



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



SENEGAL Naatal Mbay

Cereal Value Chains

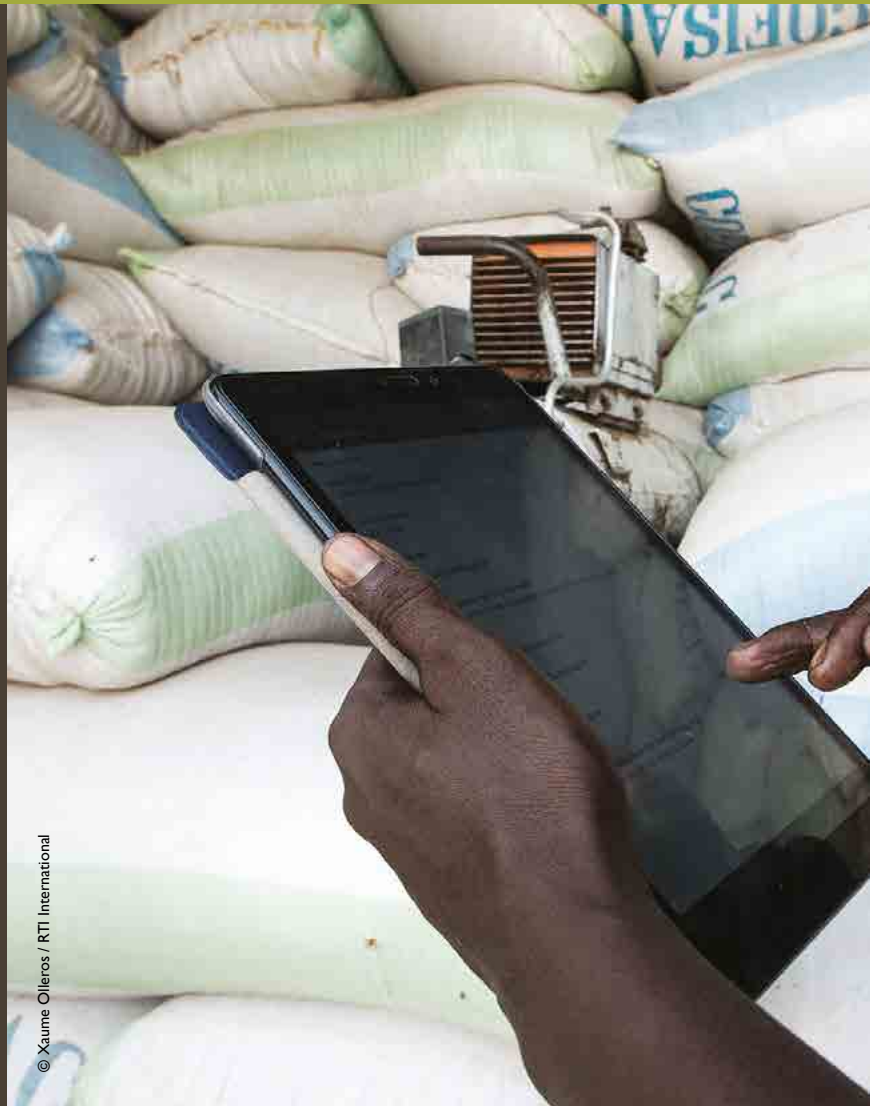
COMPUTERIZED STOCK MANAGEMENT PLATFORM

In Senegal, the rapid growth of rice stocks under bank guarantee has led to a sharp increase in credit granted to both network producers and industrial rice mills. Supporting this growth, starting in 2016, a locally developed computerized platform has facilitated bank control of aggregated rice stocks and the effective marketing of those stocks under guarantee, until loans are repaid.

2019

INTRODUCTION

Feed the Future and CNCAS have successfully implemented in the Senegal River Valley a contracting system that links producers, banks and industrial rice mills. This system generates physical, financial, and informational flows that contribute to enhancing the performance and competitiveness of the irrigated rice value chain. To support the expansion of this trading framework and to take care of the needs of all the stakeholders, a computerized stock management platform was put in place.



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BACKGROUND

For years, the Senegalese government has promoted credit to rice producers and private rice mills in the Senegal River Valley through the Senegal National Agricultural Bank (CNCAS). Loans that were not repaid eroded credit lines, requiring a political commitment to cancel the debts and restore solvency to the system. Loans in the Senegal River Valley (SRV) region had stagnated to around US\$ 6 million (3 billion CFA francs), well below what is needed to cover the input requirements of 30,000 small-scale rice farmers in the region and of industrial rice mills expected to acquire their stocks.

