that some of the greatest growth potential for Malian agro-industry lies in the small and medium enterprises, especially in helping them expand and capture (or recapture) national and regional markets (Ilboudou and Kambou, 2009). Neither an exclusive focus on the smallest firms in agro-industry nor on the large-scale “industrial” category of agro-industry, focused primarily on the overseas export-trade, is likely to lead to a successful path of economic growth and poverty alleviation. . There is a parallel between the optimal scale of agro-industry and farming, where a number of studies have shown that, with limited exceptions, large-scale enterprises in SSA do not have significant scale economies relative to the larger of the small-scale farms (World Bank, 2007; World Bank, 2009b).

#### *4.8.2. The prime movers of productivity growth and competitiveness in Malian agro-processing*

The major factors driving productivity growth and competitiveness in agro-processing in Mali are similar to those that promote such growth in farming and which are discussed earlier in this report: the institutional and infrastructural enabling environment; access to key technologies; arrangements for horizontal and vertical coordination among actors in the agrifood system;

access to markets; access to financing, and managerial capacity. While space does not permit a full discussion here of all these factors with respect to agro-processing (see Staatz, forthcoming, for details), a few are especially important in Mali.

*Infrastructure.* **Mali's high cost of electrical power** and limited access to electricity in many rural areas severely constrain the development of cold chains that are critical for maintaining quality of potentially high-value perishable products such as fruit and dairy products, and interruptions of electrical power greatly increase costs of agro-processing. Processors face the unpalatable choice of having to throw out goods that are in the processing line every time electricity is cut to the plant or investing in costly generators to assure a continuous supply of power.

*Technology* For many small- and medium-sized agro-processing firms, limited access to, and the cost of, appropriate **packaging materials** seriously compromise their competitiveness. Inappropriate packaging reduces the quality and shelf-life of processed food products and can lead to problems of product contamination. Constraints exist at three levels: inadequate technical knowledge among some of these agro-processors about which packaging materials are most appropriate for which products; the simple lack of availability of appropriate packaging materials for some products in some markets (linked to the requirement for large minimum order size from foreign manufacturers); and the high cost of packaging materials when available, which is frequently linked to high energy costs that drive up the cost of locally produced packaging. Faced with these constraints, some small-scale enterprises recycle packaging materials (e.g. putting their fruit preserves in old mayonnaise jars), which presents serious potential hygiene problems and precludes these products from all but the lowest-income markets where effective demand for quality is low.

*Vertical and horizontal coordination and ensuring market access.* There are two key challenges which include developing **reliable contracting systems** between farmers and processors (to ensure processors with reliable supplies) and putting together structures and incentives at the firm, value-chain, and industry levels to **ensure and signal product quality**.<sup>49</sup> The ability to guarantee to consumers the quality of one's product is essential to compete in international markets and increasingly so in regional and even national markets. For example, interviews with KOUMALIM, the firm that produces Maggi bouillon cubes in Bamako under license from Nestlé, revealed that the firm was importing onions that were grown in Egypt, shipped to Germany for processing, then sent to Côte d'Ivoire before being shipped to Mali (with all the attendant costs) because Mali's small-scale onion producers could not deliver onions to the plant that met Nestlé's quality standards. Developing such quality control systems represents a large fixed cost, so it is more difficult for small and medium-sized firms than large firms to amortize such investments. Addressing the issue requires upgrading of managerial capacities of these firms, improved vertical and horizontal coordination (including group action) among farmers and agribusiness firms (both to pool resources to help cover the cost of the systems and to improve traceability) and, strengthening of laboratories and third-party certification firms.

