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# Chapter 13

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## Rice in Mali: Enhancing competitiveness and promoting policies for inclusive value chain development\*

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# Table of Contents

<b>1. Introduction: An overview of rice production in Mali</b>	<b>419</b>
<b>2. The rice value chain in Mali: productive capacity and economics</b>	<b>423</b>
2.1 Production potential	423
A. Water resources in Mali	424
B. Land availability in Mali	424
C. Rice productivity	425
2.2 Rice sector actors and policies	428
A. Public role in the rice sector	428
B. Private sector actors	429
C. Other institutional actors	432
2.3 Economics of the rice value chain in Mali	432
A. Price formation	432
B. Import and competitiveness sub-sector	433
C. Added value and market segmentation	435
D. Production system of and added value	436
<b>3. Towards a sustainable rice production for Mali</b>	<b>439</b>
3.1 The sector's constraints	439
A. Production constraints	440
B. Marketing constraints	440
3.2 Recommendations	442
A. At the production level	442
B. At the commercial level	444
<b>4. Conclusion</b>	<b>447</b>
<b>5. References</b>	<b>449</b>

## 1. Introduction: an overview of rice production in Mali

Mali is a landlocked country in West Africa with a population of 14.5 million unevenly distributed over an area of 1 241 300 km<sup>2</sup>. Its economy is predominantly rural and the agricultural sector employs about 75 percent of the population (including crops and fishing), while livestock is the main occupation for 10 percent of its inhabitants.

Mali has been strongly affected by the brunt of variations in the international price of cotton, one of its major cash crops. The structural vulnerability of the country is also due to the difficult agro-climatic conditions: 65 percent of the country is made up of arid or semi-arid lands. These constraints, along with deteriorating terms of trade and variable production volumes due to climate hazards, have negatively affected the balance of trade.

While other food and cash crops tend to be affected by rainfall variations, rice cultivation may be considered an exception. Its undeniable advantages in terms of its irrigation potential can minimize issues linked to the lack of water prevailing in the region. Local authorities have undertaken irrigation development projects, following the serious drought of 1973. Ambitious programs have been launched to increase farmers' income and strengthen the fight against hunger through rice production.

Joint efforts at all levels have resulted in technical pathways and varietal choices that seek to reconcile productivity requirements and consumers' organoleptic demands. Mobilizing the nation around food security has decreased the grain deficit. In Mali, arable land is scarce and rice has gradually become the most produced cereal, as it is grown on wet marginal lands not suitable for other crops. The two other main cereals are millet and sorghum.

An extensive institutional and organizational system has been set up around potential watersheds in the country, with the main ones being the 1 700 km long Niger River, the 900 km long Senegal River and their numerous tributaries. The opportunity to take advantage of the many areas irrigated by gravity offers real opportunities for agricultural development. In Mali, agricultural land covers 12.2 million hectares (ha), and floodplains 2.2 million ha; only a quarter of these are cultivated. The Inner Niger Delta alone represents an area of 30 000 km<sup>2</sup>, making it a world landmark recognized by the Ramsar Convention on Wetlands.

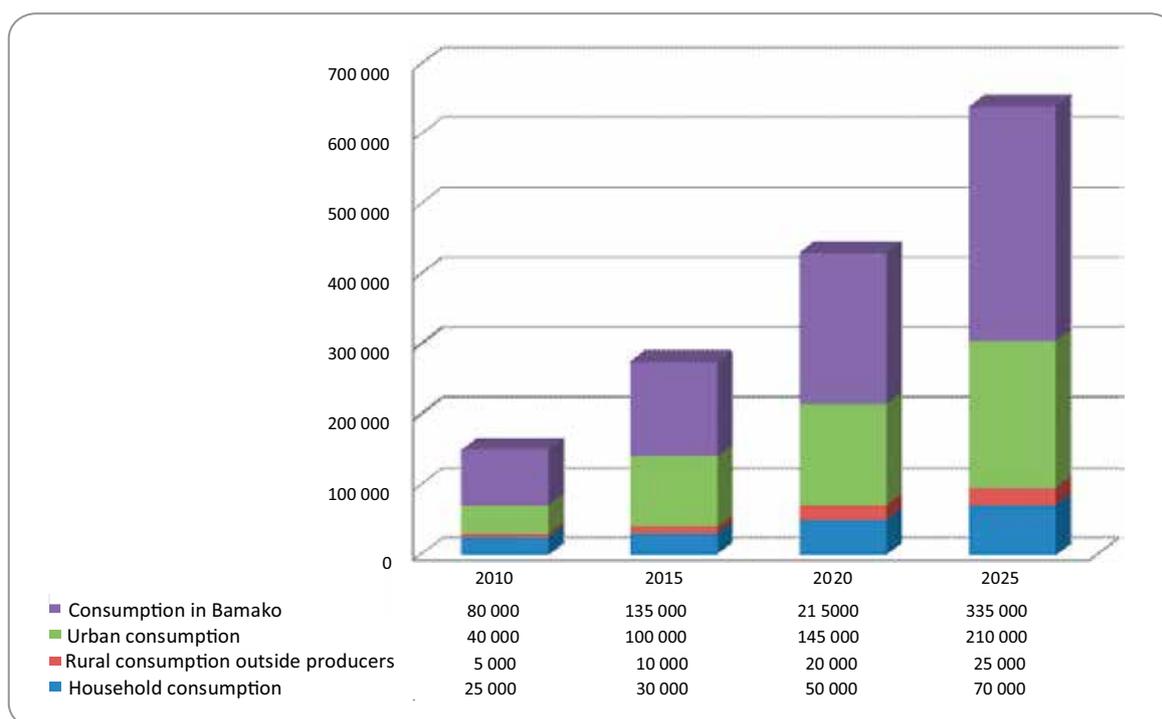
Very early on, Malian authorities had a clear objective: transform Mali into the rice granary of the sub-region by increasing the amount of agricultural land, as this would substantially improve the country's productive capacity. Encouraging leaders to aim for this goal was the priority as long as the tariff protection to third party producers warranted this kind of agricultural policy. However, the World Trade Organization (WTO) strongly recommends, within a set timeframe, removing tariffs at state borders. Tariff preferences are also being questioned and will probably decrease in the future. Malian rice is facing challenges to remain competitive in the new global context characterised by foreign competition. Mali needs to consider whether it can dominate the African market with its own production and also whether its rice value chain can successfully take on the current global liberalized market.

There are different viewpoints. Since the global food crisis of 2008, some neoliberal paradigms have stalled. Food sovereignty and self-sufficiency issues have reappeared. They counter the comparative advantage theory that focuses on countries becoming extremely specialized by confining themselves to their most productive sector when weighted against other partner nations. This would provide food at the lowest cost for the whole planet and ensure individual and collective wellbeing throughout the world. The food crisis has shown that this does not guarantee food security. Moreover, subscribing to such a paradigm would result in acquiring competitiveness *ad infinitum*, with irrevocably fixed derived market shares. Some

are now defending the thesis of food security through self-sufficiency and dispute the limitations of the comparative advantage theory. However, the usefulness of food transfers from most competitive to less competitive areas is not questioned by these diverging voices. They simply argue in favour of mitigating the extreme dependence of fragile states in relation to the outside world and reinforcing self-protection mechanisms from exogenous shocks. Therefore, agriculture's strategic purposefulness, often opposed to a certain "economic rationality", has been restored following this food crisis.

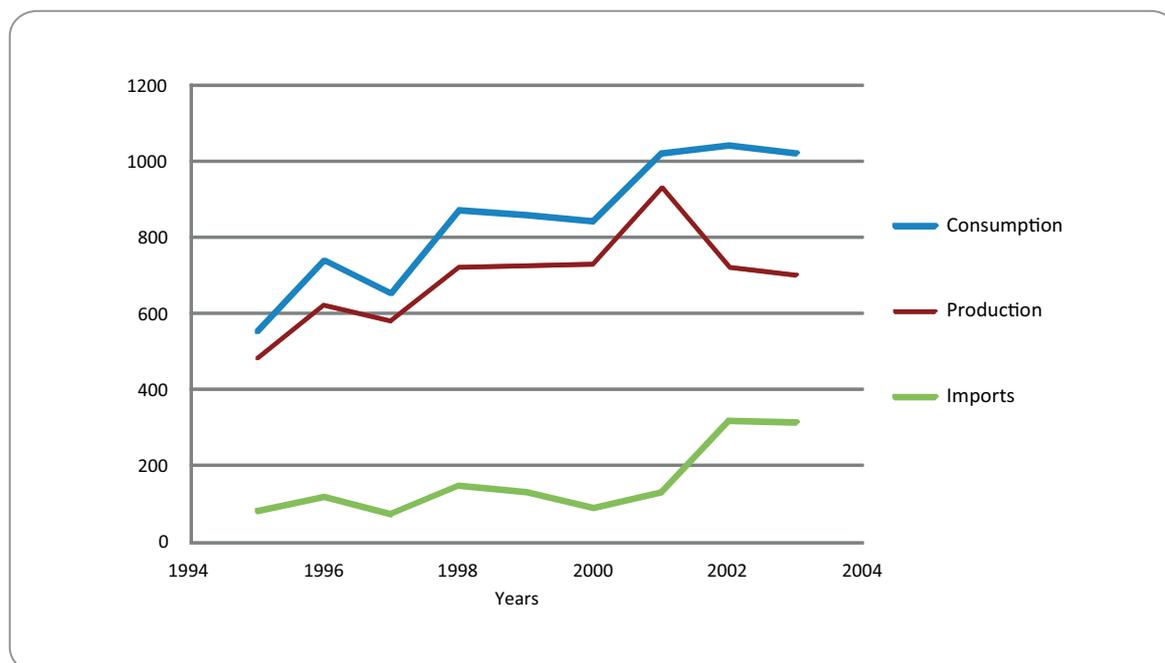
The above reasons validating the choice of national policymakers to support rice production are reinforced by the following factors. The population of Mali is a sustainable solvent clientele, with a known and constant price and income demand. The fact that domestic yields are not meeting an important part of the demand at consumer level shows that focus should be given to improve productivity rather than to marketing opportunities. According to the AFD (Baris *et al.*, 2005), national requirements, which are already well above domestic supply, have been growing at a robust rate of 7.5 percent per year since 1995, due to both demographic growth and changes in dietary habits. Figure 1 illustrates AFD projections for new demands. The increment of the gap between local demand and availability creates constant increases in rice imports: 300 000 tonnes or more were regularly imported since 2002 – six times less in the preceding decade (Figure 2).

**Figure 1. Estimated level of new requirements for rice in Mali (rice quantity in tonnes)**



**Source:** AFD-CIRAD-FIDA (2011)

The current trend of increases in imports can partially be explained by the sharp decline in domestic rice supply and the surge in demand.

**Figure 2. Illustration of the disconnect between domestic supply and consumption in Mali**

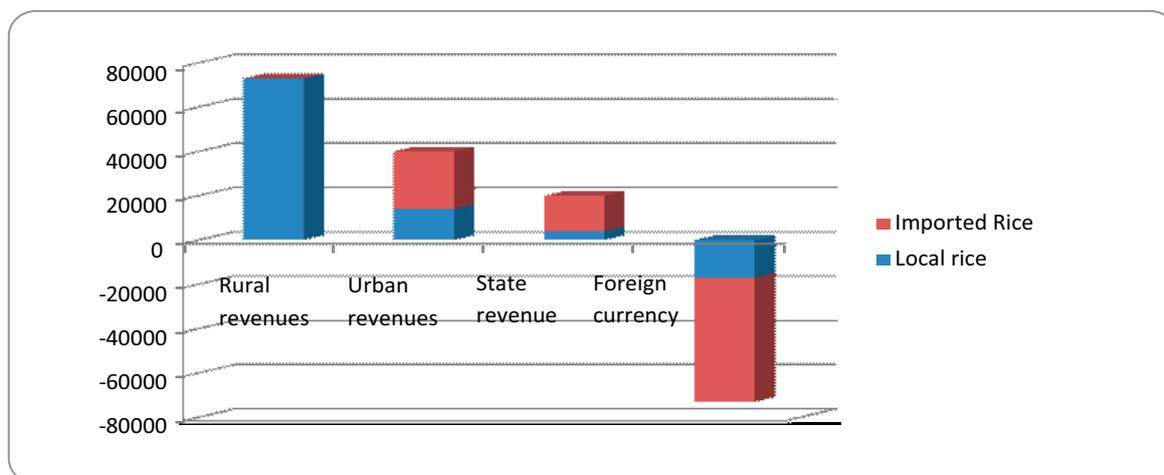
**Source:** FAO Stat (2012)

Unless national production is revitalized, the gap is expected to continue to become larger as imports increase. Malian producers not only face the challenge of meeting new demand, but also of reducing imports. As the world rice market ceases to be a residual market, this dual need becomes more urgent.