The system of contract farming and integrated credit¹, driven by CNCAS with the support of Feed the Future, stabilized producer prices at relatively high levels, created economies of scale, and improved the quality of the raw material. Consequently, the local rice sector has become a profitable

activity for both farmers and rice mills. CNCAS and other banks have monitored the trends and increased seasonal credit portfolios above historic highs. The rapid expansion of the system, however also created conditions associated with a potential loss of control. With the system expanding, it was no longer possible for the bank's branches to regularly visit nearly 100 storage sites located along a 375 kilometer stretch of the SRV, in order to monitor the consolidation process which was the critical control measure of the guarantee system. Similarly, stock movements at the level of the rice mills made it difficult to manage credit lines for stocks, and this slowed down transactions for the purchase of raw materials and the sales of finished products. Finally, the volume of activity made it difficult to monitor the local supply so that the authorities could manage the level of imports and guarantee a continuous supply in the country.

Exchange Rate : Financial data originally presented in this note has been converted at the standard project exchange rate of US\$ 1.00 = 500 FCFA.

PHOTO. PAGE 1

Warehouse operator and his tablet.

PHOTO. PAGE 2

The stock monitoring platform used throughout the Senegal River Valley is based on a Cloud database, fed by a "Made in Senegal" application

¹. See capitalization notes on "Integrated Financing" and "Contracting."

TECHNOLOGY DESCRIPTION

Since 2014, an integrated credit mechanism has been in place to finance the rice value chain in the Senegal River Valley. To support the rapid expansion of this system, a computerized digital platform, rooted in a digital-upgrade of the bank's stock monitoring procedures was created. It is a Cloud-based database, powered by simple applications and managed by the warehouse managers of producer networks and community agents using tablets. All of this takes place under the supervision of a local IT services firm.

The data is used by bank branches to monitor the storage and sales operations associated with the pledged stocks.

Thus, the platform was designed to execute targeted inventory control tasks linked to credit collateral and recovery. It makes it possible for bank staff to:

1. Analyze and control the aggregation of paddy rice stocks in producers' storage sites until their credit has been fully covered and hence their loans repaid;
2. Have an overview of the movements of paddy rice (raw material) and white rice (processed product) stored in rice mill warehouses and ensure at all times that the level of stocks is sufficient to cover their outstanding credit;
3. Identify groups that are late in aggregating their repayment stocks and to take corrective action as soon as possible, if necessary;
4. Notify the rice mills when the stocks of raw materials (paddy stocks) available in the producers' warehouses reach significant levels so that they can be picked up as soon as possible. Priority is given to early deliveries at aggregation points that are deemed at-risk in the advent of early rains, due to poor storage infrastructure or road access.

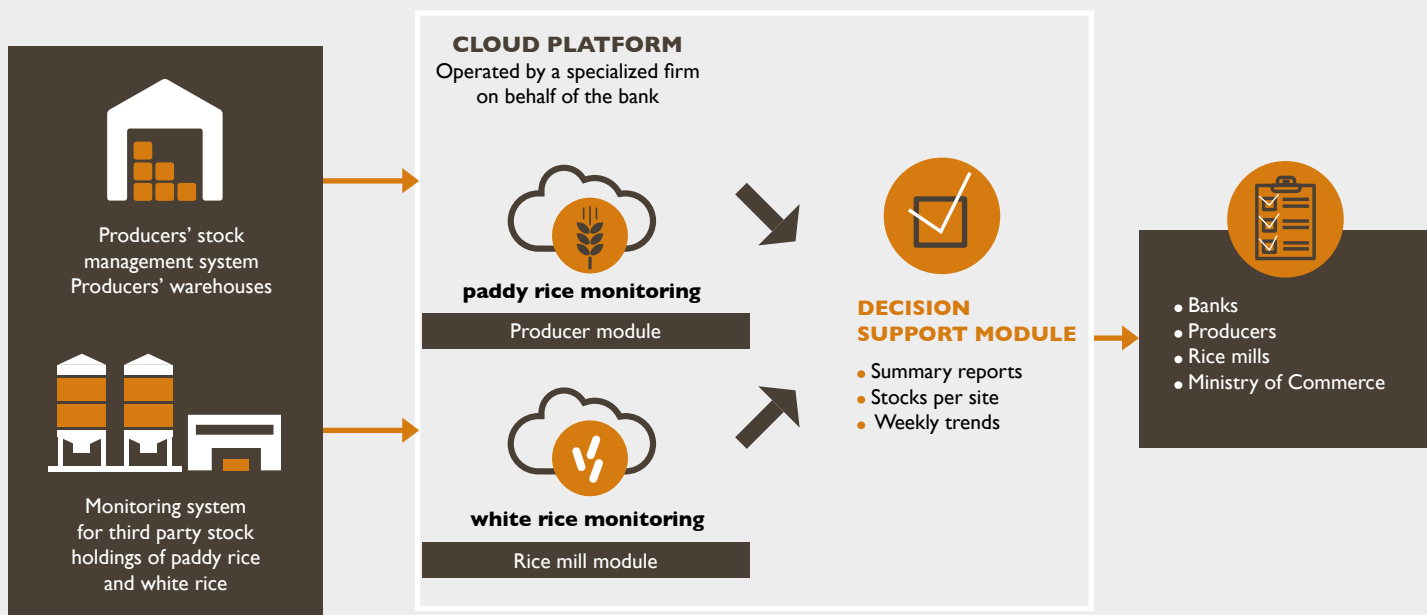
The platform started with an initial module that centralizes information on paddy rice stocks held by producer organizations. This facilitates the tracking of repayments for seasonal credit granted to producers by the bank. This platform is fed with data by the warehouse operators located at the producers' warehouses and operated by an IT services firm on behalf of the bank. Because of its partnership with the Senegal National Telecommunications Company (SONATEL), the service firm was able to set up a Private Enterprise Network that offers: i) centrally managed mobile Internet access to the platform for all stock managers; ii) free peer to peer phone communications amongst platform users to facilitate monitoring and creating a virtual help-desk.

