

Organic rice production in areas with natural constraints such as the Ebro Delta

Summary

At present, organic rice in the Ebro Delta covers an area of less than 2%. This is due to major problems for the rice sector in the Ebro Delta in being competitive in terms of obtaining a viable and sustained yield over the years in the fields where organic rice is grown.

The main problem is weed infestation in the fields after a few years of organic rice production. This leads to exponential growth in labour costs for weed removal year after year and the rice fields become infested with weed seeds.

Furthermore, we need to find solutions for controlling fungal diseases and pests that severely affect the crop by assessing responses in different varieties.

The high salinity of the soils in the Ebro Delta is also a limiting factor that must be taken into account. This salinity becomes a determining factor when defining farming strategies and agronomic practices in water management, soil tillage, weed management and seeding typology and/or planting strategies.

Finally, the impact of all the strategies on biodiversity in the paddy fields is assessed to improve the agricultural system in the Ebro Delta area.

Objectives

Main objective

- To increase the competitiveness of the rice sector in organic rice farming in areas with natural limitations such as the Ebro Delta.

Specific objectives

- Optimise the management of pests, weeds, diseases and fertilisation by defining new agronomic strategies in organic rice farming in the Ebro Delta.
- Preserve and enhance biodiversity in an agricultural system of high value in terms of nature and landscape.
- Assess the effects of various farming strategies on biodiversity.

Description of the actions carried out in the project

Review of interesting strategies

A compilation was made of the studies in the Ebro Delta compatible with organic rice production.

Plots

The trials were carried out on plots representative of the Ebro Delta soil and climate conditions.

Depending on the type of trial, either small plots were used to control variables requiring isolation or the trials were carried out on larger plots to more closely reproduce real paddy field conditions.

Varieties

In commercial and agronomic terms, interesting and representative varieties were chosen in the region and their adaptation to organic production and tolerance to pests and diseases were assessed.

Fertilisation

Different strategies with fertilisers authorised for organic farming were assessed, both in dry seeding and conventional seeding and planting strategies, for all the different varieties.

Weed control

Various strategies for direct and indirect weed control were tested. Some were innovative and others we intended to improve or fine tune, using specific machinery and/or prototypes for weed control, water management strategies or different types of crop seeding and/or planting.

Assessment of chironomid damage by cropping strategy

A number of irrigation and plot water management practices were studied to minimise chironomid damage. Such water management had to be compatible with the correct management of all other crop farming actions.

The chironomid population in the paddy fields was monitored to identify the impact of different strategies on pest populations and the damage they cause to rice.

Final results and practical recommendations

1. Weed control strategies
2. Agronomic performance of varieties in organic rice production using water seeding
3. Agronomic performance of varieties in organic rice production using dry seeding
4. Comparative study of biodiversity between organic and conventional production fields

WEED CONTROL STRATEGIES

The strategies tested in the water seeding system:

(1) Seeding x 1.5 doses + overflowing + eraser A + mechanical control BC.

(2) Seeding x 1.5 doses + no overflowing + eraser A + mechanical control BC.

Mechanical weed control is carried out with three different types of “roller weeder”, a tool used for weed control between rows in paddy fields.

The in-house device is termed Agroservices (A), the one manufactured in Japan is termed Japanese (J) and the one manufactured in Germany is termed German (D).

Estratègia 2- Sembra x 1,5 + goma d'esborrar						Estratègia 1- Sembra x 1,5 + Sobreinundació + goma d'esborrar					
2D - R3	2J - R3	2A - R3	2D - R4	2J - R4	2A - R4	1D - R3	1J - R3	1A - R3	1D - R4	1J - R4	1A - R4
Testimoni						Testimoni					
2D - R1	2J - R1	2A - R1	2D - R2	2J - R2	2A - R2	1D - R1	1J - R1	1A - R1	1D - R2	1J - R2	1A - R2
7,5	9,72	10,5	7,5	9,72	10,5	7,5	9,72	10,5	7,5	9,72	10,5
Rodolí		Amplada (m)									
(A) Agroserveis		2,5									
(J) Japonés		2									
(D) Alemany		1,83									

Figure 2: Sketch of the fields in a water seeding system.