The proportion of quantities traded on international markets compared to global quantities of rice produced is low, between 7 and 8 percent. This will increase in the coming years according to projected current domestic demand in major producing countries.

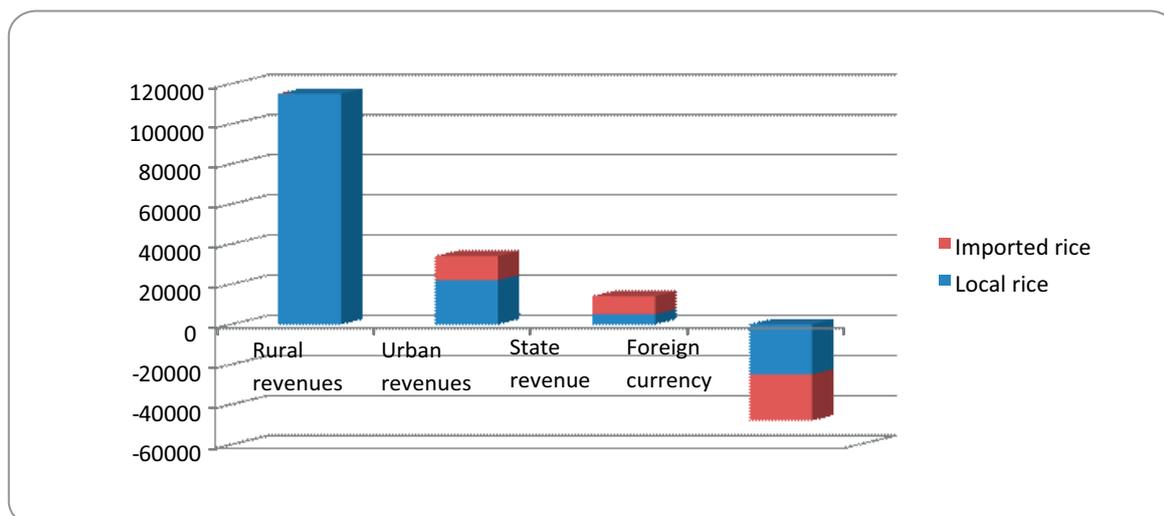
In this structurally characterized international context, the Malian government may consider focusing on new production, processing and marketing strategies to better meet consumer's preference for rice over other cereal crops. The close link with food security and poverty reduction at national level renders this cereal particularly important. Each year, the different sectors of Malian rice generate more than 100 billion XOF of income, including 70 billion for rural people and 4 billion in revenues for the state. In comparison, rice imports in 2003 only rendered 16 billion in revenues, which were mainly urban, and 6 billion in tax revenue. The increase in revenue for the state is tied into an exchange value in foreign currency with a cost that already exceeds 23 billion. This also irreparably increases the gap between the urban and rural populations as the latter have been recognised as those most in need. Moreover, this option goes against the Millennium Development Goals (MDGs) objectives, which aim to halve, between 1990 and 2015, the proportion of people living on less than a dollar a day. Figures 3 and 4 summarize the macroeconomic results of a comparative study between the two "import" versus "cultivated land expansion" options to meet new demands by 2015.

**Figure 3. Macroeconomic “imports” option outcomes in millions of CFA francs**



Source : AFD-CIRAD-FIDA (2011)

**Figure 4. Macroeconomic “production” option outcomes in millions of CFA francs.**



Source : AFD-CIRAD-FIDA (2011)

Given its effects on macroeconomic stability, food security and poverty, the development of Malian rice appears to be fully justified. It will be especially beneficial if it can substitute imported rice. But the stakes of Malian rice are also sub-regional; West Africa has an overall need of approximately 7 million tonnes of rice, and the 3 million tonnes deficit (40 percent of the demand) is met through imports. The two other producing countries, Côte d'Ivoire and Guinea, have a production system that is mainly rainfed and can only increase their production by deforesting which would further disrupt the frail ecological balance. To stifle competition from overseas in the sub-region, preferential tariffs could be implemented with the collaboration of Mali's dual membership in ECOWAS and WAEMU. To a lesser extent, the fact that imports are concentrated in the hands of a few private operators increases consumer prices of imported rice, as their main aim is to make profits through high margins. This oligopoly, who seems to cast off the option of increasing market shares through price reduction, is motivated by the characteristics of the demand: inelasticity of rice as a basic necessity, people increasingly preferring rice and a demographic pressure boosting demand and consumer surplus.

Malian rice benefits from several factors that derive from the expected outcomes of the regional integration agreements on the free movement of rice within the Community and imports that have been largely constricted following the devaluation of the CFA franc (XOF) in January 1994. This positively resulted in cancelling out the effects of the 1980 competitive trade liberalization and was reinforced by the recovery of tariffs and other quantitative restrictions on imports (Dupressoir, 2001). More recently, transaction costs, including ocean freight, inherent in the increased volume of trade and the soaring price of oil, have made Malian rice more competitive. This is reinforced by the intrinsic financial costs and delays in land transit, which must be taken into account in Mali as it is a landlocked importing country.

The context around Malian rice is beneficial regardless of whether the international environment changes significantly or not. Moreover, the major constraints it faces are essentially endogenous and flexible. These can be reduced through a large national project that would encompass the magnitude of the challenges sustained by strong political will.

This value chain generates millions of jobs directly and indirectly and depends on the capacity of national actors to transform its constraints. At present there is an opportunity to take advantage of these favourable indicators to transform potentially productive assets into real ones while addressing weaknesses and removing threats. This is only possible when the value chain is strong with stakeholders that maintain synergistic activities and dynamic functional links in all equity, under the arbitration of a state acting in accordance with principles of good governance.

It is important to better understand the present conditions of the rice sector in Mali, and more specifically its productive, economic and operational substructures before putting forward recommendations.

## 2. The rice value chain in Mali: productive capacity and economics

### 2.1 Production potential

In the central delta of the Niger River, the history of Malian rice dates back more than 1 500 years before Christ. During colonial times, initiatives were launched to modernize agriculture and thus prevent recurring famine. The Office du Niger was created in 1932 primarily to promote the cultivation of cotton, along with facilitating an increase in rice production. At independence in 1960, less than 50 000 ha were developed, and the potentially irrigable land was estimated at 960 000 ha - including 510 000 ha for cotton and 450 000 for rice.

Over the years, the rice sector in Mali has acquired its current configuration and reflects the reforms that have taken place since that date. Post-independence it is characterized by the rapid development of paddy production. Between 1961 and 1965, rice represented 16 percent of the total cereal production, and by 2001-2005 it had increased to reach 30 percent. The liberalization of the cereal sector in 1980 gave it a boost and it multiplied by seven in 20 years, leaping from 100 000 tonnes to 700 000 tonnes in the late 1990s.

The rice sector is built around its main activity, production, and continues to spread throughout the country in different and varied conditions. Cultivation practices include a host of technical pathways ranging from rainfed rice to irrigated rice and multiple intermediate systems of natural flooding in river deltas. Systems identified to date are classified according to criteria related to water. They are:

- The rainfed rice system, entirely dependent on weather conditions,
- The natural fluvial flood rice system, dependent on flood / deflood and requiring hardy varieties with a high adaptability,

- The controlled flooding and lowlands rice system, with partial control of water through the erection of seawalls, and
- The irrigation system with a total control of water through irrigation schemes.

These production methods reflect water availability in the country as a major constraint to rice production.

### A. Water resources in Mali

Rice production requires large quantities of water. Most of Mali's water comes from rain that provides each year on average 415 billion m<sup>3</sup> of water. There are large interregional disparities in rainfall, the south of the country being relatively well off with 1 200 mm of rainwater per year, and the north receiving less than 100 mm.

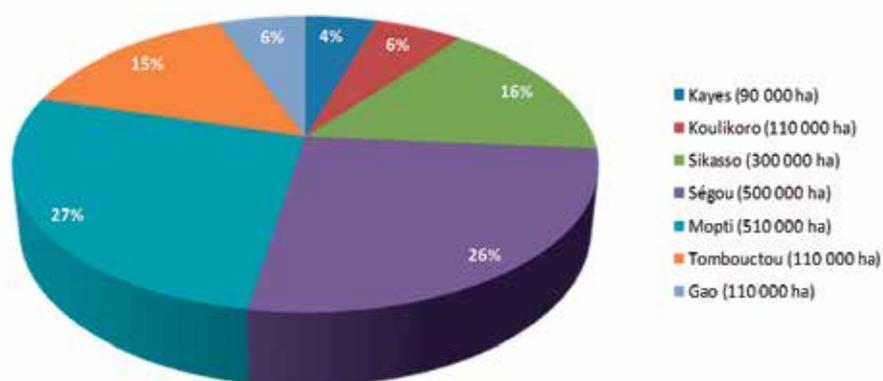
In addition to rainwater, the country has two rivers with a high irrigation potential, the Niger and the Senegal. They alone drain an annual average of 70 billion m<sup>3</sup> of water, with 110 billion m<sup>3</sup> in a wet year and 30 billion m<sup>3</sup> of water in a dry year.

The other major production factor that needs to be taken into account is the agricultural capital.

### B. Land availability in Mali

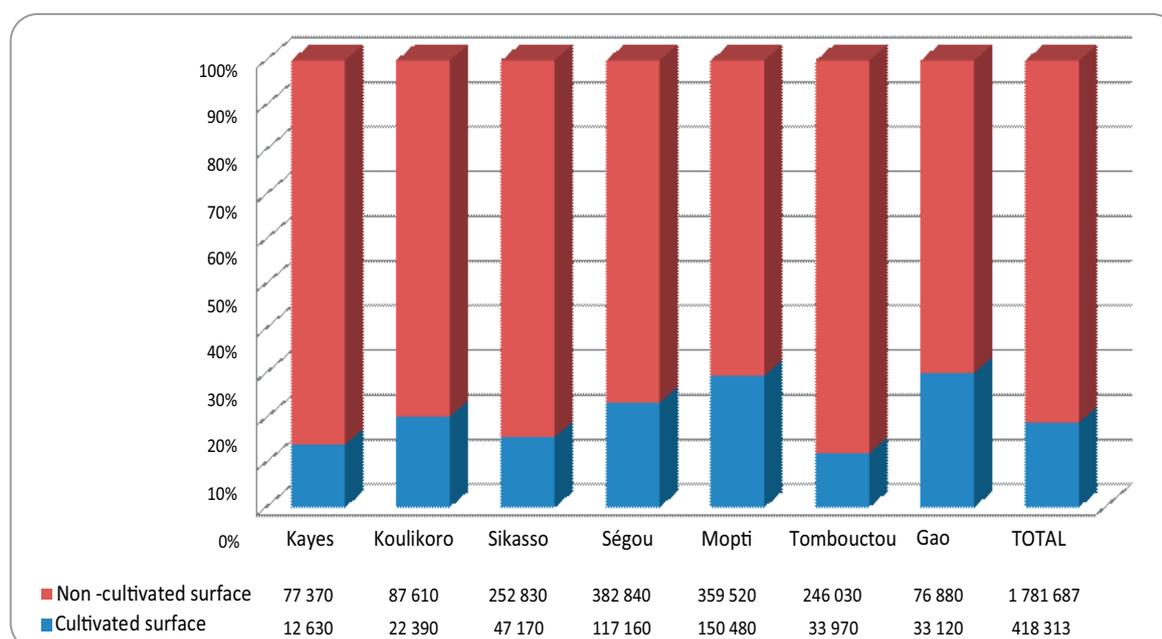
Areas suitable for irrigation are estimated at nearly 2.2 million ha, with 20 percent already cultivated. Some of this land is suitable for gravity flow, which reduces production costs. Table 1 shows the distribution of the land and is illustrated in Figures 1 and 2.