A second module was then added to the platform to monitor the movements of stocks pledged as collateral at the rice mill level. The information provided by the module the quantities provided as collateral to the lines of credit makes it possible to control, in real time, the solvency of the rice mills. This platform is fed data by the bank based on reports of third-party holding companies positioned at the rice mill storage points.

Both modules were then consolidated to provide an integrated view of the paddy rice and white rice movements associated with bank credit in the Senegal River Valley. This consolidated decision support module is used by the bank and the Government of Senegal to monitor the local rice available and coordinate imports accordingly.

RICE MONITORING SYSTEM IN THE SENEGAL RIVER VALLEY

A computerized platform that makes it possible to monitor rice production and facilitates decision-making



RESULTING CHANGES

The inventory tracking platform introduced as part of the collaboration between CNCAS and Feed the Future represents a major qualitative leap for the rice value chain, at several levels:

The traditional approach of paper-based agricultural banking and site visits is replaced by a digitized information system accessible in “real time”

The “real time” visibility that the platform provides to bank branch staff has increased their monitoring capacity without the need for additional staff or logistical means to manage the significant expansion in rice farming credit. These platforms have effectively supported scaling-up and facilitated credit operations totaling more than US\$ 3 million (15 billion CFA francs) annually, between the bank, the producers, and the rice manufacturers through the various CNCAS agencies in the Senegal River Valley.

Faster credit settlement and processing of requests for the following season based on inventory

Improved visibility of the makeup of collateral inventory by producer groups allows branch agents to quickly identify who has fulfilled their obligations and who has qualified for the next cycle of seasonal credit. This acceleration of off-season processes is a key condition for producers to be able to produce two crop cycles per year on the same plot and thereby double their revenues.

The bank/producer relationship is strengthened

The inclusion of smallholder farmers, i.e. of producers who practice agriculture at the family farm level, in a robust credit system, ensures that they have regular income. Because of this reliable and functional system, producers are visible to different buyers whose creditworthiness is guaranteed by the bank, and who buy at stabilized prices. All of these positive changes help to improve their resilience.

The bank now plays a brokerage role for paddy rice for rice mills

The platform gives real-time visibility for paddy rice stocks available throughout the Senegal River Valley. With the new system, rice millers now rely on the bank to direct them to producer groups that have benefited from loans. This has created a new role for the bank which facilitates the relationship between buyers (mills) and sellers (producers) and guarantees the payment of transactions with the credit lines it manages, which helps to improve the rate of recovery and trust between stakeholders.

Reliable data for seasonal monitoring by the authorities

In Senegal, rice is a strategic food staple. In 2017, the bank agreed to share the data generated by this platform with the Ministry of Commerce which needed a reliable way to track local rice stocks

to more effectively manage imports and ensure a steady rice supply for the domestic market. Today, this consolidated transactional data is used daily during the harvest period. The Ministry of Commerce logs on to the system and receives a weekly report sent by e-mail with data on available rice stocks.

A standardized stock management system for the stakeholders in the value chain

The bank's requirement for keeping real-time stock records convinced the participating groups and processing companies of the added value of such rigor for conducting operations and protecting their assets. The platform is a start for modernizing the control and management systems of organizations and companies.