Strategies in the dry seeding system:

(3) Early laser + (power harrow-dry seeding) + tine harrow

3.R Early laser + (power harrow-dry seeding) + tine harrow ABC + coulter harrow D

(4) Late laser + (power harrow-dry seeding) + tine harrow ABC

4.R Late laser + (power harrow-dry seeding) + tine harrow ABC + coulter harrow D

Mechanical weed control was carried out using two types of harrow: the flexible tine harrow (G) and coulter harrow (R)

	Estratègia 4.-Làser tard				6 m	Estratègia 3.- Làser aviat				
11,5 m	4R - R3	4G - R3	4R - R4	4G - R4		3R - R3	3G - R3	3R - R4	3G - R4	
3 m										
3 m	Testimoni		Testimoni			Testimoni		Testimoni		73
3 m										
11,5 m	4G - R1	4R - R1	4G - R2	4R - R2		3G - R1	3R - R1	3G - R2	3R - R2	
	12	12	12	12	6	12	12	12	12	
	24		24			24		24		
	48					48				
						54				
	102									
Maquinària		Mides								
(G) Grada de pues		6 m								
(R) Grada de rella		3,5 m								

Early seeding in conjunction with the high seeding rate provided rapid establishment of the rice crop with a high plant density per square metre, creating relative competition for space with weeds.

As can be seen in the following graph (figure 27), both techniques had a very similar density of rice plants. Despite maintaining a high water level for 18 days in the overflooding technique, this did not result in a lower density, but quite the opposite.

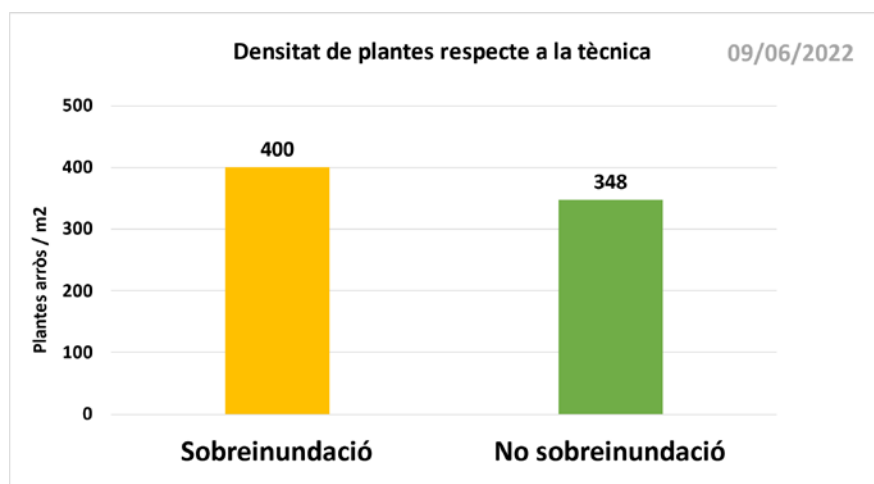


Figure 27: Rice plant density per m² (09/06)

STRATEGY 1 and 2

The aim of the trial was to compare the different “rollers” used in terms of both weed control and crop selectivity.

The main weeds in both cases were aquatic (*Heteranthera reniformis*) in high numbers and to a lesser extent cyperaceae, or rice sedge (*Cyperus difformis*). We also observed a medium-sized population of millet (*Echinochloa* spp.) in non-overflooding strategy 2.

It should be noted that the first action (A, “eraser”) in the two techniques, 1 overflooding and 2 non-overflooding, achieved very high weed control.

