# IMPROVING IRRIGATION AND LAND RIGHTS IN SENEGAL
## Land under cultivation and horticulture have grown but not to expected levels

## Program Overview

MCC's $540 million Senegal Compact (2010-2015) funded the $170 million Irrigation and Water Resources Management (IWRM) Project to improve the productivity of the agricultural sector in certain agricultural-dependent areas of northern Senegal. The project rehabilitated or built 266 km of irrigation and drainage infrastructure, constructed a 450-hectare perimeter, mapped irrigated land, and trained officials to better administer land. The project was based on the theory that improved irrigation and land rights increase agricultural investment, productivity and ultimately household income.

MCC commissioned Mathematica to conduct an independent final performance evaluation of the IWRM Project, focusing on a limited set of outcomes. Full report results and learning: https://data.mcc.gov/evaluations/index.php/catalog/123.

## Key Findings

### Maintenance

› The irrigation infrastructure that the project built and rehabilitated remains in good condition, but routine weed clearance and dredging is not keeping pace with what is needed, which may reduce water available for farming.

### Land Use and Farming

› The area of land under production has steadily increased since the end of the compact, but the cropping intensity of 78% remains well below the target of 150%.

› Cultivation across multiple seasons is leading to increased production in the area, likely driven by large farmers.

### Vegetable Production

› Overall, the production of tomatoes and onions increased, but it is still less than 20% of the compact targets.

› Some farmers perceive risks in adopting new crops and farming practices.

### Land Tenure

› Demand for land titles continues to be strong and is met only with donor assistance.

## Evaluation Questions

This final performance evaluation was designed to answer five questions on a subset of intended project outcomes to complement the findings presented in the interim report.
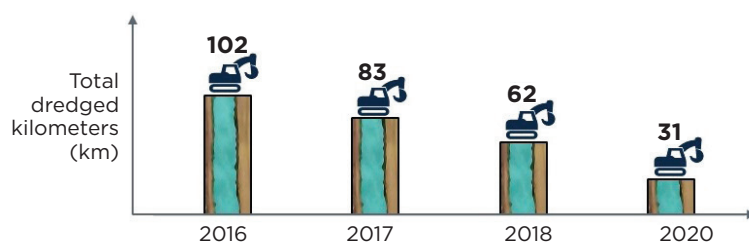
1. Has the primary irrigation infrastructure been maintained since the end of the compact?

2. Have farmers increased their cropping intensity as expected by the project logic? Why or why not?

3. Are farmers growing tomatoes and onions as expected by the project logic? Why or why not?

4. Which stakeholders were more likely to demand a land title and change land use behaviors?

5. Is there continued demand for land titles, and are they being processed? Why or why not?
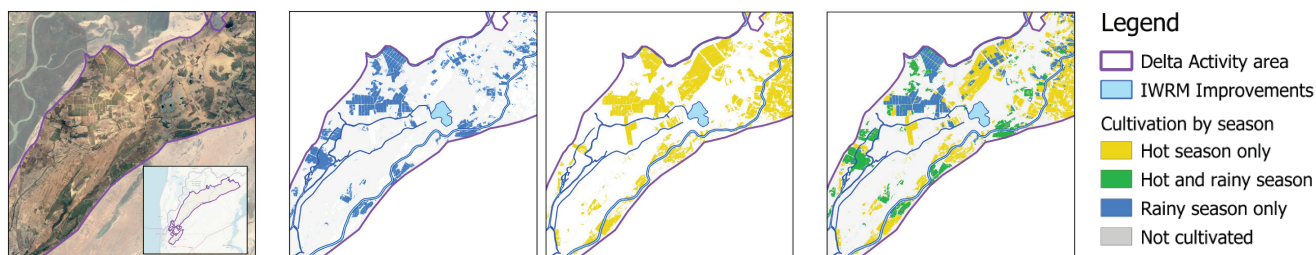
## Detailed Findings

These findings build upon the _interim evaluation report_, which assessed the achievement of the project objective and intermediate outcomes within the timeframe envisioned by the compact. Focusing primarily on the Delta region, the final report explores why a subset of intended outcomes were not achieved at interim and establishes whether a subset of medium-term outcome targets were met in the three years since.

### Maintenance

Water control structures are in good condition five years after the compact, but budget shortfalls at the irrigation and agriculture agency due to water fee recovery rates below the compact target and a declining state subsidy to the maintenance fund limit canal dredging and clearing invasive weeds. These maintenance activities are necessary to ensure sufficient water flow. Maintenance funds have declined each year since the close of the compact.



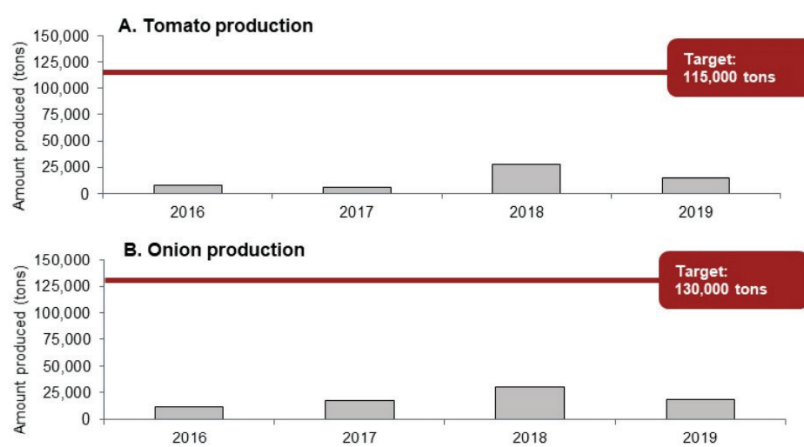**Dredging of irrigation canals, Delta Activity area (2016 – 2020)**