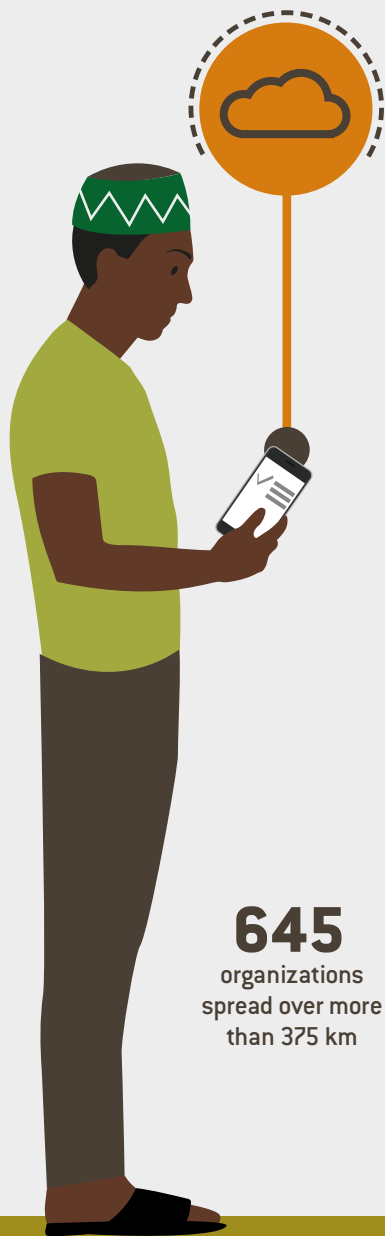
SITUATION IN NUMBERS

Since its creation in 2016, the platform has monitored the aggregation of 255,000 tons of paddy rice by 645 organizations spread over 89 storages sites, representing a total value in loans from 2016 until the off-season in 2018 of US\$ 41 million (20.5 billion CFA francs). A large part of this stock was then bought and processed by 14 rice mills participating in the third-party holding financing program. The annual results for 2017 show that CNCAS loan portfolio for rice farmers reached US\$ 19.4 million (9.7 billion CFA francs), and that the repayment rate reached 95 percent whereas it had been below 80 percent in previous years.

In 2018, more than 14 third party holding factories were involved in the supply system, and two other banks besides CNCAS.

For credit lines granted to rice mills, repayments were close to 100 percent.

REAL TIME VISIBILITY MAKES IT POSSIBLE TO SCALE UP AND FACILITATE CREDIT OPERATIONS



Amount of loans to rice mills
19.4
US\$ million

95%
Rate of producer loan repayment

99,9%
Rate of rice mill loan repayment

PARTICIPANTS
IN THE SYSTEM

645
organizations
spread over more
than 375 km



83
storage sites

Since 2016
Paddy rice monitored
255,000 T
associated with loans for
24
million US\$

Prices practiced
by "monitored"
farmers
25%
higher than the
average
baseline



	Number of collection points	Credit monitored by the platform	% of seasonal credit monitored by the platform vs. total credit granted	Quantity of paddy rice	Movement of white rice
Hot off-season / 2016	18	US\$ 4.2 million	63 % (In-kind only)	13,894 T	Module under development
Winter / 2016	22	US\$ 2.4 million	70 % (In-kind and cash)	3,724 T	Module under development
Hot off-season / 2017	89	US\$ 13.6 million	84 % (In-kind and cash)	85,000 T	49,000 T
Winter / 2017	82	US\$ 5.8 million	94 % (In-kind and cash)	65,000 T	38,000 T
Hot off-season / 2018	83	US\$ 15 million	96 % (In-kind and cash)	87,000 T	51,000 T

FACILITATION APPROACH

The development of the platform is a continuation of the expansion of the integrated credit mechanism introduced in the Senegal River Valley through the collaboration between CNCAS and Feed the Future. The platform had to fit into well-established processes for managing credit portfolios. Consequently, a transition of this nature from manual systems to a remote monitoring platform needed to take place gradually, given the considerable financial stakes associated with the loans.

The implementation of the system followed four major phases.

1. Refinement of the Repayment Tracking Mechanism and Development of a Cloud Platform prototype

i) Creation of a Collection Point Master Listing and Training of a Network of Skilled Warehouse Managers

First of all, Feed the Future and CNCAS agreed to entrust the monitoring for an entire season to an accounting firm responsible for deploying teams in the area and for auditing rice inventories using a conventional paper based system. Thus, CNCAS produced the list of collection points associated with its loans and set credit recovery objectives for each of them. Warehouse clerks at the paddy rice storage points were trained by the accounting firm to keep standardized manual records. The firm's regional agents collected the data on-site and communicated it by telephone to a central point responsible for producing weekly reports on behalf of the bank.

