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IS MALI-SUD *BAS-FOND* RICE PRODUCTION PROFITABLE TO FARMERS?

By

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BACKGROUND: The Mali government agricultural policy has focused on (1) reducing food imports, (2) stabilizing food prices and supply in urban areas, (3) increasing and stabilizing farmers' incomes, and (4) achieving nationwide food security. A primary mean to achieving these goals has been to expand the area under intensive rice production. *Office du Niger*, the semi-autonomous public agency responsible for managing the country's intensive irrigation schemes, has always been the centerpiece of the supply side of rice policy in Mali and main supplier of domestic rice production (50%). The various governments in Mali have always given priority to domestic rice production in part because rice is the only cereal in Mali that is widely grown under irrigation in this drought-prone country, it offers the greatest potential for a significant yield increase, and it is an important staple for the politically powerful urban consumers.

The high costs of rehabilitating and/or expanding the existing government-managed irrigated schemes have prompted policymakers and researchers to explore the potential for including

the largely underdeveloped farmer-managed inland valley swamps (known as *bas-fonds*) in the national strategy to ensure adequate rice supply for all. Unfortunately, very little is known about *bas-fond* rice production in Mali. Other recent publications aimed at filling this information gap have addressed various research issues including factors determining farmers' adoption of improved varieties and fertilizer, the determinants of rice yield, and the profitability of *bas-fond* rice production from the point of view of the country as a whole. This synthesis focused on the question: Is *bas-fond* rice production profitable to farmers?

OBJECTIVES: This synthesis (1) analyzes the financial profitability of *bas-fond* rice production systems, and (2) compares their profitability with that of maize, sorghum/millet, and cotton.

Bas-fonds are cultivated by small-scale farmers who also cultivate upland crops. For these farmers, interactions between rice and those other crops are important because they compete for scarce resources, especially labor. Thus, the profitability of *bas-fond* rice production should automatically



take into account the opportunity cost of not producing upland crops by using an appropriate estimate of family labor opportunity cost. But, given that it is difficult to estimate the opportunity cost of family labor accurately, the synthesis analyzes *bas-fond* financial profitability relative to three alternatives: (1) different methods or systems for producing *bas-fond* rice, (2) employment as a wage laborer, and (3) returns to family labor in producing upland crops.

METHODS AND DATA: To determine financial profitability, the synthesis uses standard enterprise budgets derived from survey data collected from a random sample of 221 rice farmers selected from a purposive sample of 12 *bas-fond* villages in Mali-Sud during the cropping season 1996-97. For the upland crops, the synthesis uses budget estimates reported by Giraudy and Niang in 1994, and labor data collected in 1988 and 1989 by the farming systems research (FSR) unit based in Sikasso. These budgets are estimated for different levels of mechanization using animal traction implements.

FINDINGS: Key findings include:

- **Numerous rice production systems exist in the *bas-fonds* surveyed, but four systems are most common:** (1) the *traditional* production system: farmers have no water control, plant "traditional" rice varieties, and apply no chemical fertilizer or herbicide; (2) the *macro-semi-intensive* production system: farmers have water control, use "traditional" rice varieties, and apply no chemical fertilizer or herbicide; (3) the *micro-semi-intensive* production system: farmers have no water control, use "traditional" rice varieties, apply no fertilizer, and apply some herbicide; and (4) the *intensive* production system: farmers have water

control, use "improved" rice varieties, and apply both chemical fertilizer and herbicide.

- **The *bas-fond* rice production costs increase with the level of intensification, and hired and family labor is the main cost component.** When family labor is excluded, the mean total cost of production is 40,338 CFA.F/ha for the *micro-semi-intensive* system, 58,815 CFA.F/ha for the *traditional* system, 69,492 CFA.F/ha for the *macro-semi-intensive* system, and 147,407 CFA.F/ha for the *intensive* system. These costs correspond to a mean average production cost of 28 CFA.F/kg of paddy produced in the *micro-semi-intensive* system, 58 CFA.F/kg of paddy for the *traditional* system, 66 CFA.F/kg of paddy for the *macro-semi-intensive* system, and 62 CFA.F/kg of paddy for the *intensive* system.