Control of kidneyleaf mud plantain (*Heteranthera reniformis*)

The following graph shows the percentage coverage of kidneyleaf mud plantain after the three actions had been carried out.

The difference in control between the different rollers can be observed (figure 28), with the Japanese roller being the most effective, while the Agroserveis and German rollers provided good control, more evidently so in overflooding strategy 1.

In the case of strategy 2, no overflooding, this weed developed more vigorously, which made it difficult to control it with the rollers.

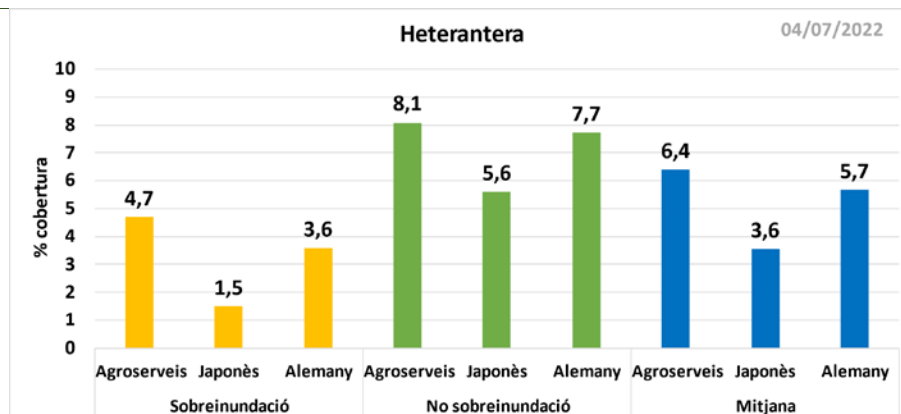


Figure 28: Percentage of kidneyleaf mud plantain coverage in the assessment on 04/07

Control of rice sedge (*Cyperus difformis*)

With regard to the control carried out after the three actions, in the two flooding techniques (figure 29), the Japanese roller was the most effective in the case of rice sedge.

The Agroserveis and German rollers performed similarly in the case of overflooding, where the rice sedge population was weak and sparse. With the non-overflooding technique, there were greater differences between the Agroserveis and German rollers.

This weed was most problematic in the non-overflooding technique.

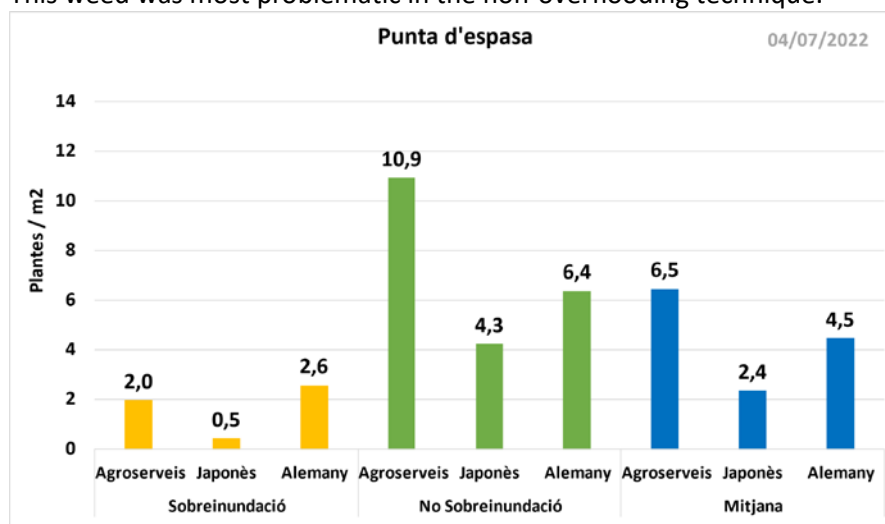


Figure 29: Plants per square metre (rice sedge) from the 04/07 assessment.

Control millet (*Echinochloa* spp.)

In the case of **millet**, the effectiveness of the rollers was only assessed in the **non-overflooding** technique, since control was almost 100% in the overflooding case thanks to the technique itself.