*Small Agro-processors.* For Mali's smallest agro-processors, the household-level micro-enterprises, **management constraints** pose a severe limit on growth. Frequently the "border"

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<sup>49</sup> See, for example, the discussion earlier in this report on product quality issues in the shea value chain.

between such enterprises and the household is blurred, with no notions of separate firm accounting, employment, or financial flows. Access to information on technologies and promising market outlets is frequently restricted due to illiteracy of the entrepreneurs. NGOs have been particularly active in working to strengthen managerial capacities of such enterprises, usually through group training in basic business practices, development of “bankable” business plans, functional literacy and encouragement of group action in accessing both finance and output markets. For small and medium enterprises, firm management challenges revolve more around identifying and adapting to promising markets and technologies, developing contractual relationships with larger actors up and down the value chain and accessing finance. Thus, just as in farming, it is unlikely that an exclusive focus on the smallest firms in agro-industry is likely to lead to a successful path of economic growth and poverty alleviation. This does not mean that emphasis should be exclusively on the promotion of the large-scale “industrial” category of agro-industry, focused primarily on the overseas export-trade. Just as in farming, where a number of studies have shown that, with limited exceptions, large-scale enterprises in SSA do not have significant scale economies relative to the larger of the small-scale farms (World Bank, 2007; World Bank, 2009a), it appears that some of the greatest growth potential for African agro-industry lies in the small and medium enterprises, especially in helping them expand and capture (or recapture) national and regional markets (Ilboudou and Kambou, 2009).

## **5. KEY INVESTMENTS AND ENGAGEMENT NEEDED TO IMPROVE FOOD SECURITY AND STIMULATE AGRICULTURE-LED GROWTH IN MALI**

From the foregoing chapters, it is clear that Mali faces daunting challenges, as well as new opportunities, as it strives to meet its twin goals of becoming an agricultural powerhouse in West Africa and ensuring food security for its population. Achieving the targets for agriculture-led economic growth and poverty reduction that Mali set for itself in its CAADP plan will require a much higher and more sustained rate of agricultural growth than the country has ever experienced. The danger is that by setting unrealistic goals, the government and its development partners may set equally unrealistic investment plans that will fall short of success and waste resources; the focus tends may be on achieving short-term, but unsustainable, output targets while failing to invest sufficiently in the building blocks for long-term success, while focusing on short-term outputs.

If accelerated agricultural growth is to substantially reduce poverty in Mali, the growth strategy will need to focus not only on the overall growth of output, but also on who participates in that growth. Agriculture and the broader food system's role in generating productive employment for the burgeoning number of young people entering the labor force will be at least equally important to the country as the sector's capacity to produce food. If the focus is simply on increasing agricultural production, there is a danger of pursuing policies that will lead to a highly protected agriculture that produces at high unit costs or a bifurcated structure of farming of large commercial operations surrounded by small subsistence farms. Mali's evolving agricultural development strategy needs to take into account of rapidly regionalizing and globalizing markets; climate and market uncertainty; changing roles of the private sector, the public sector and civil society; and increasing demands from the population for accountable performance at both the national and local levels.

How best can USAID/Mali support Mali in this process? Strengthening key value chains will be important (see below), but this study also reveals the critical importance of several cross-cutting issues, where USAID/Mali engagement could have a catalytic effect in leveraging private sector and Malian government investments across a number of different value chains.

### **5.1. Cross-cutting Issues**

Given its own development experience and approaches, the US has a potential comparative advantage compared to some of Mali's other development partners in helping address the following cross-cutting issues:

- *Agricultural policy reform, especially concerning input and output marketing.* Historically, USAID/Mali has been a leader in helping foster agricultural policy reform in Mali, through its engagement in the PRMC process, support in creating and strengthening the market information system that provided key insights that informed policy debates, and providing long-term training to Malian analysts who subsequently became strong advocates of policy reform. With the high food prices since 2007/08, there have been increasing calls from the public and some Malian political leaders to reengage the state in grain marketing through OPAM, expand financially unsustainable input subsidies, and restrict exports to hold down domestic prices. USAID/Mali needs to stay firmly engaged in the policy debates as it has in the past in order to help avoid



the country slipping back into policies that proved detrimental to agricultural growth and food security in the past. This policy engagement should aim at improving the predictability of government actions with respect to: (a) buying and selling from the national security and national grain intervention stocks and (b) the imposition of trade restrictions in periods of high prices, as well as general improvements in the business climate and contract enforcement. But to be credible in this debate, USAID/Mali needs to (a) support analysis about alternatives open to the government to deal with the very real political-economic challenges facing it when food prices are volatile (e.g., design of sustainable social safety nets), and (b) invest in more than just policy dialogue. If USAID does not also invest in other concrete actions to support agricultural development in the country, it risks being perceived as only offering gratuitous advice.

