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# COST BENEFIT ANALYSIS OF USAID/MALI'S SORGHUM AND MILLET VALUE CHAIN INTERVENTIONS: FINAL SUMMARY FINDINGS

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# Learning, Evaluation and Analysis Project-II (LEAP-II)

## Cost Benefit Analysis of USAID/Mali's Sorghum and Millet Value Chain Interventions

### Final Summary Findings

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# **COST-BENEFIT ANALYSIS OF USAID/MALI'S MILLET AND SORGHUM VALUE CHAINS UNDER THE ARDT\_SMS PROJECT: SUMMARY FINDINGS**

## **PROJECT DESCRIPTION**

USAID/Mali's ARDT\_SMS project falls within a larger portfolio of U.S. Government interventions in Mali to improve food security, under the Feed the Future initiative. The project commenced in 2014 and will be completed in 2017. The ARDT\_SMS project is implemented in line with Government of Mali's (GoM's) development strategies toward achieving the food security of small farmers and national self-sufficiency in sorghum and millet production.

The focus of the ARDT\_SMS project is on the diffusion of technologies of proven efficacy for enhancing sorghum and pearl millet production systems under the environmental and socio-economic realities of Malian farmers. The major agro-ecological and production system differences in the Mopti and Sikasso regions as well as the presence and capabilities of different implementing partners led to the development of two different approaches for the Sikasso and Mopti regions. Interventions in Mopti are focused on productivity of the millet crop, while those in Sikasso target the sorghum crop.

The two main activities of the ARDT\_SMS projects are:

1. Establishment of farmer field schools to enhance farmers' knowledge of new sorghum and millet production technologies; and
2. Establishment of demonstration plots to promote productive technologies by showing farmers potential productivity when using new technology and techniques.

The project promotes specific technologies to improve millet and sorghum crop productivity including:

- Introduction of improved varieties and hybrids of millet and sorghum;
- Seed treatment for controlling early season insect pests and diseases using fungicides;
- Introduction of intercropping of millet and sorghum with cowpea;
- Weed management and micro dose application of fertilizers; and
- Biological control of the millet head miner moth (for millet only).

The cost benefit analysis (CBA) was conducted on the above-mentioned interventions and provided positive results. According to the table below, the impact of USAID's investment is significantly positive with an economic net present value (ENPV) of US\$ 14.33 million and an economic rate of return of 24 percent. For the country of Mali overall, there is also a large ENPV of US\$ 23.8 million.

**Table 1. Summary Impact Figures**

VALUE CHAIN	ENPV <sup>1</sup> MALI PERSPECTIVE	PV** USAID INVESTMENT	NPV USAID PERSPECTIVE
Millet	USD 8.41 m	USD 4.73 m	USD 3.68
Sorghum	USD 15.39 m	USD 4.73 m	USD 10.65
<b>Total</b>	<b>USD 23.80 m</b>	<b>USD 9.47 m</b>	<b>USD 14.33 m</b>
ERR <sup>2</sup> USAID Perspective			24%

## KEY RISK AREAS

The key risk factors affecting financial and economic outcomes of the ARDT\_SMS project interventions include:

1. **Purchasing Improved Seed Varieties.** Culturally, farmers are not used to purchasing seeds in Mali. This cultural tradition of using seeds from one's own production has been one of the major constraints to the success of previous interventions focused on introducing improved varieties of crops.<sup>3</sup> Although the ARDT\_SMS project has focused attention on this issue, including a media campaign to disseminate knowledge of the benefits of using improved seed varieties, the time required to bring about sustainable change may not be sufficient.
2. **Focus Only on Production Improvements.** Despite the potential of new production technologies to improve household income, limited attention of the ARDT\_SMS project on other value chain constraints beyond productivity-related issues (such as market access and access to credit) raises a major concern. With this limited focus, potential benefits of the project activities may be reduced. For instance, a 10 percent decrease in an adoption rate reduces ENPV from a USAID perspective by one-third to US\$ 9.57 m.
3. **Changes in Yields.** Consultations with stakeholders revealed that production practices promoted by the ARDT\_SMS project result in a 30 percent and 60 percent increase in yields of millet and sorghum, respectively. However, this variable is very sensitive to changes making it a significant risk factor for financial and economic returns of project interventions. The ENPV declines to a marginal US\$ 0.63 million – an 83 percent drop – if farmers on average only achieve a 20 percent increase in millet yields. In the case of sorghum, an average increase in yield of only 50 percent would reduce ENPV from a USAID perspective by 27 percent to US\$ 7.74 million.