ii) Development and Validation of a Cloud Prototype

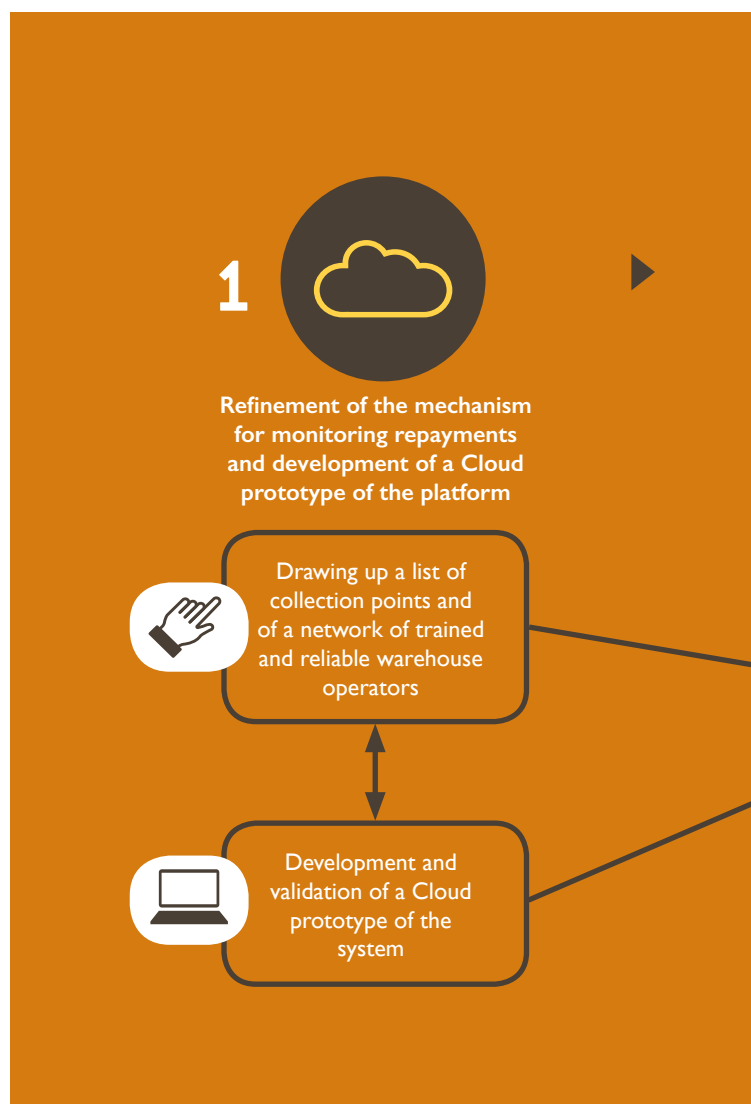
Simultaneously, Feed the Future and CNCAS entrusted a local IT engineering firm with the mandate to design a warehouse tracking system based on a Cloud database, accessible to the banks, so that they would be able to monitor the movement of rice stocks in a transparent manner. This pilot project, rolled out in a subset of the sites monitored by CNCAS, aimed at digitizing the system implemented by the accounting firm. Both systems (one digital and the other manual) were operated simultaneously for two seasons to systematically compare their results and ensure the reliability of the digital application.

2. Scaling up of the Repayment Management System

Once the results produced by both systems (digital and manual) were found to be consistent and satisfactory for the bank, the digital version was extended to all of the producers' paddy rice storage points. The initial goal of the digital platform launched in August 2016 during the dry season harvest was to focus exclusively on monitoring paddy rice stored in warehouses by producer networks.

3. Creation of a Marketing Management System

At the request of CNCAS, the scope of the platform was extended to monitor the rice bought and stored by the rice mills in accordance with the lines of credit implemented by CNCAS and two other banks to finance contractual transactions between producers and industrial rice mills. With this second module, the Cloud database thus gave a more global view of the movements of paddy rice between the producers' warehouses and the rice mills. However, it remains limited to the monitoring of stocks subject and do not include transactions on rice purchased using other financial instruments.