As with the previous weeds, the first action (A, "eraser") was the one that worked well from the beginning, as the early millet stage favoured control. As shown in the graph (figure 30), the Japanese roller was also the most effective, although with little significant difference between rollers.

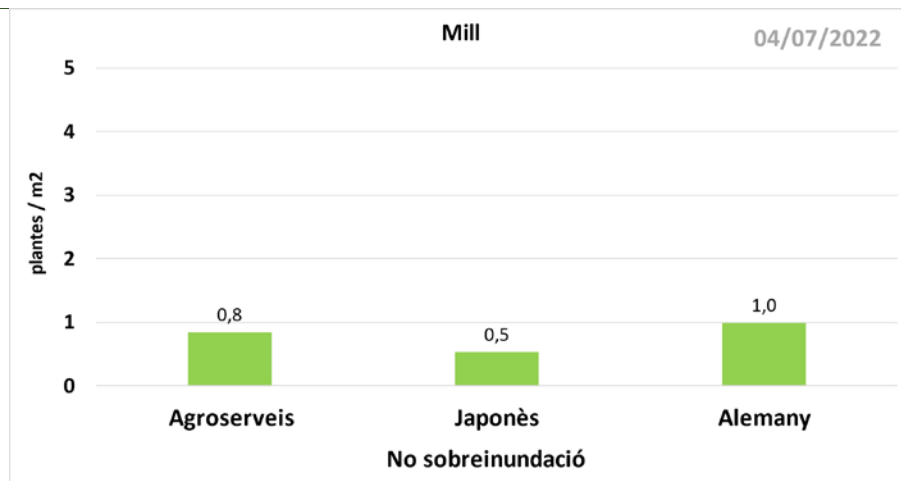


Figure 30: Millet plants per square metre in the non-overflooding assessment (04/07)

Summary of all weeds

To summarise of the effectiveness observed with the different rollers, we added up the number of plants and the percentage cover of the different weeds and obtained the average from the two techniques to provide an overview.

It should be noted that the best results were obtained in the overflooding technique and in particular with the Japanese roller (figure 31).

In the case of non-overflooding, the controls were generally lower due to the difficulty of the weeds in terms of both population and vigour. In this case, the Japanese roller once again provided the best results.