**Figure 5. Regional distribution of 2.2 million ha of potential irrigable land in Mali**



**Source:** National Agricultural Directorate, 2009

Figure 6. Percentage of cultivated land in Mali, by region



Source: National Agricultural Directorate, 2009

Table 1. Distribution of land suitable for irrigation by region

Regions	Irrigation potential (ha)	Cultivated areas	
		(ha)	(%)
Kayes	90 000	1 263	14
Koulikoro	110 000	2 239	20
Sikasso	300 000	4 717	16
Ségou	500 000	1 171	23
Mopti	510 000	150 400	29
Tombouctou	280 000	3 397	12
Gao	110 000	3 312	30
<b>TOTAL</b>	<b>2 200 000</b>	<b>418 313</b>	<b>100</b>

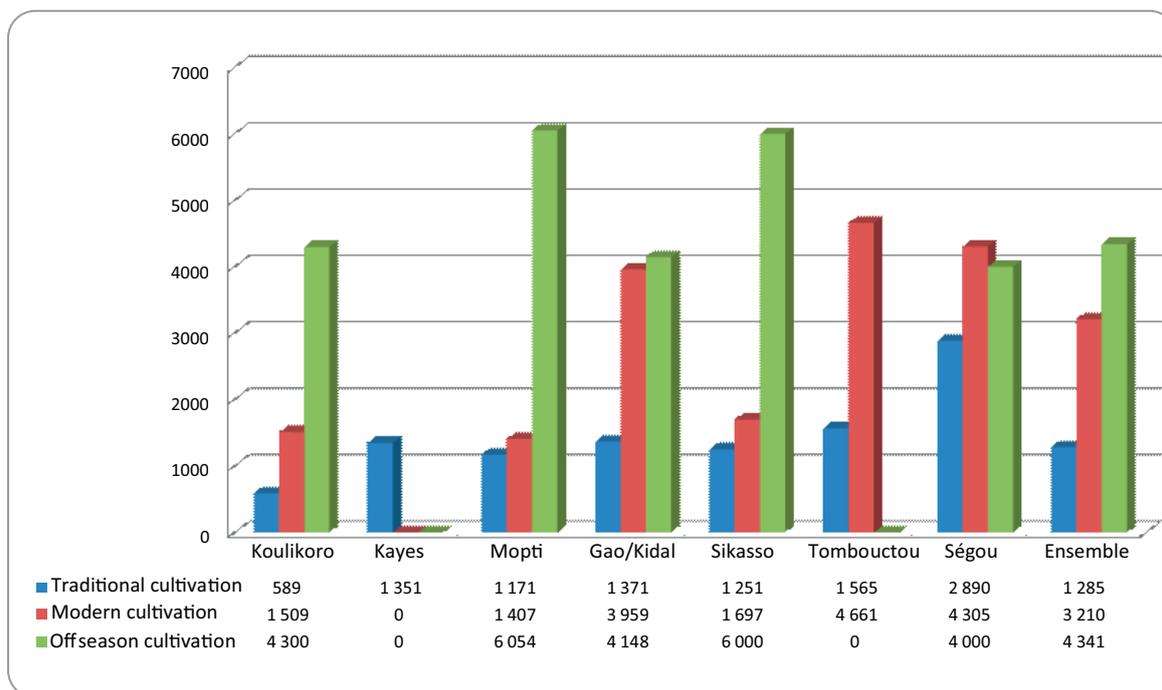
Source: National Agriculture Directorate, 2009

Notwithstanding the rice land potential in Mali, the average area per farmer has sharply declined: from 7 ha in 1980, it went to 4 ha in 1990 and is less than 3 ha today.

### C. Rice productivity

Malian rice yields are closely related to cultivation methods, seasonality and elements such as the know-how of the producer, how much s/he has access to inputs, and therefore to credit. Figure 7 reflects productivity statistics by region and cropping patterns.

Figure 7. Levels of performance according to regions and production systems in Mali (kg/ha)



Source: DNGR, 2009

It may be noted that off-season returns far outweigh those of winter rice production. Several hypotheses could explain this, including predominating controlled water production, more labour availability, smaller planted areas, better supervision, good off-season epidemiology.

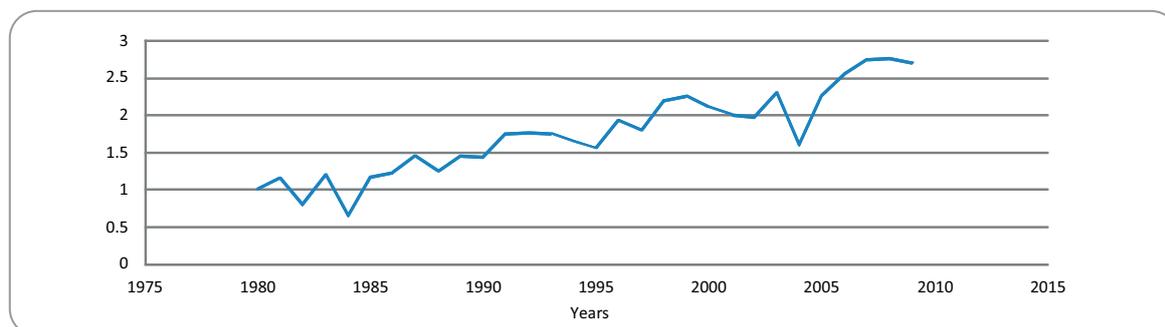
In addition, modern<sup>2</sup> rice production appears to be more productive than the traditional<sup>3</sup> one and covers 70 percent of the total national production. However, traditional production accounts for more than a quarter of a million tonnes of rice. Figure 7 also illustrates the significant disparity in performance between different regions, regardless of the mode of production.

In terms of land distribution, the traditional and modern sectors occupy respectively more than 47 percent and 49 percent, while off-season production occurs on less than 3 percent of the land, which is attributable both to seasonal water deficit and competition from vegetable crops.

Over time and at national levels, yields are changing gradually, as shown in the chart below.

<sup>2</sup> Modern rice production: controlled flooding, irrigated rice, total water control methods.

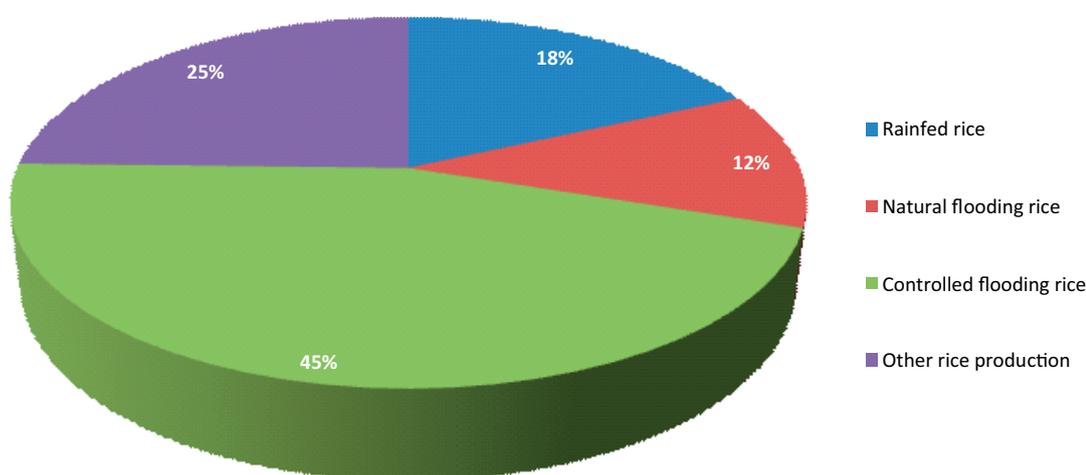
<sup>3</sup> Traditional rice production: rainfed and natural flooding methods.

**Figure 8. Evolution of rice yields (tonne per hectare) in Mali**

Source: FAO stat

However, agricultural intensification in paddy fields with high yields as seen in Ségou and Tombouctou, have made significant strides with possibly smaller growth in the future. Improved farming techniques have already been demonstrated with possibly slower push in the future. This leads us to propose to expand production by developing new agricultural land that would not only satisfy the growing demand for rice, but also would respond positively to the many requests for land to cultivate rice.

Limitations of national production can largely be explained by relatively low yields, which characterize production systems other than the irrigated one. Land allocation is primarily made for the benefit of controlled flooding rice production, as shown in Figure 9.

**Figure 9. Allocation of rice land according to production methods**

Source: National Agricultural Directorate, 2009

Production, which is a variable explained through yields, thus through production methods, has a relatively slow evolution compared to needs. Figure 2, which illustrates this, also shows how production began to increase at the end of the 2000s especially in 2008. This reflects the efforts of the government to give a boost to the rice sector in the aftermath of the global food crisis.

## 2.2 Rice sector actors and policies

The study of the economic aspects of the rice sector in Mali comprises trade, pricing competitiveness, non-price competitiveness as well as the market and comparisons between supply and demand. Segmentation terms of this market, price formation and the distribution of the added value should also be referenced. Production and consumer preferences, and resulting consequences will inform the determinants of supply and demand.

Understanding which parties are involved in this sector is essential before getting into the complexity of the economic analysis centred on the value chain.

The rice sector in Mali is comprised of institutional actors and professionals whose interests are not always convergent. Given the sensitive nature of the sector and its multiple links with macroeconomic stability, food security and the fight against poverty, the state and its satellite structures also play an important role.

### A. Public role in the rice sector

After independence, the Malian government controlled the production and marketing of rice. In 1981, the implementation of structural adjustment programs resulted in a certain liberalization of the sector following the opening of borders and elimination of customs duties. The decline of the role of the state resulted in imports soaring to 100 000 tonnes in 1985. Between March 1987 and June 1988, the state resumed an intervention policy by first banning imports to then allow a return to twinning and restoring tariffs. Imports then dropped to 20 000 tonnes. In 1990, a special import tax (TCI), which stabilizes imports, came into force until the devaluation of the CFA franc (XOF) in 1994. The event was accompanied by a fall in imports, which then rose very quickly thanks to the combined effects of lowering tariffs to 11 percent and expanding sources of supply. Increases were moderate until 2002-2003, when imports boomed due to the state's intervention in lowering the VAT<sup>4</sup> on 40 000 tonnes of imported rice. This was done to avoid soaring prices on the cereals market, because of poor grain and domestic rice harvests, and re-exports to the north of Côte d'Ivoire where the military-political crisis cut off access to the ports in the south.

In addition to the tax, customs and trade policies, the Malian government supports a national production policy. The last major action recorded in this area, *Rice Initiative*, dates back to the global food crisis of 2008. According to the Ministry of Agriculture in charge of its implementation, the goal of *Rice Initiative* has been to double production during the 2008-2009 campaign by bringing it to 1.6 million tonnes of paddy to then reach more than 2 million tonnes the following crop year. The state is involved in this project at two levels, firstly with production assistance through agricultural input (seeds, fertilizers, pesticides) subsidies, pre-financing of equipment, strengthening agricultural extension services, secondly with building and developing new irrigated areas. This should result in extending rice production areas to about 770 000 ha. At the moment, the results of this endeavour remain controversial, although they have been widely publicised.

Before 2008, authorities undertook storage operations to counter food insecurity threats. The Food Security Commission (CFS) was created in 2003 for this purpose and the many supporters in the highest ranks of the state led to the creation of cereal banks in all 703 municipalities of Mali. There are also two national stocks, the National Food Security Stock (NSH) and the Government Intervention Stock (EIS). Communities manage the cereal banks through a management committee, while national provisions are in the hands of the government. The NSH, totalling 35 000 tonnes of cereals including 10 000 tonnes of rice, is funded

<sup>4</sup> VAT: Value added tax. Internal tax, with a reputed neutral effect. Paid by the final consumer.

jointly by the state and donors, which include Japan and the European Union. Its purpose is to alleviate poverty and respond to food crisis emergencies, pending the arrival of imports and / or external assistance. Stocks are renewed by a third every year, according to a procedure that preserves grain quality by avoiding a prolonged stay in warehouses. Their recovery is through local purchases, which allows them to regulate the market.

The EIS has about 15 000 tonnes of cereals with a financial value estimated at 3 billion XOF. Two thousand of these 15 000 tonnes are awarded annually to the most needy, while the rest is reserved for extreme situations such as loss and other cases of force majeure.

This stock management through public intervention is linked to mechanisms promoting information on production and markets, and early warning systems. Thus, the market observatory (AMO) that succeeded the OPAM<sup>5</sup> market information system (MIS) in 1989, collects, processes and disseminates statistical, regulatory and general information on all the factors that influence price formation in the agricultural market. In doing so, it contributes to regulating the market, stabilizing and levelling prices between regions that have surplus and those that have structural insufficient production. In the wake of this prerogative, the Early Warning System (EWS) has the role of watchdog regarding food crisis symptoms. The EWS is required to keep public authorities and development partners informed to ensure that appropriate actions are triggered.