- *Developing improved rules and processes concerning land tenure and water rights.* Land tenure and water rights are already the source of conflict in rural Mali, and such conflict is only likely to grow as demand for water and land increase with burgeoning population, increased desire by both Malians and foreigners to invest in irrigated agriculture, and climate change. Moreover, more secure and exchangeable rights to water and land are essential to stimulating rapid agricultural growth in Mali. Secure land tenure allows land to be used as collateral for loans, improving farmers' access to capital; while a reliable land registry allows national and/or local governments to use land taxes as a source for efficient financing of critical public services. Tradable rights to water and land also facilitate the access to these resources by those most able to use them efficiently, thereby spurring economic growth. At the same time, the design of land and water tenure rules need to protect the current rights of local populations so that they are not disenfranchised by water or land "grabs" by powerful outside interests. The US has much experience from its own history, both positive and negative, on these issues, that it can contribute to the debate, while also supporting the processes (e.g., policy discussions, research, consultative forums, and institutional design and strengthening) to find Malian solutions to these issues in Mali.
- *Strengthening technical research and outreach on improved soil and water management,* which are critical complements to tenure reforms in order to sustain and enhance the natural resource base that undergirds Malian agriculture.
- *Improving knowledge systems at all levels of the agrifood system, including agricultural statistics, market information, agricultural research and extension, and nutrition education.* Getting the right information to the right people in the right form at the right time will be essential to improved public and private decisions regarding investments, policies, production, marketing, and adaptation to climate change.
- *Agricultural education at all levels,* from basic literacy through technical and managerial training to agricultural higher education. Supporting basic literacy programs is beyond the scope of USAID/Mali's accelerated economic growth (AEG) program, but coordinating with the mission's education program and with other donors is very important, as it will be very difficult and costly to bring about rapid transformation of agriculture when a large part of the rural population is illiterate. Strengthening agricultural vocational schools and technical institutes will help meet the

anticipated increase in the demand for a new generation of agricultural technicians, while support of agricultural higher education is needed to produce a new generation of agricultural scientists and policy makers to replace the large cohort that is nearing retirement.

- *Building the capacity of local governments*, which are currently very weak but where, in practice, many of the key elements necessary to spur agricultural growth and improve food security (which involve bringing together many different government services) have to coalesce. For example, developing some funding for, and programmatic control of, extension agents by local communes is likely to be necessary in order to improve the performance incentives of extension agents. While such strengthening of local governments may fall outside of the realm of USAID/Mali's AEG program, there are clear opportunities to coordinate AEG's program with the mission's governance program to help in this area.
- *Building stronger cooperatives, farmer and trader organizations, and interprofessional organizations* to help carry out some of the critical economic coordination functions necessary for broad-based agricultural growth. In the past, many of these coordination functions were handled (often poorly) by state agencies or parastatals. Failure to develop more effective civil-society and private-sector based organizations to address these coordination functions may increase pressures to bring back the old, failed policies and structures of the past.
- *Improving the ability of the financial system* to serve farmers and other actors in agricultural value chains and attract the capital necessary for rapid agricultural growth. Key challenges will be to move beyond just a micro-finance approach to funding agricultural activities towards fuller integration of the commercial banking system into agricultural lending and rural savings mobilization and resisting pressures for large-scale interest-rate subsidies, which often lead to credit rationing and biasing of lending away from the poor.

## **5.2. Support for Value Chains**

Given that Mali's CAADP plan and agricultural policy focus is on the promotion of strategic agricultural value chains, it will also be essential for USAID/Mali to be engaged in support of some of these value chains. To the extent that USAID/Mali aligns its actions with the country's CAADP plan, the choice of value chains will depend on the priorities sent in that plan. The initial 5-year plan (the PNIP-SA) focuses on five value chains: (a) rice (particularly outside of the full-irrigation schemes of the Office du Niger, which are the focus of other government and donor actions, such as the Initiative Riz), (b) maize, (c) millet and sorghum, (d) livestock products (including cattle, sheep, goats, dairy, and poultry), and (e) inland fisheries and aquaculture. The PNIP-SA also includes support for cross-cutting actions on nutrition education. Presumably, USAID/Mali's primary value-chain focus will be some subset of the list included in the PNIP-SA.