SIS'TECH

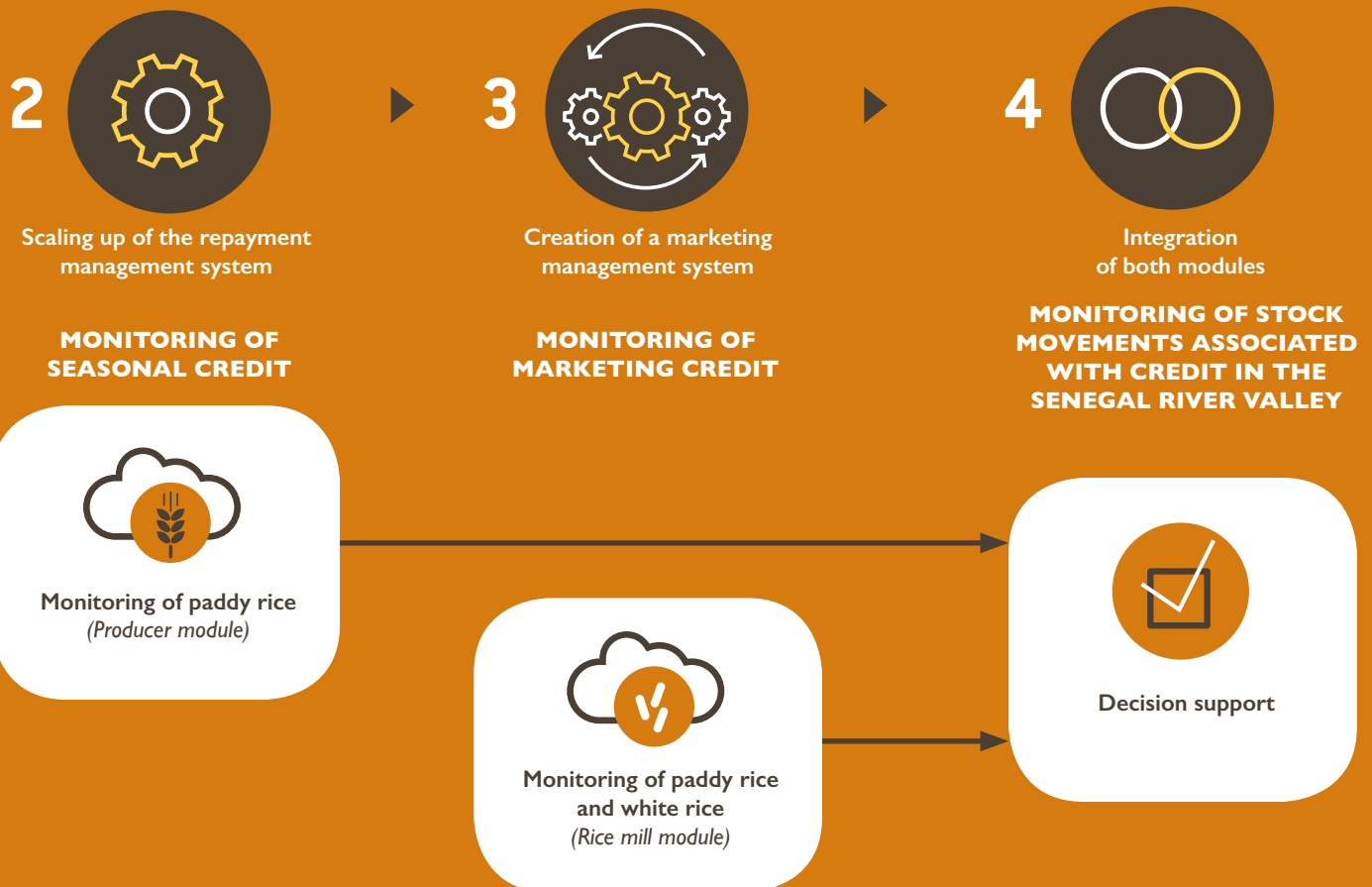
Based in Saint-Louis, SIS'Tech is a private firm focused on providing quality information technology (IT) services, including the development of customized IT solutions including standalone software as well as Web and mobile applications. As part of the Naatal Mbay project, SIS'tech developed a system to track paddy stocks intended for repayment of CNCAS credits and of white rice. SIS'TECH also facilitates user training.

The digital system by SIS'Tech relies on collection agents located at each consolidation point to capture rice stocks on a daily basis during the harvest season using a mobile application. SIS'Tech has trained 100 stock monitors from local farmers' communities to use mobile tablets to track inventory movements. This team of data collection agents is connected through telecom Orange's enterprise network services, which provide full Internet access and internal communications between a group of devices for a fixed cost, thereby allowing supervisors to communicate regularly with stock monitors. Mobile application data is synchronized with a Web application where banks can log in and monitor inventory in real time.

4. Integration of Both Platforms

Following a request from the Ministry of Commerce, commissioned to monitor the marketing of local rice in the context of rice self-sufficiency, data from both modules was consolidated to give an overview of stock movements associated with credit in the Senegal River Valley.

FROM MANUAL COLLECTION TO INTEGRATION INTO A COMPUTERIZED PLATFORM



PARTNERSHIPS AND SYNERGIES

A Public-Private Innovation

The development of this platform is an example of iterative design which integrates the contribution of public and private structures, namely the Feed the Future Naatal Mbay project, the Ministry of Commerce, the Senegal National Agricultural Bank (CNCAS), local IT, accounting and inventory management companies, producer organizations, and private industrial enterprises.

A Co-Creation Process Facilitates a Market System Transformation

Initially, the idea of this platform emerged from collaboration between the Feed the Future Naatal Mbay project, the Ministry of Commerce and the International Finance Corporation (World Bank) within the framework of the initiative for the development of a warehouse receipt system. The initial design of the platform combined a centralized physical infrastructure with a stock movement information system.