Following the failure of self-sufficiency strategies, the new awareness in government and the injunction of donors in terms of aid conditionality led to a more liberal vision of food security management, where the market and private operators are given more responsibility. However, a good balance between these professional actors and the state is challenging. The constant change in the domestic and international environments explains the permanent readjustment of the rules of the game by the state. Currently, a series of formal and informal actors, whether constituted or not, make up the structure of the rice value chains.

## **B. Private sector actors**

Contrary to appearances, the rice sector does not start with producers, although their central role is crucial. Service providers (repair workers) and other suppliers of materials and inputs, the latter being more or less informal traders, are upstream of production operations.

Downstream production, there are several families of actors grouped under the single term of intermediaries. Intermediaries are persons or organizations involved in the purchase and sale channels between the producer and the consumer. Although their activities overlap to varying degrees, the observatory of the agricultural market differentiates a number of categories. They are classified below in the sequence order of their interventions:

1. Collectors: they buy cereals with producers in periodic street markets or in the villages. Many of them work on a seasonal basis because they are primarily producers;
2. Aggregators: they represent the traders who collect quantities of grain to be stored or to move towards large collection centres or regional capitals. There are three major categories of aggregators:
  - Aggregator wholesalers who are based in large collection centres, and personally go to production markets to buy and then resell to wholesalers in major cities. These wholesalers have networks of collectors who get most of their supplies from weekly fairs.
  - Independent fair aggregators who are based in large collection centres or regional capitals. They

<sup>5</sup> OPAM: Office of Agricultural Products in Mali. In charge of regulating the market, prices and managing the national security stock.

buy grain with their own means in production markets to sell in large collective centres or regional capitals.

- Commissionary aggregators, working on behalf of large wholesalers located in collection centres or regional capitals. They are the ones who go to the production market to buy grain and transport it to the wholesaler's city.
3. Wholesalers and semi-wholesalers: they are based in an urban centre or in a large consolidation centre and buy through their own collection and consolidation network. Their financial means are substantial, with transactions on large grain quantities they can hold in their storehouse. They are the only intermediaries who actually have working capital. When they offer credit downstream and upstream, the system works; without their capital, the system stagnates.
  4. Retailers comparable to traders who buy small tonnages of cereal from semi-wholesalers, fair stallholders or even wholesalers and then retail them to consumers. Their margins are higher than those of other actors in the marketing chain given the low volumes and the high risks involved;
  5. Retail commission agents who retail grain entrusted to them by producers for a commission. They provide direct intermediary contact between producers and consumers.

There are other actors who are not directly involved in the operations of rice purchase and sale such as transporters and processors through the provision of services that ensure the sector's viability:

6. Carriers: they offer leases on their vehicle or a price per transported bag. Given the rising price of oil, the age of their fleet and poor road conditions, this link represents more than 50 percent of the products' final gross margin.
7. Transformers: they are the link in the chain responsible for husking and parboiling. Husking paddy rice turns it into white rice, while parboiling is a kind of soft cooking of fresh paddy previously soaked in cold water (for one to two days) or hot water (a few hours). Hot soaking prevents the rice from having a fermented smell, but its fuel consumption is higher. Parboiling not only responds to market demand, but it also allows for a much better husking than non-parboiled rice. Less rice grains break, and it is possible to recover the paddy that cannot be milled. In addition, it increases the nutritional value of rice as soaking and cooking permit nutrients contained in the husk to migrate to the center of the kernel.
8. Consumers are the final beneficiaries of production. They include households, street food vendors and restaurant and hotel chefs. They are mainly urban and their number is growing quickly. The increase in urban population due to rural migration and urbanization strongly influences rice consumption, which is at 70 kg per capita per year in some urban areas, while the national average is estimated at 57 kg.

Producers are fundamental in this whole chain and complete the list of professional actors.

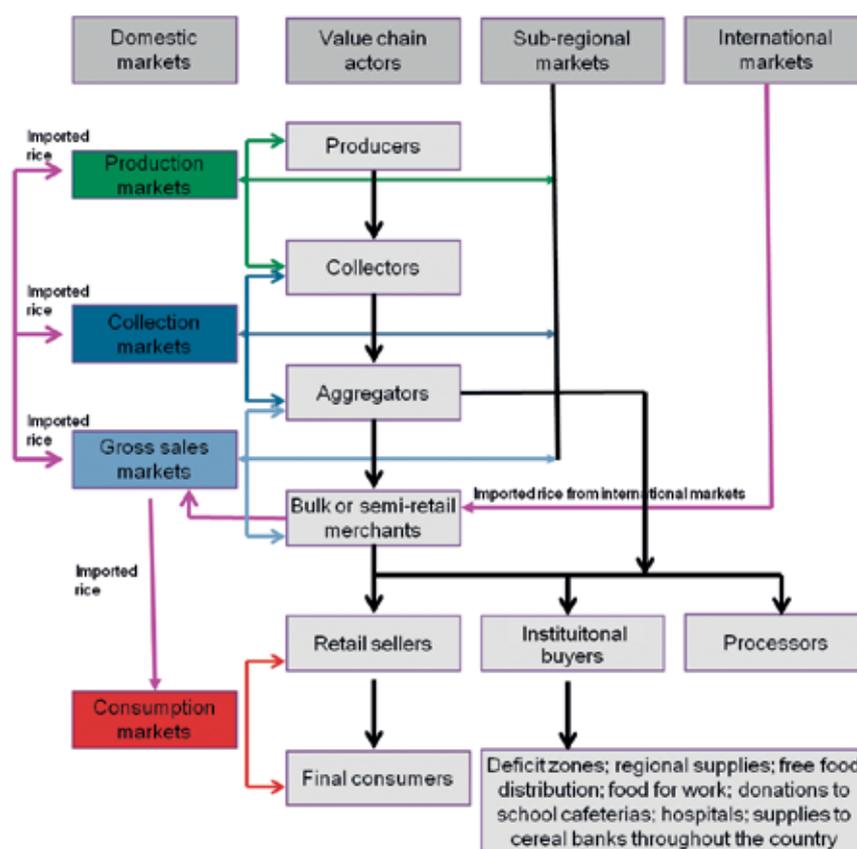
9. Producers are the linchpin of the value chain. Domestic supply and imports depend on their production and they maintain close relations upstream with input and credit suppliers and extension services.

All these private actors interact to different degrees on markets of varying importance, linked to one another according to Figure 10. Four cardinal axes govern the commercial circuit: the west axis that leads to Senegal, the central and northern axes that join Niger and Burkina Faso, the south axis that leads essentially to Côte d'Ivoire. Each route includes several types of markets and exchange points where collection, consolidation, storage, transport and retail operations take place. This is detailed in Table 2.

**Table 2. Typology of rice markets in Mali**

Market type	Characteristics
Small production markets	Primary collection markets, difficult to access; Main actors: producers and commissioners / collectors large collection centres.
Large production markets	Consolidation focal points before transport in consumption centres; Located along tarmac and dirt roads; Main actors: producers from nearby villages and collectors / aggregators bringing goods from small production markets;
Wholesale markets	Located in urban centres; Run by relatively prosperous operators who also invest as in import channels; Supply many retailers with locally and imported rice; System based on highly concentrated trade; Supplied by a large number of intermediate who often play multiple roles within the sector; farmers / vendors, processors / traders, merchants, and who often only have virtual stocks.
Retail markets	Consumer markets, interface between wholesalers and consumers with rather small profit margins ranging from 10% to 15% between wholesale and retail.
Cross-border markets	Generic term for all kinds of markets located near national borders

**Source:** Diakit  (2006)

**Figure 10. Functional links between actors and between different rice markets in Mali**

P.S. Cross-border markets can be production, aggregation, or bulk markets

**Source:** Diakit  (2006)

Over time, marketing costs have experienced little change, despite the overall increase in transport, bagging, storage and handling costs. End intermediaries, whose business has become very competitive over the years and opportunities, have endured this margin erosion.

Essentially, the marketing sector is still very informal, and many transactions are in cash. The system is based on the speed and the multiplication of trade transactions. Resorting to bank credit is limited, except for important traders and residual processors.

### **C. Other institutional actors**

These essentially have a humanitarian and / or food security role, ensuring that strategic stocks are in place so that they may be redistributed when appropriate in a timely manner. In doing so, they interfere with trade flows and prices. They include the World Food Programme (WFP) and Non Governmental Organizations (NGOs).

Professional producers try to organize themselves into groups, cooperatives and unions as they now have a broader awareness of their vulnerability in power relations with other actors. This movement is growing throughout the country, and is organized at the village level in cooperatives and at municipal level in cooperative unions; these are then grouped into larger platforms at national level. It is estimated that more than 90 percent of the rice farmers belong to an organized and operational group in their area. More than 2 million producers are thus organized and represented, broadening the landscape of actors.

The PAO's main role is to negotiate loans by establishing themselves as credible spokespersons with microfinance institutions. They also aim to add more value after the harvest by directly handling processing and marketing. In addition they have an advocacy role when dialoguing with the state.

## **2.3 Economics of the rice value chain in Mali**

### **A. Price formation**

In these commercial networks, flows and marketing volumes depend on production surpluses<sup>6</sup>, linked to how successful the crop year is, producers' cash needs, the number of traders and the demand for rice. Prices stem from these commercial quantities, the rice quality and the production area.

More generally, the formation of consumer prices, which influence the added value's outcome, is also based on many other factors: the international price of rice, the importance of imports, tax exemptions, import market concentration, special import taxes, domestic rice supply, supply of other domestic dry cereals – that is rainfall – the importance of institutional buying, or in contrast destocking of strategic provisions, atomicity of the collection market, etc.

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<sup>6</sup> Surplus production: production obtained by deducting the fraction consumed on farm from total production. Commodity production is estimated at about 70 percent and consumption on farm at about 30 percent of the total production.

When the CFA franc (XOF)<sup>7</sup> was devaluated in 1994, international prices soared abruptly. This event has shown that the price of local rice increases in a similar fashion to that of imported rice. During the 1990-93 and 1995-98 periods, prices for both rices rose in the same proportion, that is to say 44 percent. The average annual price ratio between these two rices remained generally between 0.9 and 0.95. During these periods, the increase in consumer prices seems to have benefited producers, leading to several others. Higher margins, which could have benefited only traders, were distributed all along the value chain. Since the devaluation, the narrowing of margins upstream plays a buffer role in limiting the effect of paddy price variations on consumer prices in Bamako. The phenomenon reoccurred when rice prices soared in 2008. While the price of local rice for consumers increased by 33 percent between May 2007 and September 2008, the producer price appreciated by 53 percent. In nominal terms, transmission on the producer price was 109.9 percent, indicating that the increase was fully transferred to the Malian producers.

As stated above, transportation costs strain the final gross margin of products more than 50 percent. These high costs are due to timeworn transport vehicles, roadblocks and the bad state of the roads. In addition to the direct transport costs, the producer also supports indirect costs related to non-compliance with delivery dates.

During the months following the harvest, the abundance of supply strengthens the price differential between imported and local rice, as most of the production is put on the market. Local rice at this time of the year is at least 20 to 25 XOF/kg cheaper than imported rice. But if we take into account the years 2003 and 2004 when the price of local Gambiaka<sup>8</sup> rice outperformed the freely imported rice, the determinism of real local price may be questioned. Poor harvests during those years increased bidding on local rice, supported by customers having access to rice surpluses and unwilling to give up their this favourable position. This demonstrates that the massive presence of imported rice has less of an effect on the sale price of local rice than its own seasonal post-harvest overabundance.

In any event, imported rice has no inhibitory effect on local price rises following poor harvests or during the lean season. Its contribution to the post-harvest abundance, which tends to drive prices down, is important. Thus, imported rice can supply the market and contain rising price attempts.