When family labor is included and valued at 500 CFA.F/day, the mean total cost of production of each system increases by 19-51%, ranging from 61,088 CFA.F/ha for the *micro-semi-intensive* system, to 80,148 CFA.F/ha for the *traditional* system, 88,158 CFA.F/ha for the *macro-semi-intensive* system, and 175,824 CFA.F/ha for the *intensive* system. Similarly, these costs correspond to a mean average production cost of 43 CFA.F/kg of paddy produced in the *micro-semi-intensive* system, 78 CFA.F/kg of paddy for the *traditional* system, 72 CFA.F/kg of paddy for the *macro-semi-intensive* system, and 74 CFA.F/kg of paddy for the *intensive* system.

Although the relative importance of the components of the *bas-fond* rice production costs differs from one system to another, hired and family labor is the main component, accounting for 75% of total costs in the *traditional* system, 86% in the *macro-semi-intensive* system, 86% in the *micro-*



semi-intensive system, and 44% in the *intensive* system.

• **All four *bas-fond* rice production systems are financially profitable.** For all systems, the return per day of family labor (1,374 to 2,971 CFA.F/day) is higher than its opportunity cost (500 CFA.F/day). In other words, the costs of producing a kg of paddy (43 to 78 CFA.F/kg) are lower than the farm-gate paddy producer price (115 CFA.F). Another analysis shows that *bas-fond* rice production is also economically profitable. This means that the contribution of *bas-fond* rice production to Mali's overall economy is great enough to justify using scarce government resources required to develop these systems further.

The most profitable of the four systems is the *micro-semi-intensive* system (43 CFA.F/kg of paddy produced and a return to family labor of 2,971 CFA.F/day). This system is so profitable in part because it is also the system that uses the least labor per ha, primarily because of significant herbicide substitution for hired labor at weeding. The least profitable of the four systems is the *traditional* system (78 CFA.F/kg of paddy and 1,374 CFA.F/day of family labor). The *intensive* system is the farmers' second best alternative (74 CFA.F/kg of paddy, and 2,194 CFA.F/day of family labor).

The superior profitability of the *micro-semi-intensive* system over the more intensive technological package (i.e., *intensive* system) highlights the important contribution of herbicide as a labor-reducing technology and thereby the impact of labor cost on profitability. Similarly, its superiority over the *macro-semi-intensive* system suggests that the existing quality of a water control

infrastructure (i.e., dams across streams with no internal water control) is ineffective. However, complementary investment in plot-level water control (e.g., internal bunding) could significantly improve the effectiveness of these infrastructures.

These positive results are based on mean or median values of budget items and they do not take into account the production risk associated with the erratic rainfall and poor water control. To examine this issue, the study looked at the distribution of the net return per day of family labor among the sampled farmers in each of the four *bas-fond* systems. For each farmer, the family labor requirement at harvest and threshing were adjusted in direct proportion to the corresponding yield difference to the average yield. Figures 1 to 4 show the distribution of net return per day of family labor among the sampled farmers in each of the four production systems.

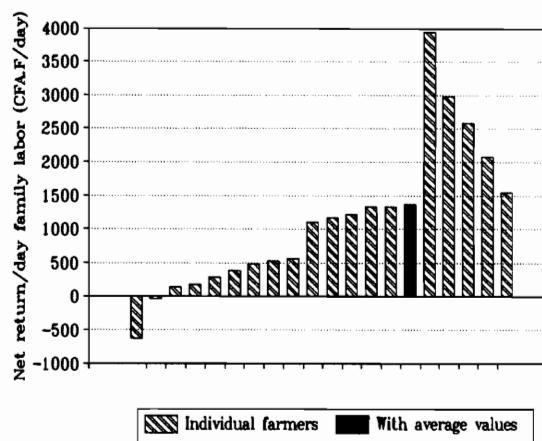


Figure 1. Net Return/Day of Family Labor Among Farmers (N=19) Following the *Traditional* System, Mali, 1996.