During implementation, it was decided to take an iterative approach based on the recently introduced integrated credit practices. The Naatal Mbay project therefore supported CNCAS on the iterative development of a computerized platform whose role would be to monitor stock movements at the level of the existing infrastructure pool, managed by the producer organizations and the rice mills. Subsequently, the Ministry of Commerce's request for a consolidated view of rice stocks led to the development of the platform's integrating module. The result of this collaboration was the emergence of an innovative and inexpensive formula that introduced a virtual platform as an alternative to a traditional centralized storage infrastructure. The platform thus builds on private sector industrial level investments in storage facilities while allowing the Ministry of Commerce to play its market control role.

TESTIMONY



CHEIKH NDIAYE,
Marketing Director,
CNCAS

The computerized platform offers CNCAS the possibility of monitoring the stocks intended for repayment during harvesting and post-harvest operations and of assessing their value. It arose from the need by organizations (either grassroots or umbrella organizations, benefiting from seasonal credit) to know about the storage possibilities available and the degree of vulnerability of this storage based on its nature and position.

This information made available by the platform, in a database that is accessible to branch managers, allows them to assess the rate of repayment and to prioritize, together with agro-industrial processors, the areas for paddy rice removal. This information system, combined with contracting, results in more flexible conditions for access to financing in the case of double cropping, as the inaccessibility of some areas does not always make it possible to complete crop removal in time for the following season. The platform also allows the bank to better direct its efforts at loan recovery and allows agro-industrials to optimize the deployment of their logistics for paddy rice removal. It is hoped in the future to make the information available in real time and to enlarge platform access to the agro-industrials and to producer umbrella organizations to ensure greater transaction fluidity.

ACHIEVEMENTS

Reaching a Critical Mass through CNCAS Portfolio Coverage

The platform has moved from the pilot stage to covering most of the CNCAS rice farming credit portfolio. During the 2017 hot off-season for example, the rate of removal of producer stocks by rice manufacturers financed by the bank reached 99.8 percent. Today, the scale achieved by the system gives value chain stakeholders the latitude to develop sustainable formulas for covering the platform's operating costs.

A Transparent System for Building Stakeholder Confidence

The unequivocal ownership of the system by the producers is an important achievement for the value chain. It has been made possible by the fact that the bank and the producers have the same real-time information about the credit they have taken and the level of repayment. This level of transparency encourages the bank to explore new credit formulas, including annual credit covering two harvest seasons.

A Functional System that Benefits all Stakeholders

The system has demonstrated in a few years its ability to facilitate access to credit and its repayment, as well as exchanges between producers and industrial processors. It benefits all the stakeholders involved, namely the bank, the rice mills, and the producer networks. As a central player in the system, the bank sees an opportunity to grow its portfolio and reduce the default rate. The adaptation of the database as a business tool facilitating contracting between producer groups and processors has added additional value and facilitated the controlled growth of credit to an expanding number rice mills.



The stock management platform has further enhanced the role of the warehouse manager and made him an essential link in a rice value chain undergoing digitalization.

THE STOCK MONITORING PLATFORM: A "100% SENEGAL RIVER VALLEY" TECHNOLOGY

In 2015, the rapid growth of loans from CNCAS to rice producers made the structuring and automation of information collection and processing a necessity. Feed the Future took up the challenge, contracting two companies based in the Senegal River Valley whose technical proposals demonstrated a solid understanding of the rice growing context in the Valley.

Kamex Audit & Conseils, a public accounting company in Dakar opened an office in Saint-Louis in 2014. KAMEX was entrusted by Feed the Future with the task of designing a rigorous stock monitoring system for paddy rice earmarked for credit repayment. A team of six supervisors in the field was deployed to train and support 82 warehouse operators designated by the producer organizations for monitoring stock movements.

Simultaneously, Feed the Future engaged the Saint-Louis based company SIS'TECH, specialized in computer engineering, with the task of automating the system, using a Cloud platform fed by data from tablets placed at the warehouse level. After a breaking in period, the SIS'TECH solution is now deployed on a full scale by CNCAS.

The local director of KAMEX noted that the effects of this partnership with Feed the Future are positive: "We have signed contracts with organizations in the area, including two well-known rice millers." As for SIS'TECH, its director, Mr. Camara, is pleased with the visibility that the automated platform offers his company and consideration is being given to the next stages. He already plans to increase his staff to take advantage of the new business opportunities that the expansion of the irrigated rice value chain offers his business.

CHALLENGES

Transforming Value Chain Stakeholder Processes

Access to accurate data for decision-making is a novelty for both public and private stakeholders. Whether it is banks, manufacturers, producer organizations, or the Government, it is important that the application of these processes result in a regular flow of accessible information to serve as dashboards and performance indicators, which are necessary for directing their activities. Therefore, developments in the platform must avoid any institutional obstacles or administrative or technological bottlenecks that would slow down the information flow and access for participants.

Sharing of Development and Operating Costs

Despite its modest cost, which represents 0.25 percent of the value of the loans and which allows the bank to assume the costs, in order to promote shared access by all stakeholders and to continue to expand the functionalities of the system, it will be important for all stakeholders to maintain a dialogue concerning the development of cost sharing formulas for the system's use and development.