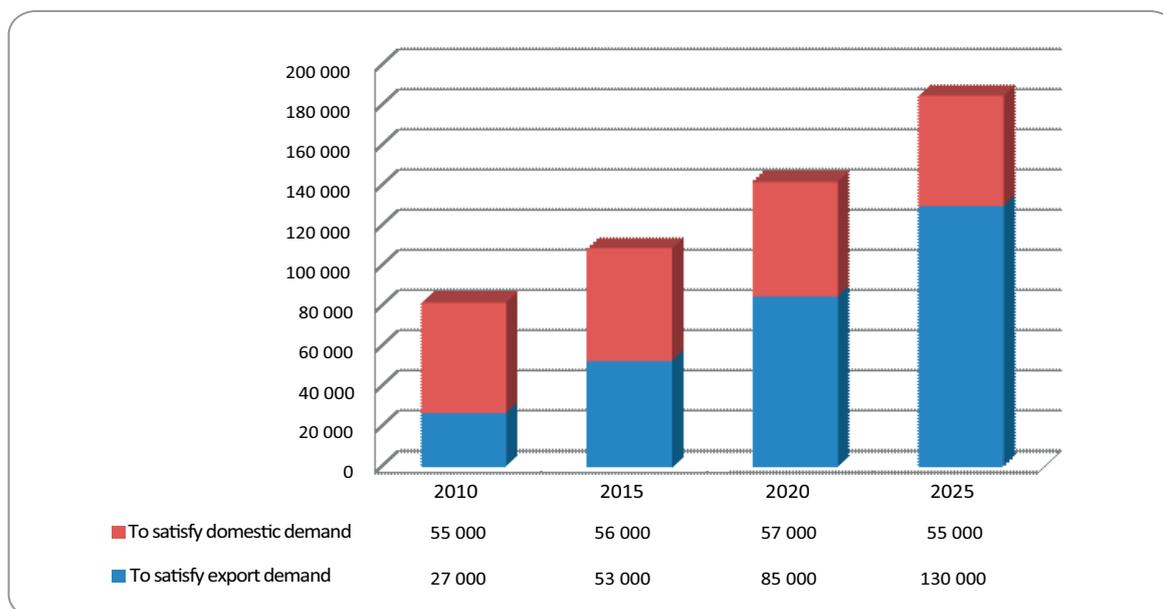
## **B. Import and competitiveness sub-sector**

For the Malian consumer, imported rice has a stabilizing role because it levels local price variations during the lean season when its effect is combined with the one of destocking of strategic supplies. In doing so, the price of domestic rice is forcefully brought down, which does not benefit producers. The need for imports is evident when taking into account the domestic supply deficit. To remedy this, considering the current level of productivity, nearly 100 000 ha should be laid out for rice growing. Half of this production could satisfy the growing domestic demand and the other half could recapture the import market. Estimates for 2025 amount to 185 000 ha. This is risky when currently, the Office of Niger only covers 75 000 ha and the average rate of expansion in recent years is barely more than 5 000 ha per year.

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<sup>7</sup> Devaluation of the XOF: depreciation or sudden drop of 50 percent of the nominal exchange rate XOF occurred in 1994. (This currency is used in the eight WAEMU countries).

<sup>8</sup> *Gambiaka*: scientific name Kogoni 91-1, results from crossing Gambiaka kokum and IR361. Has become the generic name for any rice resembling it : local, long, white, complete grain rice.

**Figure 11. Estimated area to meet domestic and export demand**

**Source:** National Agricultural Directorate, 2009

Studies carried out on the level of competitiveness of local rice in relation to imports lack structural elements that can adequately support their conclusion. The competitiveness of Malian rice cannot be considered as static. The dumping of Asian exports because of the depreciation of the dollar and the Chinese Yuan is one of the hurdles, but this is an ad-hoc phenomenon that can turn around at any time. Before the Yuan's depreciation, including the period that followed the devaluation of the CFA franc in 1994, local rice was considered competitive in Mali with the exception of the areas between Bamako and the imported rice ports of entry. Similarly, the elimination of export subsidies that distort fair competition could significantly change the situation, even if this is more hypothetical. The special import taxes that the country has used at times gave local rice a higher level of competitiveness in the market. But the community at large was bearing deadweight<sup>9</sup> that has not been carefully considered by studies on the value chain.

In contrast to ad-hoc factors, the increase in ocean freight costs is more structural and has a positive influence on the competitiveness of Malian rice. The rising cost of oil and the rapid expansion in the volume of trade need to be taken into consideration. In Mali, as in the West African community space, these transaction costs allow the Malian rice to be more competitive. This is reinforced by the preferential zero-rate tariff in the sub-regional free trade zone.

Finally, the competitiveness of Malian rice remains dependent on external factors such as international rice prices, the dollar exchange rate, the cost of ocean and land freight and common external tariff regulations in the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS). It also is influenced by some endogenous factors relating to production costs, production techniques, monitoring of technical pathways, and other factors that can ensure productivity or that may compromise when not taken into account.

Non-price competitiveness factors should also be considered when assessing the competitiveness of Malian rice. In this respect, the way consumers have responded to Gambiaka since its introduction, bodes well in

<sup>10</sup> Deadweight: collective shortfall, following the introduction of customs duties or any other taxes with a similar effect. Change in surplus at the expense of consumers, but not recovered by producers.

terms of market prospects. Substantial consumer surplus may allow for this variety to stand up to the onslaught of imported rice. As a matter of fact, while the imported price was at 270 XOF per kg in 2001, 2003 and 2004, locally grown rice kept its market share despite the fact that it cost 20 to 25 francs more per kg. In those years, Gambiaka sold quite competitively despite the unrestricted lower priced rice imports.

### C. Added value and market segmentation

In Mali, rice is one of the first three farming activities after livestock and cotton. It represents about 5 percent of GDP. Its share of domestic added value increases rapidly when applying trade flows to urban areas. Since 1995, the rice sector has taken over millet and sorghum, and is the leading cereal in the creation of added value.

Beyond competitiveness, partially underpinned by productivity and the exchange rate, the sustainability of the value chain depends on the distribution of the added value. In this regard, it is essential that the producer earn a fair income that guarantees no loss of revenue in favour of the intermediaries' interests. It is therefore necessary to understand what is the share of added value for each actor by disaggregating the overall wealth generated by the value chain<sup>11</sup> (Direction nationale du Genie Rural, 2009).

Generally, three post-harvest processing products are put on the market. These are: broken rice, parboiled rice and local Gambiaka rice. These products correspond to more or less differentiated market segments, with as many index value chains.

The three value chains commonly used by support structures and institutions because of their ability to create jobs, income and food security are: Gambiaka rice, parboiled rice and broken rice. In the absence of comprehensive data, the field of study is limited to a comparative analysis between two production sites respectively located north and south of the capital, Bamako.

- Gambiaka rice in Ségou: the overall added value obtained from production systems, that is to say, the collective wealth created from beginning to end of the chain is 217 XOF/kg of grain rice sold downstream by the retailer. As much as 82 percent of 217 XOF return to private actors in the form of total income, that is 178.5 XOF/kg. The producer receives 89 XOF/kg against 20.5 XOF/kg for collectors and processors.
- Parboiled rice in Ségou: the overall added value obtained from different production systems is 140 XOF/kg parboiled rice sold downstream by the retailer. Fifty percent of this amount, or 70 XOF/kg, goes to all the private actors. The producer makes 22.4 XOF/kg while collectors and processors emerge with 10 XOF/kg.
- Gambiaka rice in Sikasso: the added value of Gambiaka is 223 XOF/kg of rice sold downstream by the retailer. As in the previous cases, 79 percent of this money goes back to all private actors, which represents 177 XOF/kg. The producer receives 73.8 XOF/kg, while collectors and processors make 23.8 XOF/kg.
- Parboiled rice in Sikasso: the overall added value regardless of production systems is 152 XOF/kg parboiled rice sold downstream by the retailer. All of 57.2 percent goes to private actors or 87 XOF/kg. Producers capture 35.5 XOF/kg against 14.3 for collectors and processors.
- Broken rice in Ségou and Sikasso: broken rice produced in the region of Sikasso is sold for 100 XOF less than whole Gambiaka rice. Production costs are identical to those of Gambiaka, since the differentiation between these two rices occurs during the shelling. Thus, whenever the shelling leads to broken grains,

<sup>11</sup> The economic analysis of the three rice value chains reported in this report are derived from a report entitled: "Analyse économique des trois chaînes de valeur de la filière de riz au Mali", Programme d'Appui au Sous-Secteur de l'Irrigation de Proximité Ministère de l'Agriculture, Direction Nationale du Génie Rural, September 2009.

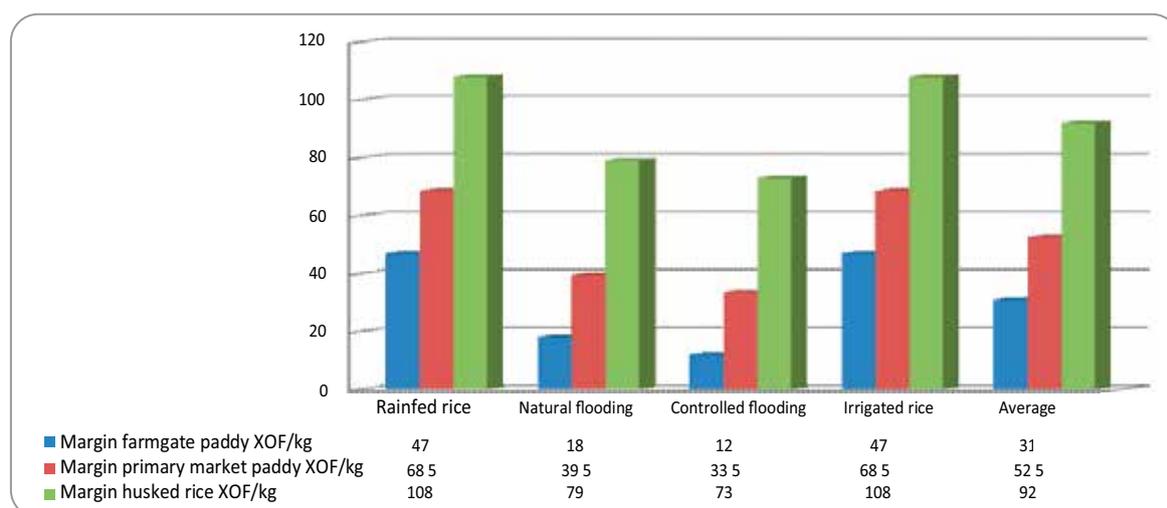
the processing brings the value per kg down by 100<sup>12</sup> XOF. This means that the producer obtains a residual value of 39 XOF/kg in Ségou and 31.5 XOF/kg in Sikasso; collective added values being 117 XOF/kg and 123 XOF/kg respectively. Thus, better than anywhere else these figures show the importance of processing in the shaping of the added value. The collective added value of broken rice is only 117 XOF for Ségou and 123 XOF for Sikasso.

These few detailed<sup>13</sup> examples that may be extrapolated, subordinate the consistency of the added value to the product types that is to say the value chains. What about production methods?

#### D. Production system of and added value

When examining the studies on the 2007-2008 crop year, the rice sector as a whole seems quite lucrative. For example, in Ségou, the producer's average value added on paddy rice sold at farm gate is 31 XOF/kg, regardless of rice variety or production methods. When the paddy is sold at the primary market, it increases to 52.5 XOF and to 92 XOF for husked rice.

**Figure 12. Value added per kg according to selling and production methods in Ségou**



**Source:** DNGR, 2009

The study shows that rainfall and irrigated systems have the lowest production costs for paddy at 73 XOF/kg, while controlled or natural flooding systems incur costs of more than 100 XOF/kg. Assuming that the selling price of paddy is the same for all production methods,<sup>14</sup> the mechanically calculated added value is higher for the actors, that is 47 XOF/kg for paddy sold at farm gate, 68.5 XOF/kg for paddy sold in the primary market and 108 XOF/kg for husked rice.

However, when integrating performance differences between the types of rice, the results are less ambiguous. Considerable differences in the added value per unit area can be observed between systems, ranging from simple to more than double yields<sup>15</sup>. Moreover, the producer's value added per ha on paddy sold at farmgate is

<sup>12</sup> Estimated consumer price 250 XOF/kg as opposed to 350 XOF/kg for Gambiaka.

