

Implementing Effective Warehouse Receipt Financing Systems

Lessons from a pilot WRS project in the Senegal River Valley

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Context

Farmers in developing countries, including in Sub Saharan Africa, face financial constraints and storage access limitations, which often expose them to pressure to sell immediately their production right after harvest and buy it later at a much higher price.¹ Warehouse Receipt Systems (WRS) financing, through which farmers can bring agricultural commodities to a certified warehouse and receive receipts certifying the quantity, quality and location of the commodity stored, which in turn can be used as collateral to access credit from financial institutions, is gaining popularity, as a potential solution.

However, there remains limited empirical evidence on the impacts of WRS on smallholder farmers in developing countries. To contribute to filling such gap, the Government of Senegal (GoS) partnered with the Development Impact Evaluation (DIME) department of the World Bank Group (WBG), and the International Financial Corporation (IFC) to embed a rigorous impact evaluation design in a pilot WRS project. The pilot was led by the Ministry of Commerce (MoC)², with technical assistance from the IFC, focusing on the rice sector in the Senegal River Valley.

This brief summarizes the lessons learned from such pilot and aims at providing useful guidance to inform the implementation of WRS in Senegal and beyond.

Intervention

In 2018, the IFC, in partnership with DIME and the Senegal Ministry of Commerce, led the implementation of a WR financing pilot, with rice farmers in the Senegal River Valley, during the post harvest period of the dry season³. As part of the pilot, selected farmers were offered the opportunity to bring their rice production to a designated warehouse⁴, and received a warehouse receipt that they could take to CNCAS, a partner bank in the pilot⁵. At the bank, farmers could use their receipt against access to credit for up to 80% of the value of

the product in storage, at a 5% annual interest rate, pro-rated to the duration of the credit. The warehouse was chosen based on its proximity to rice production areas, and also because it met the minimum requirements defined by the WRS regulatory framework adopted by the parliament in 2017⁶. Given the limited capacity of the warehouse compared to the rice farmer population in the area, there was a selection process that followed the following steps: (i) a sensitization campaign to educate farmers about the WRS and stimulate their interests; (ii) a listing of farmers via the rice farmers' associations in the area, during which farmers had indicated their interest in participating in the pilot; (iii) a computer-based lottery process to select the farmers who would be given access to the warehouse; (iv) a high frequency data collection starting right after harvest and spanning the whole post-harvest period, to capture rice sales, prices, and storage from individual farmers.

Research Questions and Methods

This pilot is designed as a Randomized Controlled Trial (RCT), to answer the following primary question: **What are the impacts of a WRS on access to finance, sales prices, and revenues of rice farmers?** The random selection insures that the farmers in treatment and control groups are similar and that the comparison between these groups after the program implementation provides unbiased estimates of the treatment effects. As shown in Figure 1, there was a two step randomization process involving a total of 1066 farmers from 120 producers' organizations (POs). In the first stage, listed POs were randomly assigned to treatment and control groups. The control group received no intervention while, in the treatment group, farmers inside each PO were assigned (randomly) to full treatment and contamination groups. The full treatment farmers were officially offered the opportunity to bring their rice to the warehouse in exchange for a receipt, while farmers in the contamination groups belong to the same

¹Marshall Burke, Lauren Falcao Bergquist, and Edward Miguel. *Sell Low and Buy High: Arbitrage and Local Price Effects in Kenyan Markets*. Tech. rep. National Bureau of Economic Research, 2018.

²MoC=Ministère du Commerce, de la Consommation, du Secteur informel et des PME.

³The dry production season, locally called "saison sèche chaude", goes from January to July and its commercialisation lasts generally between July and December.

⁴The warehouse was rented specifically for the purpose of this pilot.

⁵CNCAS = Caisse Nationale du Crédit Agricole du Sénégal partnered with the MoC to support the pilot WRS.

⁶Loi numéro 2017-29 du 14 juillet 2017 portant sur le Système de Récépissé d'Entrepôt de Marchandises au Sénégal.



POs as the treatment farmers but were not allowed to bring their products to the warehouse. The contamination groups are primarily useful for capturing within POs spillover effects from the treatment. This two-stage randomization process yielded overall 363 farmers in treatment, 242 in contamination, and 461 in control groups.