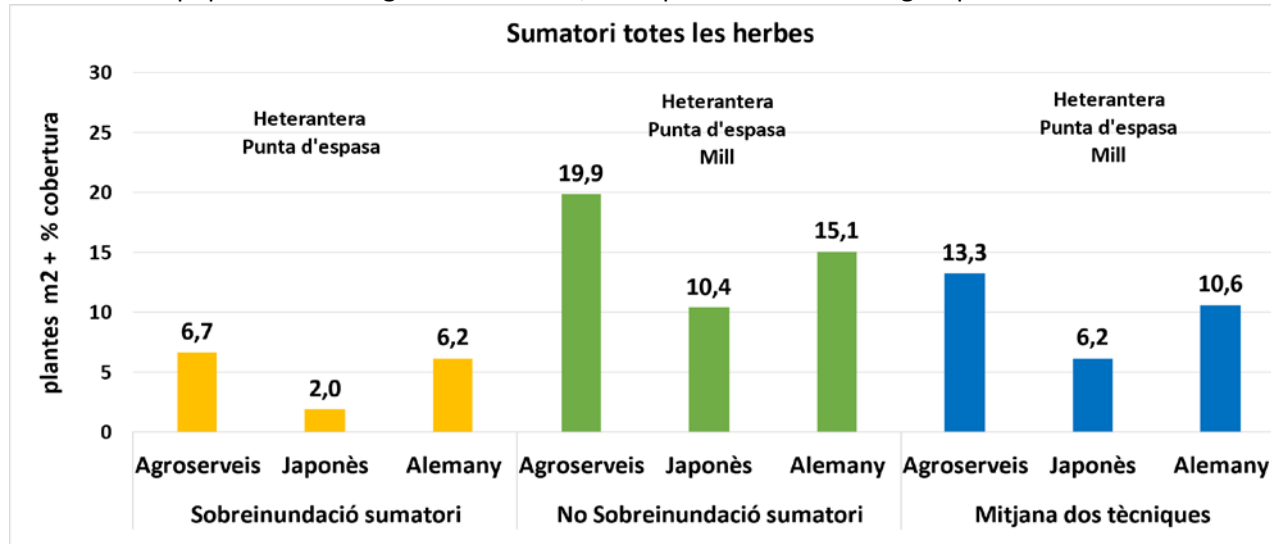


Figure 31: Total and average of plants per square metre in the flooding techniques.

Roller selectivity

Taking into account the different designs, dimensions and performance of each of the rollers, the results show that after the actions, each of them not only had an effect on the weeds but also on the crop.

The results after the three actions show their impact on crop density, which means the number of ears per square metre, depending on the width of the rice rows and the spacing between them. Every roller is different and this implies different widths for both alleys and rice lines. The most defined lines were those of the Japanese roller, with a width of 13 cm between them, followed by the German with 5 cm and finally Agroserveis with 4 cm between lines. This means that the shorter the distance between rows, the wider the rows are, as shown in figure 32, and consequently the greater the number of ears per square metre.

	04-jul		08-ago
DEMO 1	Línia d'arròs (cm)	Línia Rodolí (cm)	Espigues/m ²
Agroserveis	25	4	526
Japonés	20	13	381
Alemanya	22	5	476

Figure 32: Width of lines and density of ears per square metre with each roller

In this respect, we note that the roller with the greatest impact on weeds also had the greatest impact on the crop. As can be seen in the graph, the Japanese roller was the most aggressive, with narrower lines and a greater width between them, resulting in fewer spikes per square metre.

There were fewer differences between the Agroserveis and the German rollers, although the Agroserveis was more selective, thus providing a greater number of ears per square metre.

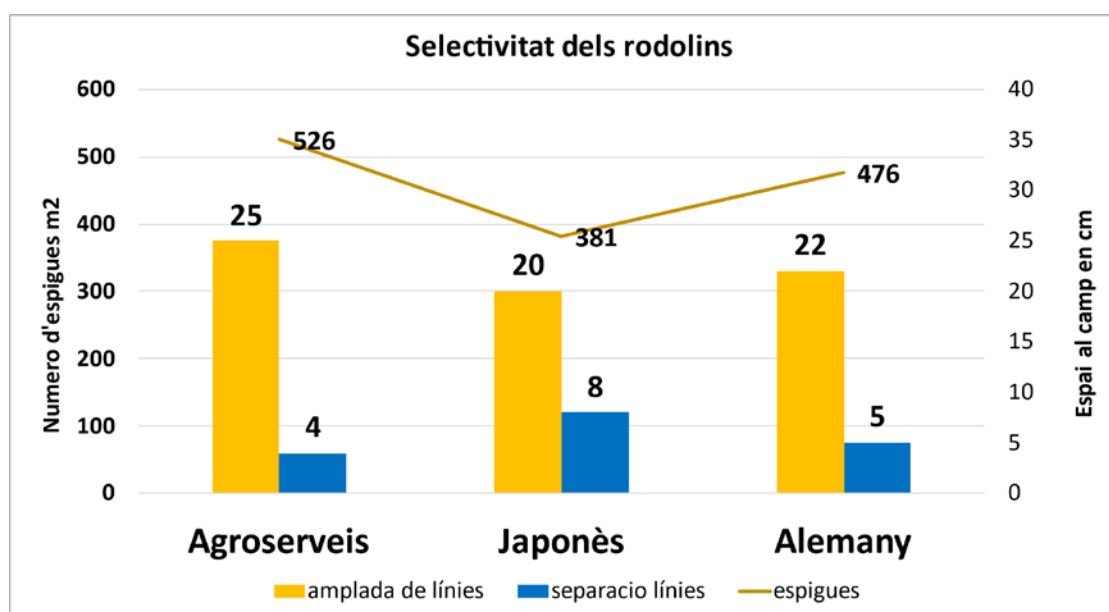


Figure 33: Selectivity of rollers, width of rice lines, spacing between them and number of ears.