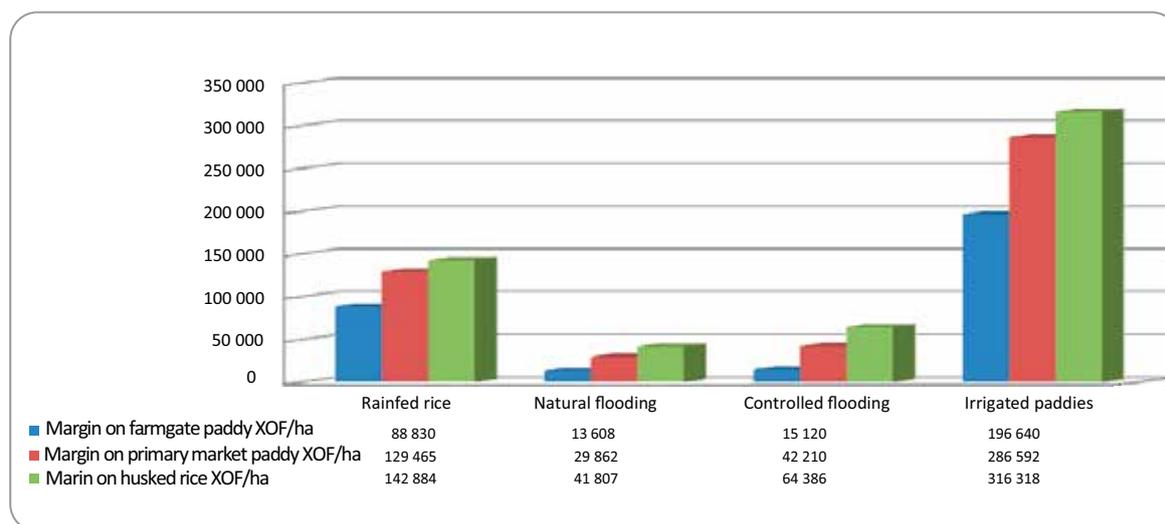
<sup>13</sup> Data extracted from a GTZ study on the value chain.

<sup>14</sup> The paddy selling price at farmgate is 120 XOF/kg. On the primary market, the paddy sells for 150, and when husked for 197 XOF.

<sup>15</sup> Yield (kg/ha): 3 000 rainfed rice; 1 200 natural flooding rice; 2 000 controlled flooding rice; 6 641 irrigated rice.

88 830 XOF for rainfed and 196 640 XOF for irrigated rice. When the rice is sold in the primary market, these added values become 129 465 XOF and 286 592 XOF respectively. They are even more substantial for husked rice, 142 882 XOF for rainfed and 316 318 XOF for the irrigated one.

**Figure 13. Value added per ha according to selling and production methods, Ségou**



**Source:** DNGR, 2009

According to this DNGR (2009) study, natural flooding rice cultivation appears to be the least profitable, generating only about 13 600 XOF of value added per ha for paddy sold at farm gate and 30 000 XOF/ha for paddy sold in the primary market. Even after husking, the margin is only 41 807 XOF/ha, because of its poor yields (1.2 t/ha) and its very high costs (118 XOF/kg). Further research may be required to confirm these findings.

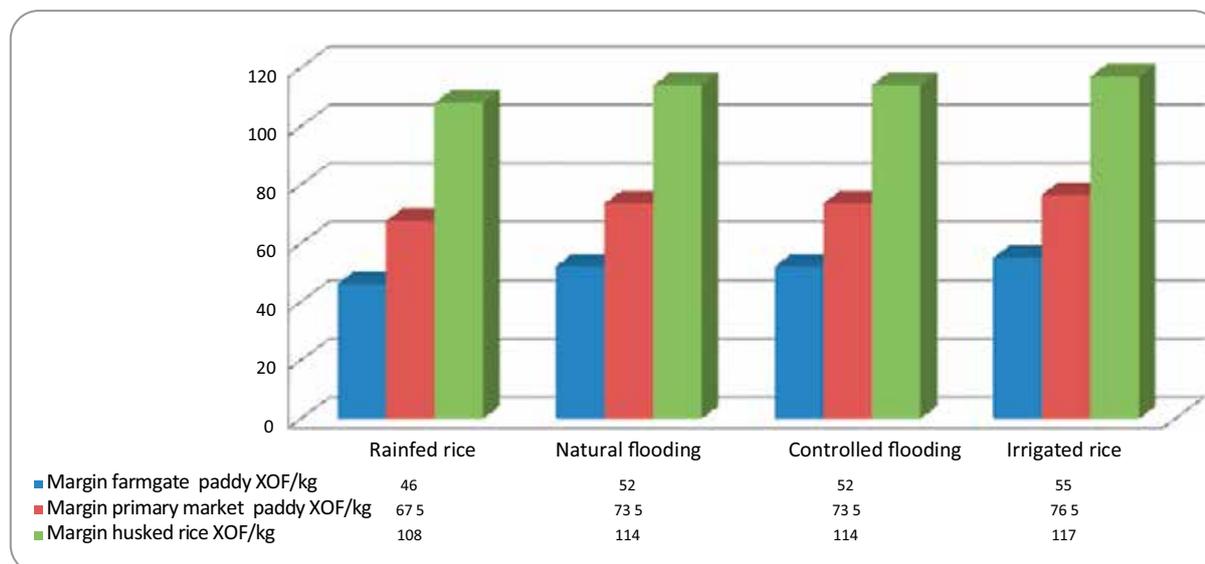
All of these results are to be taken into account in decisions related to food security strategies, soil distribution and choices in terms of agriculture. This also applies when designing programs to promote the well-being of farm households and the fight against poverty. 2009 Census figures allow a more in-depth interpretation. People involved in rice growing are not evenly distributed according to production methods. Thus the density for rainfed production is 24 person-days/ha, 8 person-days/ha for free flooding production, 10 person-days/ha for controlled flooding production, and only 4 person-days/ha for the irrigated rice system. This shows that beyond the inherent added value achievable per unit area, the density of the people directly linked to rice production can seriously compromise financial gains. Also, when linking demographic data with added values, spreads tighten between rainfed, natural flooding and controlled flooding rice systems.

Once again, farmers cultivating rice with irrigation are better off as they generate the most added value per unit area, while being the least numerous. Irrigation also offers the most opportunities for multiple crop seasons. By contrast, farmers practicing rainfed rice production are the worse off in terms of density and must make a choice between rice and other dry crops.

These figures have also revealed a significant margin differential between paddy rice sold at farmgate and husked rice sold at the primary market. This 33.4 XOF/kg difference on average is what a number of producers capture in downstream markets.

In Sikasso where the study was conducted, the results are quite similar. The average added value is even 20 XOF higher than in Ségou. This brings the price to 51.25 XOF/kg for paddy rice sold at farmgate, 72.75 XOF/kg for paddy rice sold in the primary market, and 113.25 XOF/kg for husked rice, regardless of the rice variety or production methods.

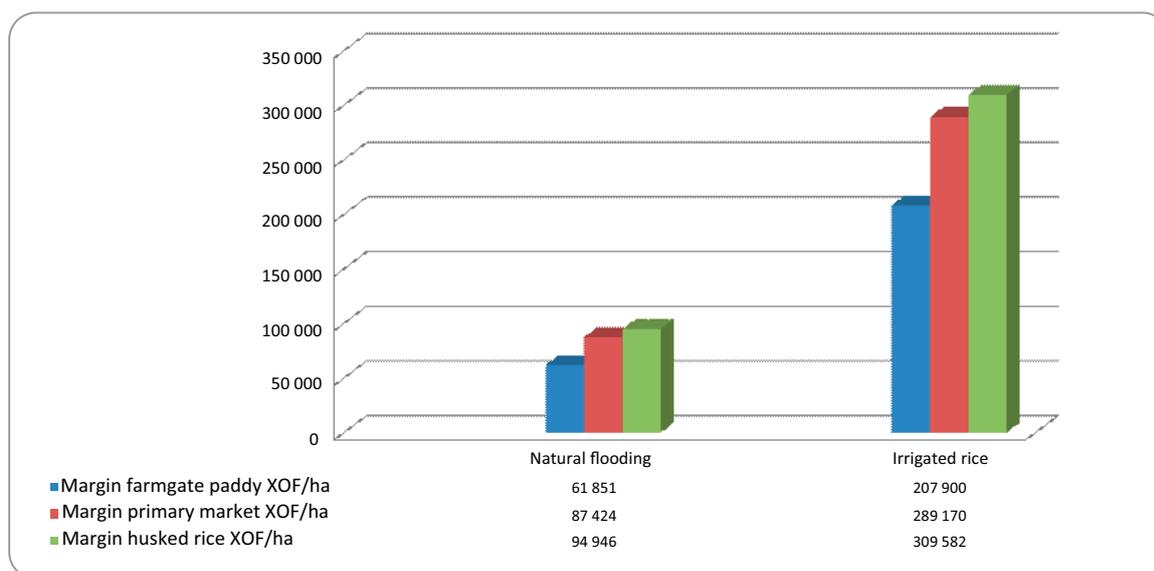
**Figure 14. Value added per ha according to selling and production methods in Sikasso**



**Source:** DNGR, 2009

The irrigated rice production method has the lowest overall costs amounting to 70 XOF/kg for paddy. It is followed by the two flooding systems, with costs coming to 73 XOF/kg for paddy. Not only the selling price of paddy at 125 XOF/kg is considered identical for the three production methods but so are post-harvest costs. However the advantage coming from lower production costs mechanically affects margins and makes the irrigated system the most lucrative activity with an added value of 55 XOF/kg for paddy sold at farmgate, 76.5 XOF/kg for paddy sold in the primary market and 117 XOF/kg for husked rice.

The natural and controlled flooding methods have identical margins of 52 XOF at the farm gate, 73 XOF at the primary paddy market, and 114 XOF at the husked rice market, respectively. Incorporating the returns does not change the rank of the irrigated rice whose operators make 207 900 XOF/ha when sold at farm gate, 289 170 XOF/ha when sold in the primary market and 309 582 XOF/ha for husked rice. It does not affect either the relative positions of the other systems: the natural flooding system generates 61 851 XOF/ha at farm gate, 87 424 XOF/ha at the primary market and 94 946 XOF/ha when husked. These added values expressed per unit area show considerable differences between the systems, with averages ranging from 81 407 XOF for natural flooding system rice to 268 884 XOF for irrigated rice.

**Figure 15. Lowest and highest added value added per ha according to selling and production methods in Sikasso**

**Source:** DNGR, 2009

Incorporating the actual number of people in farm households to these results leads to more nuanced conclusions. In Ségou, for example, the irrigated rice is the most profitable. Its 431 597 XOF/ha gain for paddy sold in the primary market suggests that after two annual crop seasons, rice farmers may have more than 215 000 XOF/person per year. This would allow them to overcome extreme poverty that has an absolute threshold of 162 000 XOF/person/year<sup>16</sup> as set by the United Nations. However, further investigation should be conducted to determine what other sources of additional income producers might have in order to reach more robust conclusions.

### 3. Towards a sustainable rice production for Mali

The future of the rice sector in Mali depends on how the assets and opportunities described in the previous chapters will be employed. The impact of responses to the weaknesses and threats will be even more important. The current situation offers sufficient leeway and levers to boost the industry in terms of competitiveness, food security, fighting against poverty or economic development.

#### 3.1 The sector's constraints

Constraints in the rice sector are many and varied and also represent challenges. They are classified into two categories, production and marketing. This section focuses on the obstacles faced by farmers in terms of adding value to their production, better integrating the market and what hinders their income growth. These objectives seem to be linked to marketing but they are actually rooted in the production domain.

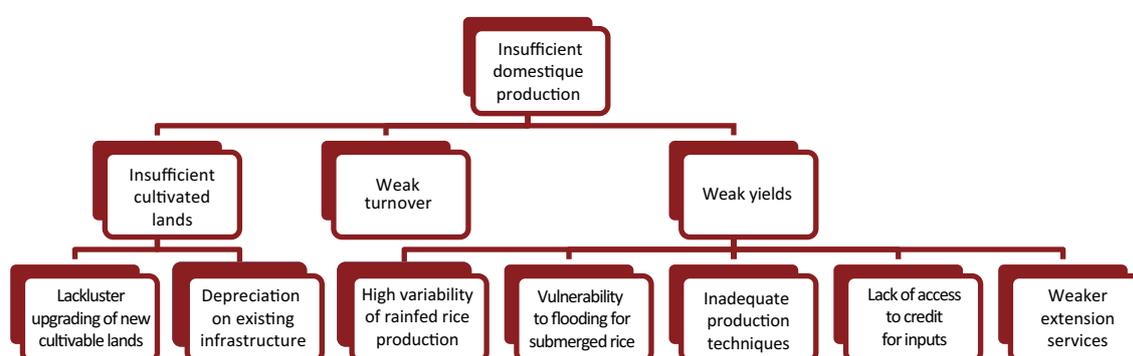
<sup>16</sup> The 162 000 XOF were obtained by calculating the threshold of one dollar/day year (365 days), with an exchange rate of 450 XOF. They may therefore vary.