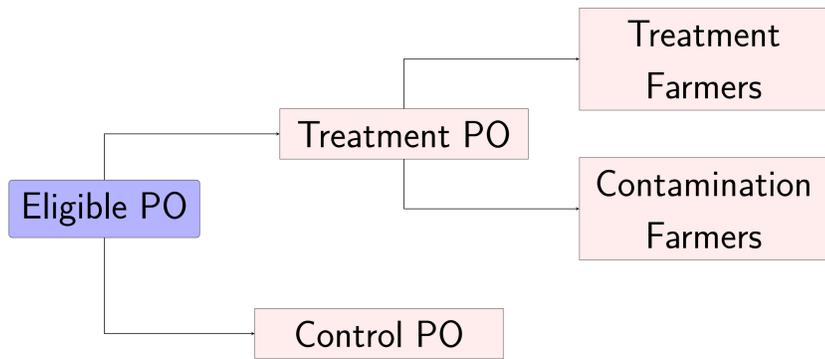


Figure 1: Study Design

Results

Low take up rate

Out of the 363 farmers assigned to the full treatment group, only 8 used the warehouse to deposit their rice. With such a low participation rate (around 2%), we could not exploit the research design and answer the intended questions. However, we leveraged the large amount of quantitative and qualitative data collected, to explore the factors that had af-

ected participation. We conclude that limited arbitrage opportunities in the rice sector, high transaction costs, and limited marketable surplus, may have curbed participation of farmers in the WRS pilot.

Limited arbitrage opportunities

In a classical storage model, rational farmers are expected to store as long as the discounted expected future price is greater than the current price plus the unit storage costs.⁷ This suggests that if farmers do not expect prices to increase sufficiently during the post-harvest period to justify the costs of bringing their rice to the warehouse and go to the bank to exchange the WR against some credit, they will not have the incentive to participate. We explore this using the high frequency farmers sales price and, as shown in Figure 3, we found that average paddy sales prices varied between 124 and 126 FCFA/kg during the post harvest period (August-December). A simple cost-benefit analysis, considering the transaction costs of the 8 farmers who actually participated, and assuming no discounting, revealed that expected future prices should reach at least 133FCFA/kg, to justify participation in the WRS. The low participation rates in the WRS seems consistent with a rational expectation by farmers about limited increase in future price trends. Nevertheless, there were still cases of paddy sales during all those months, suggesting that some farmers did hold positive storage, though primarily at home.