**Map of land under cultivation for a portion of the Delta Activity area (2019)**

## Land Use and Farming

Land under production during the hot dry season increased from 14,512 hectares in 2016 to 20,766 hectares in 2019, indicating a steady expansion into new farming land. In the same period, land under production in the rainy season increased from 5,619 hectares to 9,225 hectares and in the cold dry season from 760 hectares to 3,302 hectares. Using the compact indicator calculation, cropping intensity was 53 percent in 2016, increased to 88 percent in 2018 and dropped back to 78 percent in 2019. This misses the target of 150 percent cropping intensity, which was set on the expectation that the extent of cultivated land would reach more than 39,000 hectares.
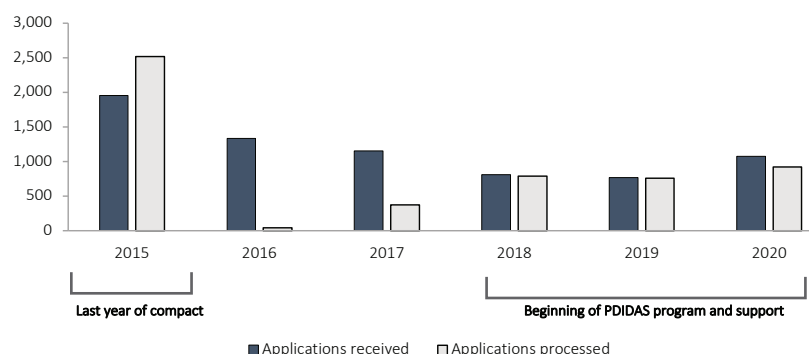
## Vegetable Production

The Senegal Compact anticipated the production of 115,000 tons of tomatoes and 130,000 tons of onions by 2020 in the Delta and Podor project areas. Instead, tomato production increased from 7,700 tons in 2016 to 14,800 tons in 2019, and onion production increased from 11,600 tons in 2016 to 18,500 tons in 2019. Although these production numbers are clearly increasing over time, they are still less than 20 percent of the compact targets. Much less land was dedicated to cold dry season vegetable production than would have been necessary to achieve the targeted levels of production.



**Tomato and onion production relative to compact targets (2016 – 2019)**

## Land Tenure

Demand for land titles spiked in 2015, under the Land Tenure Security Activity. The poorest households and households with a small area under cultivation had the largest increases in the formalizations of their plots. Demand for land titles has continued, and land managers are processing applications with support from the World Bank's Sustainable and Inclusive Agribusiness Project (PDIDAS) program. Gandon commune data illustrates the dropoff in processing between the compact and PDIDAS.



**Land applications received and processed, Gandon (2015 – 2020)**

## Economic Rate of Return

MCC considers a 10% economic rate of return (ERR) as the threshold to proceed with investment.

| | Original MCC ERR | Closeout MCC ERR | Evaluation-Based ERR |
|---|---|---|---|
| Delta Activity | 15.9% | 15.9% | 1.8% |
| Podor Activity | 7% | 3.5% | -7.5% |
| Year of model | 2009 | 2014 | 2021 |

Lower ERRs for the Delta Activity and Podor Activity reflect less area of land under production, lower intensification and limited vegetable production, all of which reduce the benefits generated by the project.

## MCC Learning

📖 Explicit institutional arrangements, tailored to the local context, should be made during implementation to ensure sufficient irrigation system maintenance post-compact.

📖 Large-scale irrigation projects, especially for smallholder farmers, may have difficulty meeting the ERR 10% hurdle rate. However, soft-side interventions, such as farmer trainings, and a strong focus on the market could boost farm incomes and the ERR. MCC is applying this lesson by supporting farmer services in Niger.

📖 Establishing and strengthening land institutions, especially those that support the administration of new types of land rights, may require more than MCC's five-year implementation timeline. Long-term sustainability and efficient land administration may require a closer look at financial sustainability and direct coordination with other actors post-compact.

## Evaluation Methods

The final performance evaluation builds on the key findings of the interim impact evaluation. At interim, Mathematica used a matched comparison group design to measure the causal effects of the Delta Activity and a quantitative pre-post evaluation design to evaluate the Podor Activity. The final evaluation used a pre-post approach that drew on qualitative data from interviews in 2021 with key informants, such as farmers, water user associations, land managers and engineers, and specialists from the irrigation and agriculture agency in the Senegal River Valley. The approach also drew on



**Mixed-methods evaluation**

QUANTITATIVE | QUALITATIVE

Data Collection

Data from administrative sources

Analysis of baseline and interim survey data collected in 2012 and 2017

Remote-sensing analysis using a supervised machine-learning approach

Key informant interviews with:
• Farmers
• Water user associations
• Land managers and engineers
• Specialists from the irrigation and agriculture agency in the Senegal River Valley

quantitative data from administrative sources and an additional analysis of baseline and interim survey data collected in 2012 and 2017, respectively. Mathematica complemented this approach with a remote-sensing analysis, using a supervised machine-learning approach to classify land under cultivation across seasons from 2017-2021. The final evaluation was conducted five years after the completion of the project.