In carrying out its value-chain oriented programs, USAID/Mali should consider the following principles:

- In order to ensure sustainability of its actions in the context of the country-led CAADP approach, it will be important to work through existing systems in the Mali rather than creating parallel projects or structures. To the extent possible, projects and programs need to be grounded in existing Malian public and private structures rather than having large, free-standing projects. Some Malian observers have criticized past USAID-funded projects for largely duplicating what the private sector or the Malian government should be doing. The aim therefore should be to focus on key investments in policies, technologies, and institutions—many of them the types of public goods identified in the discussion of the cross-cutting issues in the previous section—that catalyze and “crowd in” rather than “crowd out” Malian government and private-sector investments in these value chains.
- There is a need to resist the current pressure in Mali for concentrating public expenditures on financially unsustainable input and credit subsidies relative to other types of public expenditures that can lead to more sustained long-term agricultural growth (such as agricultural research, extension, agricultural higher education, and infrastructure).
- Whatever value-chain programs USAID/Mali supports, it will be important to frame these squarely in an open-economy framework that takes account of regional trade flows, external market opportunities, and the strategic options in agricultural development being pursued in neighboring countries. In this context, it will be helpful to be aware of, and to the extent possible, coordinate the mission’s investment decisions with those of neighboring-country USAID missions, the West Africa Regional bureau, and the ECOWAS regional CAADP program.

With respect to the choice of specific value chains in which to invest, the following observations may be helpful:

- The analysis of consumption patterns earlier in this report highlights the continuing central importance of the four major cereals (millet, sorghum, maize, and rice) in providing the bulk of the calories Malians consume and in accounting for a large share of their food expenditures. Thus, improving the performance of these value chains will continue to be central to improving food security, reducing poverty, and in dealing with many of the political-economic issues surrounding food policy in Mali. The importance the government of Mali attaches to these value chains is highlighted by their inclusion in the PNIP-SA.
- With respect to the individual **cereal value chains**:
  - *Millet and sorghum.* These grains continue to be the most widely consumed cereals in Mali, particularly in rural areas, and are especially important for lower-income Malians. Thus, efforts to stabilize yields and improve markets for these cereals could have important food security benefits for large numbers of the population. Based on past experience, however, the scope for wide-spread intensification of the production of these crops and their conversion into major cash crops seems much more limited. Millet generally shows low fertilizer

response, and while there are more productive new sorghum cultivars, less-than-vibrant market opportunities (as indicated by decreasing per capita consumption of sorghum) may constrain their widespread adoption. For these cereals, a two-pronged strategy may be desirable. The first prong would aim at stabilizing yields (for example, through varietal improvement and better soil and water conservation practices) that would reduce risk for rural populations dependent on these cereals, thereby allowing them more scope to diversify into other income-earning activities, such as production of small ruminants or poultry. The second prong would focus on (a) selected intensification of sorghum for certain emerging opportunities, such as its use in animal feed and in blended flours and (b) marketing improvements, such as the bonded warehouse receipt (*warrantage*) systems for both domestic cereal markets and facilitating regional export opportunities, where the prospects are strong for millet. Few other development partners are investing in the millet and sorghum value chains, which may open a niche for USAID programs. But one also has to ask *why* other partners are slow to invest in these value chains; it likely reflects their judgment that returns may be modest and the benefits from reductions in supply and price volatility difficult to measure. Nonetheless, the potential of improvements in these value chains to strengthen the food security of a large number of poor Malians warrants serious consideration.