Integration of Paddy Production beyond the Credit Circuit

The integrated platform currently only accounts for rice governed by bank credit collateral management rules. However, some producers and millers produce and process rice using their own funds or non-seasonal credit. In addition, a non-negligible amount of rice is processed outside the "formal" circuits by small rice mills. This rice is not accounted for either by the current system. This information is also useful for measuring total rice production in the Senegal River Valley. The Ministry of Commerce would thus gain from investing in the expansion of the platform and the development of complementary tracking and forecasting tools.

The Challenge of Transparency and Controlled Access to Data

The bank that centralizes the database has the obligation to ensure data security. With the rapid development of the system and its possible opening up to third-party users, it will be necessary to take into account the security and confidentiality dimensions.



The traditional 80 kg bag of paddy rice is destined to disappear. The accelerated growth of rice production in the Senegal River Valley will soon require scaling up to bulk logistics systems and new digital stock management technologies. This means that the warehouse operator will play a more and more specialized role.

OUTLOOK

The Warehouse Receipts System (WRS) and Building a Rice Trading System

Very quickly, the computerized platform has demonstrated that better visibility of paddy and white rice stocks is strengthening business relationships, and banks have rapidly developed financial mechanisms to facilitate the settlement of transactions. With the gradual introduction of the WRS and the improvement in the warehousing infrastructure, we can expect the current platform to evolve towards a computerized trading system based on warehouse receipts, financially supported by the banking system.

Platform Coverage

The success of the platform in the rice value chain has led banks to consider its application to other sectors to manage stocks for various products spread over a vast territory: seeds, fertilizer, peanuts, maize, cashew nuts, etc. Other expansion projects involve bringing the platform closer to the data collection systems of the producer networks. A wider coverage area beyond the Senegal

River Valley can be anticipated which would require a more closely-knit network over the national territory with approved deposit and collection points managed by staff trained in the use of digital technologies.

Data for piloting the value chain

Rice processing companies see the usefulness of sharing information on their activities. During debriefing meetings on the operation of the platforms, the processing units insisted that this system should be extended to include all stocks they manage instead of being limited to the stocks under bank control. This would help them with advocacy and when seeking funding. Thus, moving closer to the principle of collaboration between public and private sector stakeholders for better management of growth.



The new legislation on warehouse receipts systems promoted by the Ministry of Commerce will result in rapid change in the rice stocks monitoring platform by introducing a greater level of traceability. The storage data points will be associated with certificates that can serve as collateral, be exchanged, and presented for delivery by the buyers. Thus, we have the foundations for the emergence of a rice commodity exchange.



TO LEARN MORE

- Caisse Nationale de Cr dit Agricole du S n gal (CNCAS) website www.cncas.sn
- Banque Nationale pour le D veloppement Economique (BNDE) website www.bn.de.sn
- Finding the best fit: Naatal Mbay case study, Cristina Manfre, USAID, Washington D.C., 2017
- Improving country capabilities for agricultural statistics building national capacity for tracking and analysis of the agriculture sector, USAID, 2015

This capitalization note and the publications mentioned are available at the following address:

www.usaid.gov/senegal

www.ipar.sn/chaines-de-valeur-agricoles-au-senegal

PHOTO

A delivery of paddy rice to one of the many rice mills located in the town of Ross Bethio. In 2018, more than 200,000 tons of paddy rice, or the equivalent of 7,000 trailer loads, converged upon the rice milling hubs of Ross B thio, Richard Toll, Rosso, and Thiagar in the Senegal River Valley.



The Naatal Mbay project (Flourishing agriculture in Wolof), spanning four years (2015-2019), invested nearly US\$ 24 million (12 billion CFA francs) to support the rice, maize, and millet cereal value chains. It has created business opportunities for inclusive growth and development of the agricultural sector in the Delta and the Senegal River Valley, in the southern portion of the central peanut basin, and in the southern regions of Ziguinchor, S dhiou, and Kolda. Naatal Mbay was implemented in the context of Feed the Future, an initiative launched by the Government of the United States of America in 2011 to combat hunger and food insecurity in the world.

For more information :
www.feedthefuture.gov

USAID is the United States Agency for International Development, one of the most active agencies in the world in this field. In Senegal, USAID is working in close collaboration with the Government of Senegal in the fields of health, economic growth, agriculture, education, and good governance.

For more information :
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The Agricultural and Rural Prospective Initiative (IPAR) is a space for reflection, dialogue, and coordinated agricultural and rural policy proposals in Senegal and in the West African region. IPAR's main research topics are: (i) structural transformation of agriculture; (ii) climate change; (iii) migration and youth employment; (iv) sustainable development objectives; and (v) governance of natural and land resources

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