<sup>1</sup> In finance, the net present value (NPV) is defined as the sum of the present values (PVs) of incoming and outgoing cash flows over a period of time. Economic Net Present Value (ENPV) then looks at incoming and outgoing resources which are defined beyond just cash flows and are described as benefit and cost resource flows, respectively.

<sup>2</sup> The Economic Rate of Return (ERR) differs from the Financial Rate of Return (FRR) in that it takes into account the effects of factors such as price controls, subsidies, and tax breaks to compute the actual cost of the project to the economy. Internal Rate of Return (IRR) is the (break-even) interest rate at which investors can expect to receive positive returns.

<sup>3</sup> "Seed Value Chains for Sorghum and Millet in Mali," International Food Policy Research Institute, 2008.

4. **Beneficiaries Switching from Maize to Improved Sorghum.** Production of local sorghum in the Sikasso region has been gradually replaced by maize cultivation. Promotion of maize production by the government and donors can partially explain this trend. The analysis also revealed that the use of existing production technologies results in low financial benefits of FNPV US\$ 292/ hectare (ha), which may explain the phenomenon. In addition, the government provides a 50 percent subsidy on fertilizers used to cultivate maize, which boosts financial returns for farmers and acts as an additional incentive to switch from local sorghum cultivation. The financial returns of improved sorghum cultivation practices promoted by the ARDT\_SMS project are higher than the returns from maize production. Therefore, the analysis assumes that 60 percent of project beneficiaries will switch from maize production to improved sorghum production, and the remaining 40 percent of beneficiaries will come from local sorghum. This assumption, however, represents a significant risk factor to the estimated economic returns. If all project beneficiaries do in fact switch from local sorghum, the sorghum VC ENPV from a USAID perspective will drop from US\$ 10.65 million to US\$ 3.13 million. Total USAID returns will drop from US\$ 14.33 million to US\$ 6.81 million. This significant impact is due to the high contribution of fiscal savings due to reduced fertilizers subsidies (from the switch of crops from maize to improved sorghum) to the economic returns.

## **BENEFICIARY PROFILE**

Total beneficiaries are currently 27,000 for the ARDT\_SMS project. The following beneficiary information was provided to the team by the ARDT\_SMS project. ARDT\_SMS project provides direct support to three groups of farmers:

1. **Millet based household production systems.** Situated in the Mopti region, these 10- person (on-average) households mainly produce local millet for consumption and sale. Most farm households are extremely poor with manual equipment, and very limited access to inputs, and very small landholdings (less than five ha). The ARDT\_SMS project has provided direct support to approximately 17,000 farmers in this category to switch from local millet to improved millet production.
2. **Sorghum and cotton-based household production systems.** Local sorghum and cotton are the major crops for these households (with 15-people, on average) situated in the northern region of Sikasso. Most of them have equipment limited to animal traction and depend on the cotton crop to receive inputs on credit. The ARDT\_SMS project has provided direct support to approximately 5,000 farmers in this category to switch from local sorghum to improved sorghum.
3. **Maize and cotton-based household production systems.** These households with an average of 15 people mainly produce maize and cotton. They can also have small local sorghum plots. They are equipped with animal traction and receive inputs on credit from Compagnie **malienn**e pour le développement du textile (CMDT). The ARDT\_SMS project has provided direct support to approximately 5,000 farmers in this category.

