

PORTUGAL

Farm's performance, restructuring & modernisation

Location

Lagoa das Donzelas

Programming period

2014 – 2020

Priority

P2– Competitiveness

Measure

M04 – Investments in physical assets

Funding (EUR)

Total budget 326 555.37

EAFRD 93 449.88

National/Regional 31 149.93

Private/own 201 955.56

Project duration

2015 – 2016

Project promoter

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Modernisation of a rice farm in Portugal through the application of precision farming in its irrigation infrastructure.

Summary

Orivárzea is a company and Association of rice producers. It also manages a production area of 959 ha and carries out other activities such as the drying, storing, milling, blanching, packing and marketing and selling of the rice (*Oryza sativa* L.). Before receiving Rural Development Programme (RDP) support Orivárzea used an inadequate irrigation infrastructure that was over 30 years old.

The old system was energy consuming, leaked and therefore wasted water. To improve its production efficiency, while also protecting the environment, Orivárzea upgraded its irrigation infrastructure in about two thirds of the production area (661.9 hectares). This was done by replacing the pumping system and improving the water distribution network to the seedbeds/rice fields.



Results

Investment in the pumping system has allowed an increase in the efficiency of the water catchment capacity, i.e. with less powerful / energy consuming systems.

The new pipelines make it possible to maintain the same low, yet sufficient, water level across all the rice beds.

In terms of the efficiency of production the costs for water, energy, pesticides, fertilisers and labour decreased while the production yield increased.

Lessons & Recommendations

- ❑ One image of rice production is that it is an environmentally aggressive form of production. Critics say that, for example, it consumes a lot of water and pollutes rivers and alluvial areas. However, these criticisms can be refuted as demonstrated by Orivárzea's example.
- ❑ The modernisation and 'environmentally friendly' efforts put in place a few years ago are now visible. Currently, all producers who are members of Orivárzea have become more efficient and faithful to the certification principles and the whole production area is under integrated production.

Context

Orivárzea is a company and Association of rice producers, but it is also a producer. It has been managing a production area of 959 ha in Portugal's Ribatejo province since 2003. In addition to production, Orivárzea carries out other activities such as the drying, storing, milling, blanching, packing and marketing and selling of the rice (*Oryza sativa* L.).

In recent years, the agricultural sector has faced the dual problem of increasing production costs and the need to respond to growing environmental concerns. In such a demanding environment it is becoming increasingly important to improve the management and use of natural resources, as well as improve agricultural practices and techniques, by for example, applying precision farming techniques.

The investment project covered about two thirds (661.9 hectares) of the area managed by Orivárzea. It focused in the modernisation of the irrigation system (the pumping system and the distribution of water to the seedbeds/rice fields).

Before the investment in the area, irrigation was carried out by inadequate equipment. The old irrigation system consisted of three pumping systems each with two pumps and a shackle pipeline. This infrastructure was over 30 years old. The irrigation system did not have the pumping capacity to irrigate the whole area. It was energy consuming and because it was under too much pressure leaked and wasted water. The excess water ended up in the rice beds where it was not needed, hampering the development of the plants in those beds.

Given the situation, Orivárzea decided to redesign the pumping system to reduce the amount of water collected and the energy used for the operation. It also aimed to manage the rice growing process better to make it more economically and environmentally sustainable.

Orivárzea decided to invest in technology to implement a precision farming system. The new system would comply with technical guidelines and common rules, such as those provided in the specifications of the Protected Geographical Indication (PGI) – Arroz Carolino das Lezírias Ribatejanas. These are based on Integrated Production standards and on Hazard Analysis and Critical Control Point (HACCP) requirements.

The rural paths/roads within the managed area also needed to be improved to allow easy access to the equipment installed for monitoring the field conditions, perform the production operations and transport the harvested rice to the drying and storage facilities.

Objectives

The investment aimed to improve productivity and increase competitiveness by making rice growing operations more efficient. The increased productivity will be achieved by reducing the costs of:

- water abstraction: by reducing energy consumption;
- water: by using less of it;
- carrying out agricultural operations: by reducing the time spent performing them; and
- fertilisers and plant protection products: by reducing the quantities used.

Activities

1. Modernisation of three pumping stations

The pumping engines were replaced by ones that are more energy efficient and with a larger pumping capacity. These changes were complemented by adjustments to the water pipes.

Pumping station 1: replacement of one 65 hp engine with a 34 hp engine maintaining the same pumping capacity of 1,000 m³/hour (47.7% more efficient).

Pumping station 2: replacement of one 40 hp engine with a pumping capacity of 1,200 m³/hour with a 54 hp engine with a capacity of 1,700 m³ / hour (41.6% increase in capacity).

Pumping station 3: replacement of the two engines, both 65 hp with individual capacity of 1,000 m³/hour, with the equipment of the pumping station 2 and the installation of a new 54 hp engine, with capacity of 1,700 m³/hour (increase of 70.0% in capacity).

2. Improvement of the water pipelines' operation

The interior of the shackle pipelines is coated with products made from polyurethane resins to seal and reinforce their structure. This reduces leakages / losses in water distribution from catchment to the plants. It therefore reduces water wastage and eliminates excess water and its effects (weed proliferation for example), especially in the beds closer to the water pumps. The improved pipelines will help avoid the formation of undulation and its dragging effect that inhibits the fixation of young plants.