## A. Production constraints

The basic assumption underlying this section is that production, as a dependent variable, is based on three variables, which are the traditional determinants. These are (i) the size of cultivated land, (ii) the land's productivity, that is to say, the production per unit area, commonly known as yield, and (iii) the speed of crop season rotation: the turnover.

Each of these determinants has been awarded its own determinants through a cause and effect relationship. The problem tree below, which follows this analytical logic, summarizes all of the identified problems and establishes the causality between them.

**Figure 16. Problem tree of the productive component for the rice sector in Mali**



It shows that the development pace of irrigable land is well below both the required level and expressed needs. This is confirmed by the decline in the average area allocated to rice households. Land fragmentation seems to be the formula found by national policymakers to meet the growing and urgent demand for land. Not only can it not curb the internal deficit in Mali, but it also causes losses for producers given that the economy of scale is eroded, as the areas under cultivation get smaller.

Figure 16 also shows that certain areas lack renovations. This hinders the productive capacity of the country, as, for example, the under-utilization of irrigation schemes. In fact there is a self-imposed limitation as how agricultural land is used in irrigated areas. Moreover, in the best-case scenario, the number of crop seasons is limited to two and this limits the annual production.

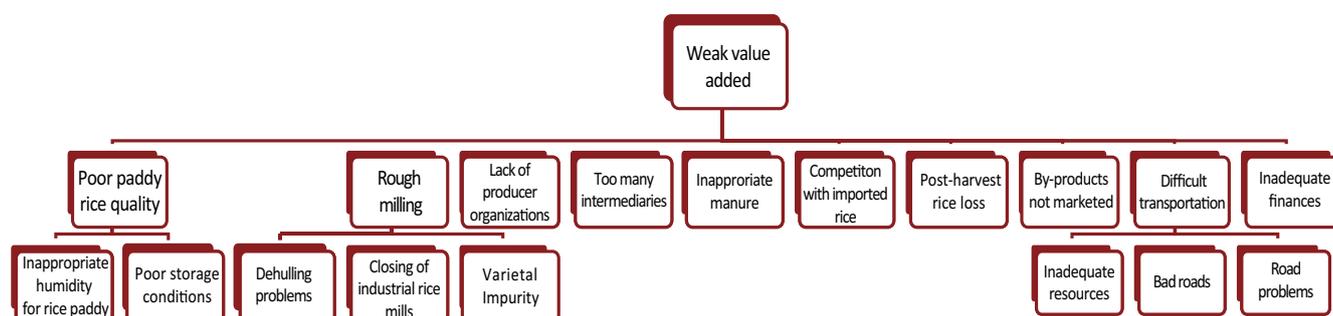
Low yields are due to a combination of factors such as hydro-climatic hazards and technical pathways. Production pathway choices are linked to the know-how of producers, but also to what physical and financial access they have to inputs. This highlights how access to inputs is linked to purchasing power and credit.

If at the national level, the lack of domestic production favours imports and overstretches the country's foreign exchange reserves, at the micro level, it affects the livelihood of farm households. The low income earned by producers, based on the number of persons per farm household shows that the achievement of the Millennium Development Goals remains a difficult challenge.

## B. Marketing constraints

These take shape in the productive part of the sector, go through the processing stage and can also be found at the end of the value chain that is the market itself. This section focuses on the elements that devalue the producer's work and may seriously weaken its added value.

Figure 17. Problem tree of the commercial side of the rice sector in Mali



The second problem tree shows a series of immediate causes to which underlying causes may or not be linked. As mentioned above, the areas of production and marketing are intertwined. Poor paddy quality is also a key obstacle to profitability. It refers specifically to the moisture level of paddy, ideally set at 14 percent.<sup>17</sup> If the rice is too dry when it is processed, it produces a lot of broken grains, which have a lower value. Conversely, when it is too humid, it sticks to the machine and generates a lot of flour; this reduces the amount of white rice and therefore revenues. Losses are also recorded when the paddy is poorly preserved or poorly parboiled, thus releasing a fermentation smell. In addition to this loss of quality, quantitative losses may also occur due to serious storage damage.

Rice milling is the second important passage between production and marketing. Its current coarseness is not only due to the closure of large industrial mills, but also to cultivation factors such as heterogeneous varieties. When the paddy is a mixture of different varieties, husking becomes difficult, as adjusting rollers for round varieties will prevent shelling of thinner varieties, while adjusting for thin varieties will cause round varieties to burst. Moreover, the varietal mixture poses important problems in determining appropriate harvest dates. As the physiological maturity of a mixture of different cultivars may not be synchronized, this will result in any harvest that is based on the early varieties containing paddy with immature and half-filled grains from the late varieties. Similarly, harvests based on late varieties will prolong the drying of early varieties, which will increase their breaking during husking and will depreciate the product.

The small transformers or huskers, with their high mobility and lower delivery cost are quite appealing but actually bring about a low husking quality. The apparent advantages of custom machining end up being costly in some way to the producer. This type of husking not only affects the turnover because it results first in a lower quality of white rice and, second, in more by-products of lesser value on the market. The sector's liberalization, which marked the end of the state monopoly on husking operations, was the starting point of the proliferation of small huskers. This led to the collapse of industrial mills, as quantities no longer allowed taking advantage of any economies of scale. As they had very heavy fixed running costs, they could only survive by acquiring rice at a cheaper price, which was impossible given the existing competition.

The fact that producers are disorganized allows intermediaries to step in and take a small part of the added value. Moreover, when producers operate through isolated initiatives, they become more vulnerable when negotiating with commercial partners.

Another major obstacle is the fertilizer formula in force; technicians and policymakers should give it careful consideration. It is not only expensive, hurting the producers' profitability, but it is also frozen, preventing them from dynamically adapting to the relative prices of inputs and rice sales. In this respect,

<sup>17</sup> Humidity rate of 14 percent: 100 g of paddy contain 14 g (= 14 mL) water.

optimum agronomic yield differs from the economic optimum. The latter, which depends on the producer's added value is reached when the marginal revenue is equal to the marginal cost rather than when yield and production are at their maximum. The upward trend of ocean freight costs shows that prices of agricultural inputs will not diminish, and thus imported inputs may be less and less economically efficient.

Furthermore, imported rice evens out the domestic price of rice, especially in times of poor harvests or during the lean season. In these cases, it drastically reduces the ability of the producer to benefit from the potential turnover. Imported rice, important to Mali's food security, actually increases the amount of rice available in the market at post-harvest, and thus further decreases local rice prices. In addition, producers tend to dump their products on the market as they have urgent needs for cash.

The lack of use of by-products adds to the constraints linked to commercialization and competitiveness of local rice. Bran, husks, flour and broken rice generated by the transformation process of paddy to white rice have not yet found market niches that may increase their market value. They are still considered as waste and do not allow the producer to earn substantial additional income. As detailed above, high transport costs also negatively affect the final gross margin.

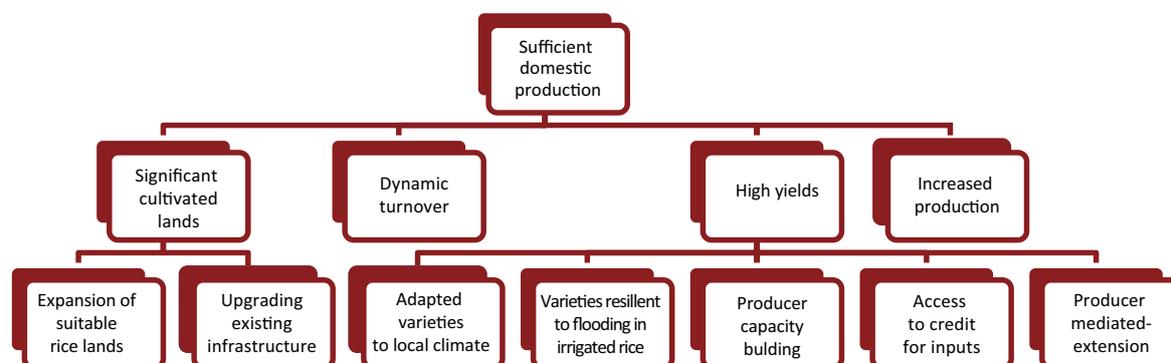
Finally, producers cannot recover the VAT from their intermediate input costs through their sales and this further reduces the already modest added value given the small amount of rice produced per cultivating household.

### 3.2 Recommendations

The solutions to address the obstacles faced by the rice value chain in Mali are derived from the two problem trees above and are summarized in two objectives trees dealing respectively with production and commercialization. The tops of these trees represent the overall objectives, while secondary levels represent specific objectives. Each of these can be associated with one or more intermediate objectives that will contribute to identifying what actions may be taken.

#### A. At the production level

**Figure 18. Objective tree for the production component of the rice sector in Mali**



There are three possible scenarios that will strengthen production. These can be implemented independently of one another, but concurrent actions will amplify results. The development of new irrigated areas as a means to overcome the insufficiency of planted areas could be implemented through double-contracting. Firstly, a public-private partnership would be set up with the private sector. The

concession contract seems to be the most appropriate form, as it is a *ex nihilo* creation that mostly requires investments, i.e. funding. These contracts can take the form of built operate transfer or even built-own-operate-transfer with the state, and then can be matched in a second phase with a concession type contract<sup>18</sup> between the asset owner and the rice farmers.

With these revenues, the state could then rehabilitate existing facilities. However, this option requires prior clarification of land rights.

The second axis with respect to yields could be to boost professional agricultural organizations and identify within these relay farmers who would expand extension services on the ground. This is even more necessary as grassroots technical guidance is no longer fully guaranteed, following the advent of liberalization as the number of agents for this task has become insufficient.

Yields could also be enhanced by the wider dissemination of the new NERICA varieties stemming from hybridization between the African species *Oriza glaberrima* for its strong hardiness and the Asian species *Oriza sativa* for its high productivity. The National Seed Service should also ensure a better distribution of seeds to face shortages that occur from time to time. Capacity building for seed research technical services is needed to boost this sector and make it more operational. The National Agricultural Research's contribution is fundamental to develop varieties with a high adaptability to the various hazards that characterize rainfed and natural flooding varieties.

Issues related to credit access could be dealt with by strengthening PAOs to give them the status of genuine partners with microfinance institutions. Boosting PAOs will help promote the formation of solidarity groups, prevent asymmetric information (adverse selection and moral hazard) and reassure credit holders. This will also allow a better acceptance of idiosyncratic risks. The state must encourage financial institutions to extend credit given the numerous and inter-linked risks by creating a compensation fund in case of problems.

Meanwhile, issuing real land certificates could also contribute to waver credit acquisition. But this double-edged instrument should be used with extreme caution. It may have a negative effect, resulting in producers losing their capital, should they be unable to meet their commitments *vis-à-vis* their creditors. That is why it should be based on solid cooperatives and PAOs.

Another element that is likely to help having a loan endorsed is collateral stock, also known as warrantage. It is a mode of access to credit against a pledge of a certain amount of food. For example, it can enable the holder to purchase inputs without altering the meagre budget of the household. When applied to several members of a PAO, it also helps to structure the demand for inputs by making it solvent, predictable and grouped. This type of credit self-guarantee has other advantages that will be discussed in the section on commercialization.

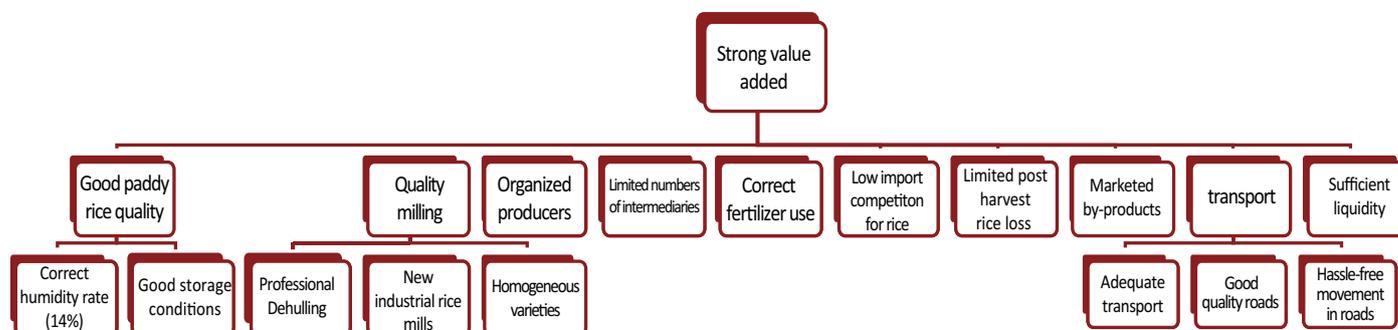
Difficult access to credit has often been cited as a major explanatory factor for the poor performance of the rice production system. Prior to liberalization, state structures advanced seeds and inputs and were reimbursed later by deducting the amounts owed by each producer from the post-harvest sales. The system was balanced through the monopoly enjoyed by the state, which in turn had an interest in providing quality inputs and excellent extension services.