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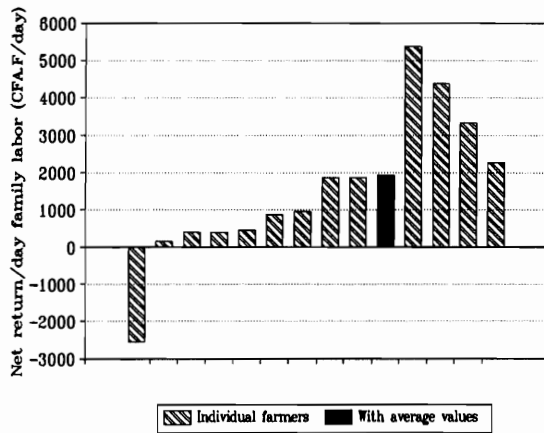


Figure 2. Net Return/Day of Family Labor Among Farmers (N=13) Following the *Macro-Semi-Intensive* System, Mali, 1996.

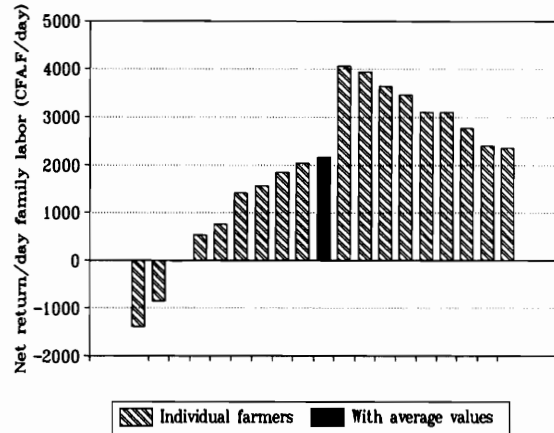


Figure 4. Net Return/Day of Family Labor Among Farmers (N=18) Following the *Intensive* System, Mali, 1996.

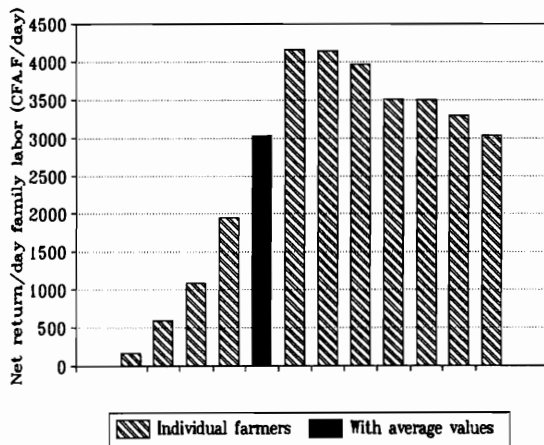


Figure 3. Net Return/Day of Family Labor Among Farmers (N=11) Following the *Micro-Semi-Intensive* System, Mali, 1996.

These figures show that, although on the average each of the four *bas-fond* rice production systems is profitable to farmers, this enterprise is not profitable for some farmers. These results indicate that, **even within a given *bas-fond* rice production system, the profitability of the rice enterprise is quite variable.** Thus, a key research question is to determine the factors that account for this variability. **From a production risk standpoint, the *micro-semi-intensive* system is the most attractive of all four systems** because it is the only system for which all sampled earned a positive net return per day of family labor (16 to 4,142 CFA.F/day). The distribution of these returns is also skewed to the right of the average value, indicating that seven of the 11 farmers (64%) using this system earn more than that average. In addition, among the 11 farmers using this system, only one (9%) earned positive net return per day that were less than the assumed opportunity cost of family labor.

The distribution of net return per day of family labor among the sampled farmers in each of the



four production systems is based on small sample sizes (less than 20). Furthermore, this distribution captures not only the intra annual production risk associated with poor water control, but also the inherent farmer-to-farmer variability in profitability attributable to their resource endowments. But, there exists an important production risk due to year-to-year variability associated with the prevailing erratic rainfall condition that is not captured in this analysis.