## KEY CONCLUSIONS AND RECOMMENDATIONS

The following are the key conclusions and recommendations for USAID from the overall analysis:

- 1. Support the increased use and purchase of hybrid and improved seed varieties.** Use of hybrid and improved seed varieties is more likely to ensure long term success of the project. In this instance, farmers will need to purchase seeds every year instead of the current practice of keeping seeds from their own harvest to plant them the next year. Farmers are culturally not used to purchasing seeds. Currently the project provides free sorghum and millet seeds to the attendants of the field schools. Farmers therefore have limited exposure to purchasing seeds directly from the market. With Phase II, the project is expecting to improve access to high quality seeds by increasing seed production. Farmers, however, only have one production cycle to begin purchasing seeds directly from the market before the anticipated project end date. One production cycle is a very short period of time for addressing any challenges that may arise. This short timeframe can potentially threaten sustainable access to new seed varieties, leading farmers to revert back to previous practices.
- 2. Reinforce improved seed production and distribution.** The improved seed market has not yet developed as there are currently only a few cooperatives producing certified improved and hybrid millet and sorghum seeds. Most of what is already produced is sold to the current project, so there is a need to develop a distribution service to farmers. While Phase II of the project will focus on increasing seed production over a one-year period, this timeframe may not be enough to create sustainable seed cooperatives. USAID may want to consider including in follow-on project activities that focus on further development of input production and distribution channels, which may be necessary to ensure improved seeds (and more generally inputs) are available to farmers.
- 3. Improve coordination at the implementing partner level.** Coordination of activities across current project implementing partners is relatively weak, resulting in a “silo approach” to project implementation in certain areas. This limited coordination can reduce the efficiency and overall impact of the project. In the 2014-15 farm year, there were instances of the same farmer receiving ARDT\_SMS project training from two different implementing partners and with two different methodologies in the Sikasso region.<sup>4</sup> This risk can be managed by introducing consultative platforms for partners and standardized procedures and training materials for organizations working in the same region. However, the lead organization, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), might strengthen its guidance and leadership activities to ensure consistency across partners in reaching the beneficiaries.
- 4. Improve coordination with other USAID interventions on the millet and sorghum VCs.** USAID is financing the Cereal Value Chain (CVC) project to promote agricultural sector growth through increased value chain integration and competitiveness in the sorghum/millet and rice value chains in Mali. CVC and ARDT\_SMS projects are working in the same area (and sometimes in the same villages). It would be useful for these two projects to coordinate their activities and to

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<sup>4</sup> Field interviews with farmers in Zangasso and N'tosso (December 12, 2015) where CMDT, AOPP and CRS are implementing ARDT\_SMS activities.

find synergies. In particular, it would be beneficial to ensure that ARDT\_SMS beneficiaries are more integrated into the millet and sorghum value chains through the CVC project. These synergies would only further support both projects' results and support better sustainability.

5. **Leverage synergies with other projects carrying out similar work in the Sikasso and Mopti regions.** Adoption of new technologies requires commitment by farmers to change current production practices. This commitment can only be obtained when farmers have access to all required inputs, credit, and markets to sell their production. Because the ARDT\_SMS project is focused mostly on productivity improvements, the project should look to leverage support from other donors/projects in areas beyond production to reduce value chain fragmentation and further support its beneficiaries.

## **METHODOLOGY AND MODEL DESCRIPTION**

The Integrated Investment Appraisal (IIA) methodology is used to evaluate both the financial and the socio-economic effectiveness of FED interventions and assess their impacts from various perspectives. IIA is the only single-model approach to quantify the impact of every project-related transaction, from the investor (USAID) to tax revenues, fiscal expenditure, consumers, and the environment. Major development banks, donor agencies, and public investment units use this methodology in project evaluations.

The analysis is applied to a 20-year evaluation period, 2012-32, and compares “with-project” and “without-project” scenarios on an incremental basis, with real financial and economic discount rates set at 12 percent. The model is constructed on an annual basis with a base year of 2015. The results are expressed in 2012 prices. The model first derives nominal cash flows, which are then discounted using corresponding price indexes to derive real cash-flow statements. The analysis uses World Bank inflation and exchange rate data.