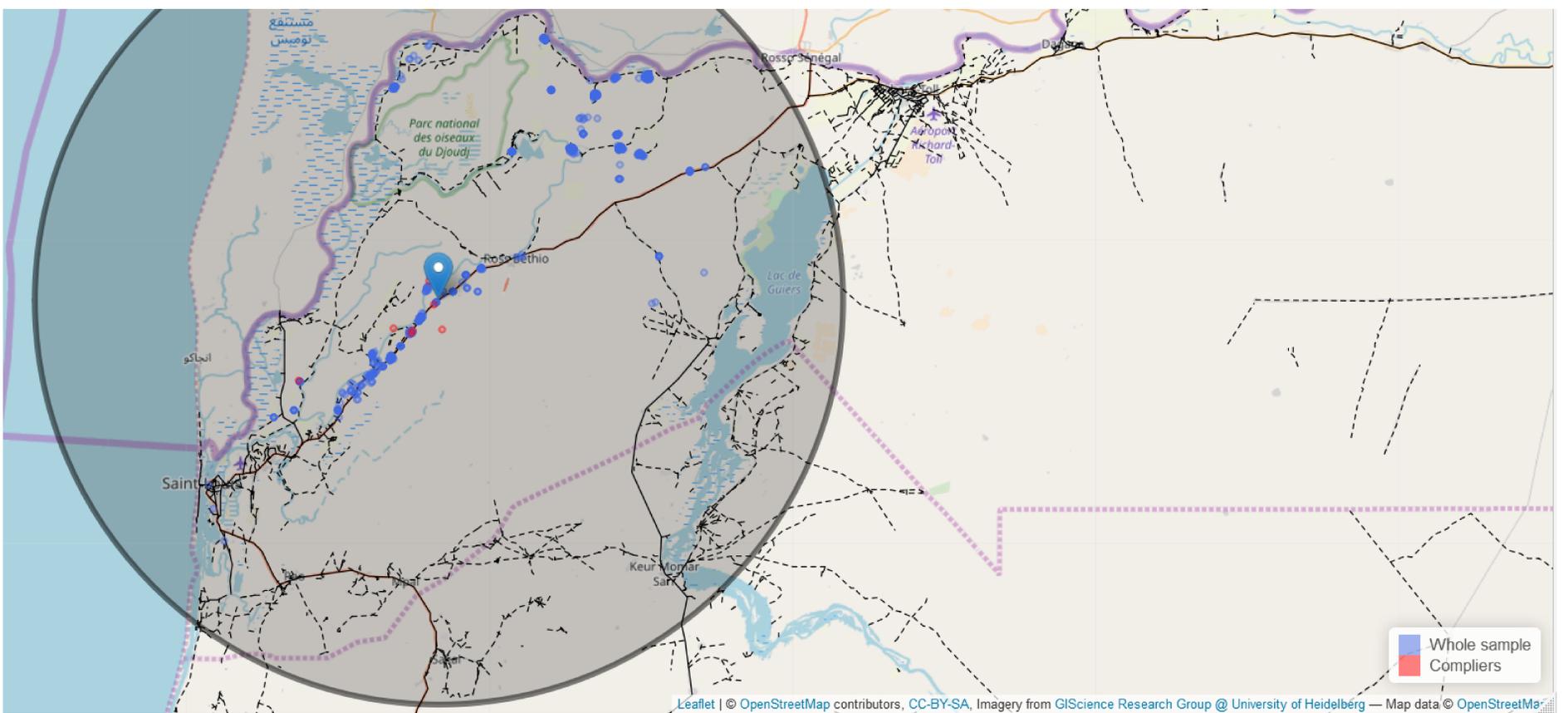


Figure 2: Map with compliers versus the whole sample. The central point shows the position of the warehouse, red points show position of compliers, while the small blue dots show position of other farmers belonging to the sample but who did not deposit their rice

⁷Atanu Saha and Janice Stroud. "A household model of on-farm storage under price risk". In: *American Journal of Agricultural Economics* 76.3 (1994), pp. 522–534.