- **The rice enterprise is more profitable to farmers than the maize, sorghum/millet, and cotton enterprises.** When the opportunity cost of family labor is assumed to be equal to zero, these four crops are profitable to farmers. However, when the opportunity cost of family labor is set to 500 CFA.F/day, the return to a day of family labor from the rice (1,374-2,194 CFA.F/day), maize (1,128-1,318 CFA.F/day) and sorghum/millet (823-1,072 CFA.F/day) enterprises are higher than labor opportunity cost. The cotton enterprise yields the lowest return to a day of family labor among the four crops being compared (341-591 CFA.F/day).

This result indicates that, for farmers, *bas-fond* rice production would constitute an economically meaningful complement to the upland crops. However, it is important to recognize that the cotton enterprise looks unprofitable in part because most fixed costs of the upland crops are attributed to cotton production, based on the consideration that those inputs (i.e., animal traction) are primarily used in the cotton fields. As a result, because the other household crops free-ride on cotton for farm-fixed investments, they tend to be very profitable, compared to cotton. However, it is likely that farmers look at the profitability of the entire grain-cotton system,

which includes the spillover benefits from cotton in terms of access to inputs (some of which go to food crops) via the cotton development agency's *Compagnie Malienne de Développement des Textiles (CMDT)* credit system. Furthermore, the guaranteed cotton cash flows permit better timing of farmers sales of food crops.

In addition, for the country as a whole, cotton production offers important growth linkages with the livestock and processing subsectors, as well as demand and fiscal linkages.

POLICY IMPLICATIONS AND RECOMMENDATIONS: Our earlier discussion highlights important policy implications:

- Clearly, profitability analysis indicates ***bas-fond* rice production represents a significant alternative source of income to farmers.** Granted there are some constraints to its extensification and greater intensification, the associated financial profitability and utility value suggest that **if given greater attention, it could be a major contribution to improving household food security.**

In order for *bas-fond* rice production to constitute a reliable source of income, it is necessary to address constraints *bas-fond* farmers face. First, group discussions with farmers revealed that they face labor constraints at weeding, a very tedious operation done manually. The large share of family and hired labor cost (relative to other cost items) in each of the four most common *bas-fond* systems (44-86%) suggests that **if scientists succeed in identifying relatively low-cost labor-saving technologies, the financial profitability of these systems could be significantly higher.** Efforts to reduce labor costs should assess the potential of reducing labor input through the



substitution of adapted and economically justifiable labor-saving technologies such as herbicide, mechanical threshing, sickle harvesting, and better water control systems to reduce weed pressure.

In addition, it is important to recognize that **currently the most pressing constraint to achieving higher rice yields is not the physiological potential of the varieties farmers plant. Rather, the inadequate plot-level water control and the inadaptability of "improved" varieties to the poor water control, soil infertility, pests and diseases, and the timeliness and quality of land preparation are the key factors that prevent farmers from fully exploiting the full potential of the varieties they currently plant.** To carry out the research required to generate appropriate technologies suitable for intensifying *bas-fond* rice farming, **the Malian agricultural research system must mobilize a political constituency in support of agricultural research** by becoming pro active advocates of the value of agricultural research, especially given the limited political power of the farmers.

Finally, **despite the major role that women play in *bas-fond* rice farming (88% of rice farmers), existing institutional arrangements do not provide women direct access to new technologies and credit.** Currently, the main source of "improved" technology is the CMDT, which only provides credit to cotton farmers. Because all cotton farmers are men, many of whom are not willing to borrow for their wives, very few women farmers have direct access to modern inputs.

- Given the superior profitability of *bas-fond* rice production relative to cotton and the role and

influence of the cotton development agency in the same area in which rice is produced, **greater intensification of the *bas-fond* rice production would have significant implications on the cotton enterprise.** Thus, a critical question for future research is to determine these implications. For example, would greater intensification of *bas-fond* rice production induce a significant number of farmers to reduce or abandon cotton cultivation, and thereby decrease its production?

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This synthesis is a summary of a paper entitled: Financial Profitability of Mali-Sud *Bas-Fond* Rice Production Systems. It can be obtained by writing to the authors:

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