3. Water levelling in all beds

With the water intake better controlled, it was possible to stabilise water levels. This allowed growers to:

- maintain the conditions for the good development of plants;
- save water and energy by using less of both;
- avoid the formation of undulation and its dragging effect on young plants;
- simplify those production operations that can be performed similarly in all beds. When some types of operations are carried out (applying plant protection products for example) there is a period when beds are emptied. The water level needs to be restored quickly so that the existing conditions can be maintained in the rice beds (salt content, temperature of the plants and so on). Excess salinity is very harmful for the rice. The depth of water acts as a thermal regulator. The sum of daily average temperatures during the production cycle has a major influence on yield - the higher the annual value, the greater the quantity produced; and
- proceed with the harvest at a more appropriate time by decreasing the number of plants under water and the quantity of fallen rice. This allows for better yield in the rice mills.

4. Investments in precision farming

These investments included the integration of a network of sensors with remote transmission that monitor the level and quality of water (salinity/conductivity/temperature) at a distance, allowing for a more rational management of water entering and exiting the rice beds, in accordance with the needs of the plants.

5. Improvement of rural paths/roads

The paths/roads in the managed areas were improved to facilitate access to the sensors and transport the harvested rice for drying.

Orivárzea developed the following Human Resources strategy to continue its activities during and after the investment project:

- outsourcing the production activities, especially those involving machines such as lowering, harrowing, fertilisation, sowing, and so on;
- employing two people for 8 months per year to monitor, supervise, manage the water distribution and perform monitoring tasks; and

- having a staff member to provide technical support, coordinate operations and oversee compliance with production cycle requirements.

Main Results

Quantified Results

The investment in the pumping system has led to an increase in the efficiency of the water catchment capacity. A higher water catchment capacity was achieved with less energy consuming systems (cf. table below).

Results in terms of saving energy and water

Pumping system	Power in hp			Capacity of water abstraction in m ³ /hour		
	Before project	After project	Variation	Before project	After project	Variation
1	105	74	-29,5%	2000	2200	10,0%
2	80	94	17,5%	2200	2900	31,8%
3	130	94	-27,7%	2000	2900	45,0%
Total	315	262	-16,8%	6200	8000	29,0%

Results in terms of saving energy and water

Better pumping capacity also led to a faster flooding of the beds resulting in:

- increased irrigation efficiency: faster initial bed flooding can anticipate the emergence of plants and reduce water losses by infiltration and evaporation; and
- more effective control of water conditions: faster water level replacement (e.g. after plant protection application) avoids situations of excess salinity and variations in water temperature.

The investment in the pipelines made it possible to maintain a minimal level of water across all the rice beds. This investment was perhaps the most relevant in terms of plants'/rice productivity and quality and, therefore, of revenues.

Among these results, the following stand out:

- greater efficiency in water use;
- higher productivity resulting from the greater number of fixed plants; and
- greater effectiveness in the application of fertilisers and plant protection products.

Investment in the network of sensors ensured a more rational management of water in the beds, thus saving water and improving plant development.

All these factors contributed to greater efficiency in the use of resources, especially energy and water. Thanks to the project, production costs for water, energy, pesticides, fertilisers and labour decreased while the production yield increased.

Water consumption (m3)

	Before project	After project	Variation	
Total	8.662.479	8.056.106	-606.373 m ³	-7,0%
Per hectare	15.900	14.787	-1.113 m ³	

Note: 1m3 of water equals 1000 lt, so the water saving amounts to 606 373 000 lt; If considering an Olympic size swimming pool (50x25x2.5m) the total saving represents approximately 242 swimming pools.

Production (Kg)

	Before project	After project	Variation	
Total	4.657.093,0	4.963.279,0	306.186,0 Kg	6,6%
Per hectare	6.730,0	7.172,5	442,5 Kg	

Unquantifiable results

Investing in farm paths/roads has led to better working conditions and at the same time has increased the efficiency of the labour force as the farming operations can now be performed faster.

The introduction of different agricultural practices such as integrated production, adopting the Eurepgap - European Good Agricultural Practices, as well as obtaining private certifications, increased the rice growing environmental sustainability. Nevertheless, Orivárzea maintained its average selling price of EUR 0.31 / kg.

“It was very important for Orivárzea to work towards a greater sustainability of the rice-growing ecosystem, using energy efficiency as a factor in improving the environmental and rural landscape of Lezíria Ribatejana.”

Joaquim Bravo, Adviser and Development and Quality Manager

Key lessons

One image of rice production is that it is an environmentally aggressive form of production. Critics say that, for example, it consumes a lot of water and pollutes rivers and alluvial areas.

However, all these criticisms can be refuted as demonstrated by Orivárzea’s example. It has incorporated the environmental dimension as one of the fundamental variables in the management of the production process. Its new practices guarantee the quality of land and water now and in the future. They also guarantee an increasing efficiency in the use of the available resources. This approach has led to a profound rethink of the methods of production, introducing more environmentally friendly technologies and adopting phytosanitary practices in line with the principles of integrated production.

The modernisation and ‘environmentally friendly’ efforts put in place a few years ago are visible: currently, all producers linked to Orivárzea have become more efficient and faithful to the certification principles, and the whole production area is under integrated production.

Furthermore, to achieve and guarantee strict control at all stages (from the seed to the placement on the supermarket shelf), the rice marketed by Orivárzea is entirely cultivated by its members. The organisation does not use rice produced by non-members.

The result of the implementation and consistency of these practices is a rice well above the official quality standards. Since its production is limited to the producers who are members of Orivárzea, the demand for the annual quantity of rice harvested often outstrips supply, as the rice often runs out by the end of the summer period.

Additional sources of information

www.instagram.com/arroz_bom_sucesso/

www.facebook.com/arroz.bomsucesso/