- *Rice.* The rice sector will continue to be at the heart of food policy and politics in Mali, so it will be important for USAID/Mali to be engaged in some way in this sector. Given that many other development partners, including the MCC, are heavily involved in supporting activities in the Office du Niger, it may be more attractive for USAID/Mali to support value chain activities in the non-ON regions that are the focus of the rice program of the PNIP-SA. The attractiveness of this option is reinforced by the apparently lower unit per kg costs of production of rice in *bas fonds* systems than in the full-water-control perimeters of the ON (although data on this issue need to be updated) and the importance of the *bas-fonds* systems for food security and women's incomes in southern Mali. In developing these *bas-fonds systems*, attention needs to be given to ensure women's continuing access to the areas as they are developed. It has been the experience in some *bas-fonds* projects that as better water-control structures are put in place that make off-season cultivation more reliable, men tend to take over the areas.
- *Maize.* This value chain, along with rice, has shown very dynamic growth during the past two decades and continues to have strong growth prospects, both on the supply and the demand sides. Production involves fewer farmers throughout the country than for millet and sorghum. Still a substantial proportion of the population in southern Mali, particularly in the southern CMDT region, is involved in maize production, where the crop has benefitted from prior investments in the cotton system and may play a key role in the diversification of incomes away from cotton. Human consumption of maize is growing quickly, increasingly in processed forms (which generates employment in off-farm parts of the value chain), and demand for maize for livestock feed (particularly for

poultry), both domestically and in neighboring countries, is rising rapidly. Indeed, prospects for investments in the poultry value chain need to be analyzed jointly with investments in the maize value chain given the strong interdependencies between the two.

- **Animal products (livestock, dairy, poultry and fish).** Before discussing the value chains for the individual animal products, it is useful first to note some common characteristics of all of them. First, as per capita incomes increase, demand for animal products increases rapidly. Thus, demand prospects for these products are strong, both in Mali and in neighboring countries to which Mali can export. Second, while improved genetics may help increase production, the general consensus is that the major constraints to production in all of these value chains are animal nutrition and, to a lesser extent, disease control. Third, value chains for some of these products (particularly poultry, dairy, and fish products) are also very labor intensive (if one considers not just farm-level production but also the marketing system) and are systems in which women are heavily involved. Indeed, it was these types of products that generated much of the initial increase in the employment of the poor in India once incomes began to rise due to the Green Revolution in the 1960s and 70s (Mellor, 1976). Hence, these value chains have particular potential to support many of USAID's broad-based growth objectives. Yet these are also products that, because of their perishability and possible adverse effects on human health if not handled properly, require more complex organization of actors than do the basic staples. Improved producer and interprofessional organizations, strengthened contracting, and improved marketing and logistical arrangements (cross-cutting areas where the US has a lot of relevant experience) are essential for these value chains to deliver on their potential. Fourth, the interactions between these value chains and the key cereal and oilseed value chains are important in terms of potential competition and complementarity in land use (for example, developing more effective integrated livestock-cropping systems and minimizing land-use conflicts between herders and farmers) and in terms of using cereals, oilseeds, and agricultural byproducts as inputs into the production of animal feed.
  - *Cattle, sheep and goats.* As mentioned earlier in this report, ruminant livestock represent important sources of rural income, savings, and contributors to improved human nutrition. Women are heavily involved in dairy and small ruminant production. Small ruminants have the advantage of broader ownership by the poor than cattle, more rapid growth rates, and strong seasonal demand peaks (particularly for Muslim holidays) that make seasonal feeding an attractive enterprise for smallholders. Major emphases in improving these value chains should focus on improving animal nutrition and health and strengthening marketing systems, both in urban areas (e.g., for dairy, where demand is growing rapidly) and regionally, where non-tariff trade barriers such as roadblocks and illicit charges add significant costs to Malian exporters. Improved ruminant nutrition will require improved local pasture management (and hence support to producers' associations to develop and apply more adapted pasture management codes and practices) as well as building links to the value chains that produce critical inputs to the feed industry, such as oilseeds.