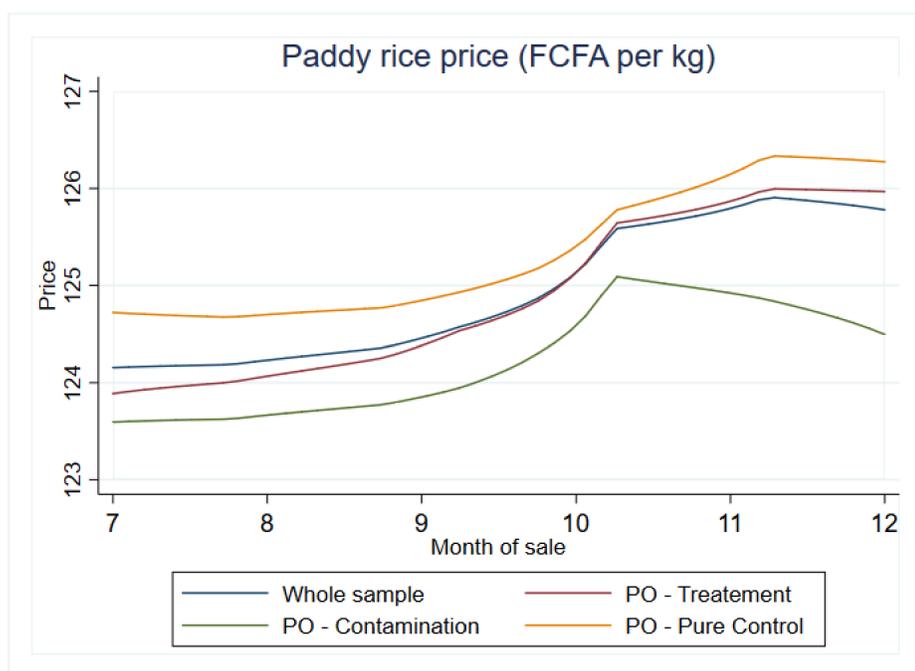


Figure 3: Rice sales prices during post harvest season

High transaction costs

High costs of using the WRS, including transportation costs, handling and storage fees, interest rate, etc., could all affect farmers' participation in the WRS. GPS data collected on farmers locations indicated that the location of the warehouse rented was relatively far from the key production area (Figure 2). The median distance between farmers locations and the warehouse was 33.74 km. On the other side, the median distance for producers who participated in the pilot was 17.68 km, which is much lower than the overall sample one. This suggests that distance may have played a role in the decision to use the WRS. In addition, the rural feeder roads in the pilot area were in bad conditions and, with the heavy and continuous rain, were hardly accessible. Those conditions may have increased transactions costs so high as to completely deter rice farmers from participating in the WRS.

Moreover, an endline survey implemented at the end of the season asked producers to self report why they did not participate in the WRS. In addition to the factors reported above, many of them mentioned not having enough marketable surplus. After paying their debts in kind for inputs and labor received on credit, many farmers were mainly left with just enough paddy for auto-consumption. Therefore the limited quantities they had could not justify economies of scale large enough to make the participation in the WRS worth it. The figure 4 summarizes the reasons reported by farmers.

Concluding Remarks

We embedded an experimental design in a WRS pilot, in the rice sector, in the Senegal River Valley, to understand the impacts of such system on farmers' access to finance, storage patterns, sales prices, and income. Due to a low take up of the system (2%), we lacked the statistical power to answer the

primary questions of interest. However, we drew important insights for WRS implementations, based on the qualitative and quantitative data collected:

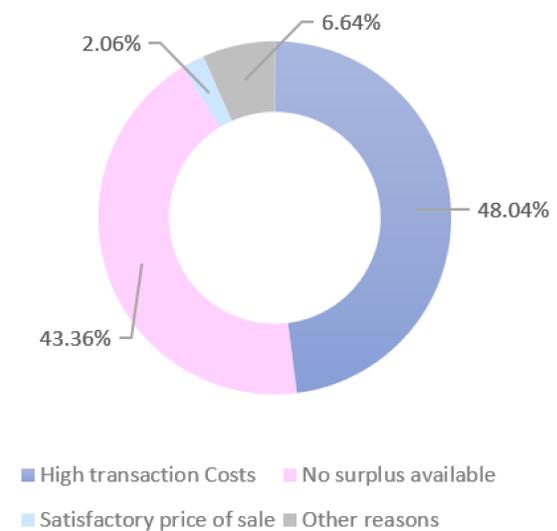


Figure 4: Reasons reported by respondents for non participating in the pilot

- The post harvest arbitrage opportunities justifying WR Financing systems do not always materialize for all types of commodities in all contexts. In cases where post harvest prices do not increase sufficiently to compensate for the costs of participation, farmers will likely not participate in a WRS. Therefore, a thorough investigation of price trends and forecasts is important for guiding the types of commodities to target with a WRS.
- When designing WRS, it is important to take into account the transaction costs faced by the potential users. Large transactions costs arising from remoteness, poor transportation infrastructures, and other fees related to storage and borrowing, increase the costs of participation relative to the benefits and discourage farmers from participating. Having warehouses located near the production areas, for easy access, has the potential to decrease significantly transaction costs and increase participation. A potential way to reduce those constraints of remoteness would be to encourage the private sector to engage and invest in the warehousing industry and provide professional warehousing services.
- When introducing a WRS in a new context, with farmers who might not all be financially savvy, it is important to put in place a sound communication and financial education strategy that not only explains sufficiently the benefits from adopting the system, but also provides enough information to make farmers comfortable and trust the system enough to want to experiment it. Because a WRS can appear complex and even risky to many farmers, a local and trusted focal point who can answer all questions timely should be available and easily accessible by farmers.