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<sup>18</sup> A type of contract in which an owner (the lessor) transfers to another party (the lessee) the enjoyment of a rural property against payment in cash or fixed value products for the rent. The lessor does not have, as such, the status of farmer. The lessee retains his independence and manages his operations as it sees fit. Products remain his property and he insures risks. rent is not the same as a contractual agreement between public and private partners.

## B. At the commercial level

Figure 19. Objective tree for the commercial component of the rice sector in Mali



Regarding the market, increasing the producer's added value can be achieved through a series of preliminary objectives. The good quality of paddy - which refers to the conditions of harvesting, handling, husking and parboiling - and husking yields linked to the intrinsic performance of huskers are amongst the first conditions to be met. The custom machining has little potential for growth when facing the urban customers who are increasingly demanding vis-à-vis the quality of the rice they buy. The high mobility of processors is an advantage for producers wishing to increase their income by conquering a part of the value chain downstream. However, the deteriorating rice quality associated with large quantitative losses in by-products significantly reduces their efforts. This is where the experimenting with contestable markets appears as an attractive alternative, provided they are accompanied by substantial specifications, which may work for quality and labelling of local rice. Contestable markets may be considered as regional monopolies temporarily granted by tender.

In addition, they are subject to competition as the contracts that underlie them are periodically challenged, and may be cancelled or assigned to others. When established according to a wise zoning of the production strongholds, they could lead to the emergence of small mills where efficient suppliers - producers - could even participate in the capital. If this were organized to prevent duplication, these mills could compete between areas, which would further enhance their performance, reduce delivery costs and thus avoid repeating the problems experienced by large mills with the advent of liberalization. An adequate supply of paddy can be ensured for small mills and thus guarantee efficient rice processing.

On the other hand, the phased sale of paddy is expected to reduce the abundance of post-harvest offer and contribute to a better appreciation of domestic rice. Adopting warrantage for this purpose may be advisable. As producers have no regular income, may find themselves in an emergency and dump their produce immediately after harvest. Such a strategy would allow them to receive credit from microfinance institutions. They could thus better sell their production by holding it until prices rose again, or even keep it for home consumption for the lean period without having to buy it at high prices.

However, good quality warehouses located in production areas are required to implement this practice. Building these can be entrusted to local authorities, and to private operators to whom the state would provide incentives. Providing production areas with warehouses helps producers with no previous access to good storage conditions to stop them dumping their harvest on the market.

In addition to using warrantage to avoid dumping of harvests, it may be useful to look into building the volume of OPAM's institutional stock. This could raise post-harvest prices as it would increase the pressure of demand on local rice. Its primary purpose of food security is fully compatible with stabilizing producers' income.

Previous fertilization plans recommended by research have not been followed. Defining a formula for chemical fertilizers that could evolve depending on variables such as input costs and selling price of rice, would be beneficial for the producer. Moreover, formulating fertilizer made with apatite, a natural phosphate from Tilemsi, could reduce input costs and better respect the doses required to obtain satisfactory yields. Adam-Yéboua (2000)'s work shows that a similar apatite, the burkinaphosphate, used in the irrigated rice production method, can compete, in some cases, with chemical fertilizers. Ensuring that the agriculture soil reabsorbs crop residues can complement this solution. Veldkamp *et al.* (1991) state that for a yield of 5 t/ha of paddy, crop residues contain 97 kg/ha of nitrogen, 19 kg/ha of phosphorus and 115 kg/ha of potassium. This should save farmers having to buy at least two bags of 50 kg of urea per ha, equalling 50 000 XOF/ha. Similarly, NPK quantities could be lowered to two bags of 50 kg/ha provided that phosphorus doses are increased.

The straw and bran that result from paddy processing are not often used despite their potential economic value. Several possible uses may be considered and would add value for the producer and to the by-products. Benchmarking<sup>19</sup> in major producing countries shows that rice bran can be turned into oil and flour can be used in the same way as broken rice when manufacturing beer, wine or pasta. Straw bales could be used as fuel. This is not only cheaper than petroleum, but more environmentally sustainable as it could largely replace firewood; this an important feature in Mali, a Sahelian country that faces desertification issues. It would be useful to explore how to make this change attractive for different users such as bakeries, transformers responsible for parboiling and households. All these suggestions can result in increased income for producers and / or processors if they are well accepted in the local context.

It is also important to pursue the research conducted by the Office du Niger on improving the palatability and nutritive value of straw in cattle feed in order to increase consumption and change the energy and nitrogen intake. However, this implies that crop residues would no longer have a fertilising action and that they should be replaced with animal manure. Currently, straw bales are sought and purchased by farmers at a price approaching that of bran. Their use in dairy production and cattle fattening could strengthen their market value allowing the producer to perhaps obtain a price similar to paddy.

Fattening animals and fertilizing rice paddies and other agricultural land brings about a first level of agricultural and pastoral subsystems integration. A second level would be to reconnect with the use of animal traction in agricultural work, already known and widely used in Mali in the past. The cattle population can facilitate the recovery and growth of this type of mechanization in the form of animal traction, with:

- An improved quantitative yield of labour, that is to say, a greater result with the same efforts,
- A higher quality result with better prepared soil, burying of organic matter, etc.,
- Less physical exertion, and
- Time saving for the producer.

Animal traction is especially suitable in Mali as households farm areas are less than 3 ha according to the latest statistics, meaning that they are very small. This type of mechanization requires a low initial investment and has low maintenance costs. In addition, as the lowland rice soil is often heavy, it could be more convenient than a tractor.

Renewing the fleet of vehicles for carriers would substantially reduce transport costs. As custom duty is an exogenous variable under the Common External Tariff (CET), a one-time internal tax relief should achieve this goal, while agricultural organizations whose restructuring is completed could use their credit access to invest in their own vehicles to transport their products. This should be accompanied by ensuring that local communities are responsible for periodically rehabilitating rural roads in their area. In addition, the

<sup>19</sup> *Benchmarking*: process of finding, globally, the company or companies that most effectively undertake a process or task, and studying it to then adapt this process to one's own business.

state should establish and put an immediate end to eliminate the proliferation of road blocks and rampant extortion by certain members of the security forces; this reduces internal revenue by several billion XOF, lengthens delivery time for rice and generates false charges that affect the value chain upstream and downstream and artificially inflate consumer prices while compressing the production price.

Tax rates in Mali reflect price fluctuations for rice internationally and are frequently countercyclical to local rice production. This is often contradictory to trade policy objectives,, which are to protect Malian producers so that they may ultimately fill the gap in domestic production, and poverty reduction. This levels local price variations during the lean period and reassures the consumer through its stabilizing role. But Malian taxation could go further, thanks to the PAO that have been established to facilitate credit access upstream of the value chain, and improve the balance of power between producers and downstream actors.

Today, the Malian government is faced with the choice of considering a transition compensatory tax of lower import earnings that would allow the development of its rice production.

Meanwhile, the dialogue between the different actors could lead to joint decisions and could be achieved by bringing together representatives of civil society, including trade union organizations of producers, agricultural cooperatives, processors, traders, consumer associations and the public authorities that would act as arbiter and custodian of market regulatory policy.

The agricultural orientation law provides for the establishment of inter-branch organizations in Articles 174, 175, 176, 178 and 179. The 31 December 2008 decree No. 08-793 lays down the rules for their set up and registration. A further step should be to bring the intent of the policy and legal framework into existence. In doing so, two fundamental points should be taken into account:

- Decentralization of representative bodies in the territory, and
- Majority votes granted to producers because they are at the base of the value chain.

Local consumption of Gambiaka and parboiled rice could be enhanced through communication campaigns. This promotion should be based on evidence of non-price competitiveness, such as the sensory quality, texture, freshness, nutritional value and benefits of eating local products. However, such initiatives must accompany efforts to improve the quality, hygiene and price decrease through lower production costs, as these are the aspects on which imported rice seems to have an advantage. The promotion will also aim to strengthen the position of local rice in niche markets for which the producer's added value and consumer surplus are relatively high.

The agricultural information dissemination system managed by the OMA should be strengthened because it gives farmers access to market information and has played a significant role since its inception in improving their bargaining position with traders. Despite its undoubted success, this system is facing such financial problems that it may be at risk of disappearing, having benefited from state subsidies and donors until now. Like any such system, it has high operating costs and a management contract or lease with the private sector should be encouraged.

In addition, farmers could set up their own data transmission network across different groups and cooperatives with the support of inter-branch organizations and chambers of agriculture. By continuing to develop communication tools (mobile phones, local rural radio, Internet) groups can share market price and buyers' purchase intentions. Various groups can set up a simple device located at the different market places, which discloses and groups proposals for demand of paddy and husked rice in terms of price, tonnage and variety. This would promote competition among buyers and could allow producers to sell at a higher price.

## 4. Conclusion

The value in developing Mali's rice production lies in its potential strategic role vis-à-vis global public goods such as food security, economic development, and the environment. It also can very much contribute to the MDGs by strengthening people's health and the fight against poverty, which is predominantly rural in the country and the region.

These multiple challenges imply that policy decisions regarding this crop should focus on improving it without giving it an exclusive status. The value chain analysis and recommendations ensuing highlight the producers' interest because of its contribution to their production's added value. The measures recommended seek to reconcile somewhat contradictory possible targets. For example, they do not suggest increasing consumer prices that would be expected to provide producers with dividends but reflect concern in terms of the low purchasing power of poor urban households.

Mali must strengthen this sector by responding promptly and decisively to the evolution of the international situation. However, the instruments allowing this have been limited due to the implementation of the Common External Tariff (CET) in the WAEMU. In addition, the WTO prohibits differentiated internal taxation on similar domestic and foreign products in the name of "national treatment" which calls for their equal treatment. In short, using VAT as a protective barrier for domestic production should be avoided. The same applies to taxes having similar effect, which, added to VAT, raise to 22 percent the extra protection on local rice in addition to the CET's 10 percent. Mali has little room to manoeuvre and with the changes in the price of rice on the world market, the rate of the dollar and the price of inputs, there is a need to react differently.

As the ultimate goal is to recapture the export market once new domestic demands are met, Mali must start to consider its tax transition by substituting tariffs with an internal tax. Indeed, the country cannot afford to let go of its customs revenues without replacing them with a substitute. By subjecting producers to VAT, the state would contribute to increasing farmers' incomes and thus to their access to inputs. Inputs would improve productivity, thus producers' added value. This would result in a beneficial circle of production that would also reduce consumer prices.

Outside of these purely fiscal measures, contracted private operators could develop new irrigation schemes. This requirement is justified for several reasons: new demands for land, stagnating yields for intensified rice production, a significant decline in domestic supply and the drastic reduction of the average farm size, limiting opportunities for modernization.

The sector can only function effectively if producer organizations are strengthened. Producers could position themselves as credible spokespersons to obtain credit from (micro) financial institutions. Revitalized PAO will also enable their members to speak unanimously in the inter-branch organizations or when policies regarding their activities are elaborated. Moreover, they are useful as they arise as an important substitute for many intermediaries who reduce the producers' added value. By pooling together their resources, they could easily invest in transport vehicles, as well as participate in investing in mills that could be implemented through a contestable again market mechanism. This would solve quality issues without increasing processing costs.

Developing warrantage is an option will avoid dumping rice due to the abundance in post-harvest periods and producers' urgent financial needs.

As production costs weigh heavily in the process of generating added value, revising the formula of fertilizers is essential in balancing the price of rice compared to that of inputs. Moreover, inventing and producing a fertilizer made with apatite, Azolla and manure could create new jobs in the country. This would limit the outflow of foreign currency linked to the import of chemical inputs and would also increase farmers' income and rice's competitiveness.

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