- *Poultry.* Improving small and medium-scale poultry operations around cities could have important income-enhancing effects. Poultry ownership is widespread, and urban demand is growing for both eggs and broilers. Improving links between poultry producers and feed suppliers (and hence links to both the maize value chain and to producers of low-tannin sorghum varieties, which can also be used for poultry feed) will be important, as will continued attention to disease control.
- *Inland fisheries and aquaculture.* Fish provides a very important source of protein in Malian diets; for the poor, it is often the main source of animal protein. Fishing is predominantly a small-scale enterprise, and fish marketing and processing (smoking) employs many women. Expanding inland fisheries will require dealing with management of common-pool resources, such as rivers, lakes, and ponds that are increasingly overfished. Thus, strengthening this part of the value chain will require some of the cross-cutting activities described above, in terms of strengthening producer associations and improved codes for management of these shared resources. Because of the current stress on capture-based inland fisheries, it will be important to expand aquaculture as a potentially more sustainable way of expanding fish production in Mali. The PNIP-SA calls for a very rapid expansion of aquaculture, some of it integrated with irrigated rice production. This rapid expansion will require significant investment in training of farmers in aquaculture techniques. There is also need to work with associations of marketing agents to improve the hygiene of the marketing system, as the risk of food-borne illnesses in this value chain is high.
- **Horticulture.** Although not a priority in the PNIP-SA, many types of horticultural production (particularly those producing for the local, national and sub-regional markets) share some of the characteristics of animal products highlighted above: strong demand growth prospects as incomes increase, labor-intensive production and marketing systems that employ many women, and perishable products that need to be handled quickly and carefully to preserve product quality and avoid contamination. The systems also face a problem of inappropriate use of some pesticides, which threatens the health of farmers, marketing agents, and consumers. Fostering collective action by actors in these value chains through strengthened producer and trader associations and *interprofessions* will be important in addressing the quality and food safety issues. Planning for investments in these value chains is hindered by very weak statistics on current production and sales. The private sector is strongly involved in these sectors (including larger actors involved the horticultural value chains targeted towards overseas export, such as mangoes and shea), and hence public action is needed primarily in addressing the types of cross-cutting organizational issues addressed earlier in this chapter.
- **Agricultural Inputs.** Mali's capacity to improve access and reduce costs to quality agricultural inputs, in a financially sustainable way, will be critical to accelerating agricultural growth. The heavy input subsidies currently in place may be fiscally unsustainable, but government will continue to feel pressure to improve farmers' access to inputs such as fertilizer and improved seed. As the government's

fertilizer policies continue to evolve, there will be a need to ensure that adequate competition remains in the sector. Analysis of the costs and benefits of a private-sector retail distribution network compared to a system based on producer organizations handling the retailing functions could help Mali develop a better system and donors better direct their project support. To enhance results from the fertilizer subsidy and from investments being made by the private sector, increased investment in fertilizer research and extension should be promoted, preferably in partnership with the major fertilizer distributor firms in Mali. Improving access to improved seeds for staples will require strengthening the production and marketing of such seeds, which is heavily dependent on government and donor projects at present. The seed multiplication sector seems to be best positioned among the input sectors for generating local employment and incomes (through greater involvement of the private sector) if effective demand for improved seeds can be increased. A major factor in developing this demand will be developing the value chains to increase the marketing of crops such as millet, sorghum, and maize. Improved markets alone, however, will not be adequate. Public-private partnerships that increase access to seed production credit, improve the marketing skills of seed producers and traders, and promote joint extension efforts similar to those that have been used in East and Southern Africa represent models for Mali to consider.





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## APPENDIX 1. DATABASES AVAILABLE FOR AGRICULTURAL PRODUCTIVITY AND POLICY ANALYSIS

Type	Survey/Dataset Name	Institution Involved	Update Frequency	Survey Description (information collected, sample section, dates covered)
Agricultural Production (crops and livestock)	ECA: Enquête Agricole de Conjoncture	Before 1986: 2 separate, duplicative systems with conflicting results. 1986 to 2004 DNSI with MinAg/CPS assistance. Since 2004/05 CPS in lean with DNSI (now INSTAT) assistance	Annual but combined with RGA in 2004/05	Production (?) and yields. Uses crop cuts to estimate yields. Supplemental information on household demographics collected every year. Varies from year to year for information on livestock holdings, input use, and productive assets (animal traction equipment). Sample has been representative at the national and regional levels; since RGA in 2004/05 the sample is supposed to be representative at the <i>cercle</i> level. Crops include principal cereals (millet, sorghum, maize, traditional rice fonio, wheat), pulses (peanuts, cowpeas, bambara nuts), and some diversification crops (sesame, tobacco). Excludes “modern/industrial” sectors (primarily irrigated rice and sugar and cotton as “ <i>offices</i> ” provide data on these crops).
	RGA: Recensement Générale de l’Agriculture	CPS with DNSI (now INSTAT) assistance	2001/02 migratory and nomadic livestock herd census. 2004/05 household RGA combined with DCA into a single survey	New sampling frame for RGA includes urban and rural farmers (to capture expansion of peri-urban horticultural production) and modern and traditional farms. RGA covers livestock, rainy and dry season crop production, irrigated agriculture, horticultural production (urban and rural), and tree production. This responds to gaps in ECA which focused only on “traditional” sector and rural farmers. Preference would be to have the RGA replace the ECA, but financial resources have not been adequate.
	EAP: Enquête Agricole Permanente, CMDT	IER/CMDT since early 1990s	Annual	Provides data on variables of interest to agricultural productivity in the CMDT cotton zones for a sample of 750 to 1000 households in 50 villages. Used as official estimates for national cotton production by DNSI/CPS. Other data used to analyze impacts of policies and investments on production and productivity. Often complemented with surveys on special themes of interest to the cotton sector (impact of anti-erosion practices, changes in costs of production over time, role of women farmer associations, etc.). Only agricultural data series in Mali that is managed for longitudinal analyses. CD available with data from 1994/95 through 2000/01 aggregated to regional and national levels.
	Commodity Production Statistics	Irrigated rice development agencies (ON, ORS, ORM, OHVN, etc.)	Annual	Individual agricultural development agencies provide information on aggregate production, area planted, and yields for their principal crops (irrigated rice, cotton, tobacco, and some horticultural products). This information is used by DNSI (now INSTAT) and CPS to complement similar data collected for the “traditional sector”.

Type	Survey/Dataset Name	Institution Involved	Update Frequency	Survey Description (information collected, sample section, dates covered)
Living Conditions, Income, and Expenditure	Budget/Consommation	DNSI (now INSTAT)	Conducted nationally in 1987	Collected detailed expenditure data for use in assessing incomes (proxied by expenditure) and well being. Many problems encountered in analysis of the database. Reports were very late and questions about quality were frequent.
	EMEP: Enquête Légère Intégré apes des Ménages	DNSI in collaboration with CSLP; primarily WB funding	Baseline collected in 2001; Update planned for 2006 (?)	Detailed expenditure and food consumption data to evaluate trends in incomes and poverty. Representative at the national and regional levels.
	ELIM: Enquête Démographique et Santé	DNSI in collaboration with CSLP; WB funding	Periodic, 1 <sup>st</sup> = 1996/97; most recent = 2010	Expenditure and living conditions data. Urban (4020 hh) and rural (4707 hh) strata; results representative at provincial, regional (N.C.S.) and urban/rural levels; ag content varies by year (high in 1996/97, low in 2002/03)
Market Information	EDS: Enquête Démographique et Santé	DNSI with USAI funding		Detailed health and reproductive information on women and anthropometric measures for children; useful for looking at differences in health status across different regions and agricultural systems.
	MIS: Market Information System	OMA, attached to APCAM; primarily GOM funding with donor supplements.	Since 1989, weekly data collection and radio announcements followed by monthly synthesis reports.	OMA collects price and quantity data for transactions at markets throughout the country using non-survey, key informant interview techniques. Products covered include cereals and selected horticultural products. OMA collaborates with other government services to report price and quantity data on livestock transactions. Data files are available in various configurations upon request and payment of appropriate fees.
	CPI: Consumer price index	DNSI (now INSTAT)	Monthly data collection; infrequent publication of results	CPI is estimated for Bamako. Data are also collected in regional capitals but there is no nationally applicable index.
Trade	Import/export data	Customs service sand Min. of Commerce with analyses by DNSI	Transactions data	Customs data are problematic as there is a general sense that they do not reflect (1) actual amounts that cross official borders due to negotiations to reduce taxes paid and (2) goods crossing informally where there is no customs post or in small quantities that are not captured by customs records.
Census	RGPH: Recensement Générale de Population à l'Habitat	DNSI (now INSTAT)	Last conducted in 2008	Official national census which serves to develop sampling frames for other surveys. Latest data from 2008 census available in 2011. 1998 available on CD.