DRY SEEDING STRATEGIES (3 and 4)

STRATEGY 3 (EARLY LASER)

Early laser + power harrow + dry seeding + tine harrow ABC

Early laser + power harrow + dry seeding + tine harrow ABC + coulter harrow D

Weed control in relation to technique

The effect of the early laser on the emergence of weeds was decisive with this technique. Up to 108 millet plants/m² were counted, so that at the time of seeding these emerging plants would be controlled with

the power harrow incorporated in the seeder, with an efficiency of 99%. This operation provided a significant reduction in weed growth after sowing, as it reduced the seed bank in germination conditions.

Weed control in relation to mechanisation (tine harrow)

Based on the results for 2021, the following actions were designed, with the flexible tine harrow used at A8, A15 and A22 days after sowing. All these actions provided very good results, from 0 to a maximum of 0.7 millet plants/m², preventing their establishment, acting from germination and the stages immediately after germination.

As can be seen in the graph (figure 34), from a few days after the last use of the tine harrow, at time C (A22), millet emergence increased, reaching values of 22 millet plants/m² in the late laser strategy and 7 plants/m² in the early laser strategy, before flooding.

From these results we can deduce that effectiveness decreased from the last intervention onwards (time C).

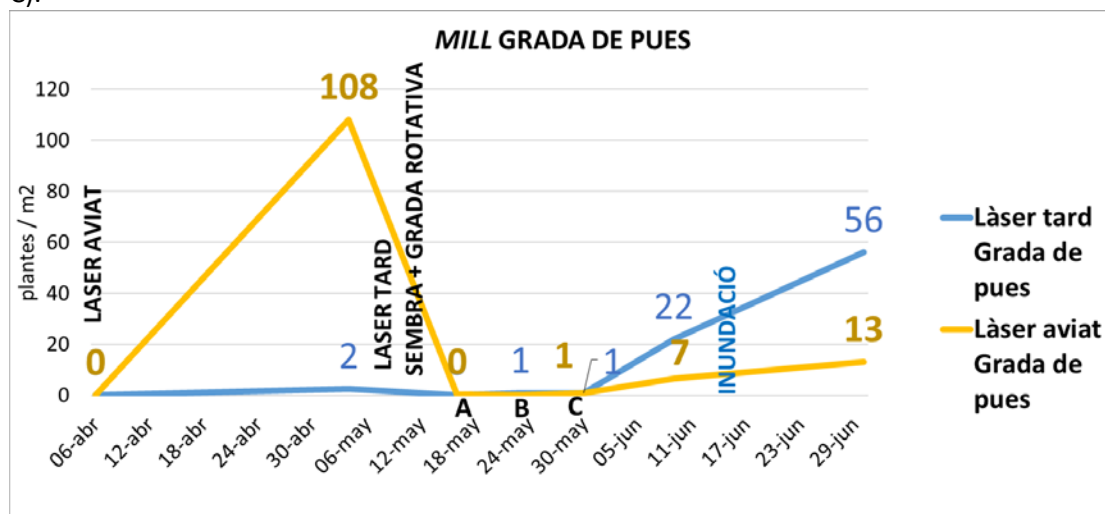


Figure 34: Development of millet (*Echinochloa* spp.) with the different tine harrow interventions.

In terms of selectivity, although the positional factor was involved, where the rice was at a greater depth than the area of the tine harrow action, the number of rice plants per square metre could be reduced by around 20% after the three actions.

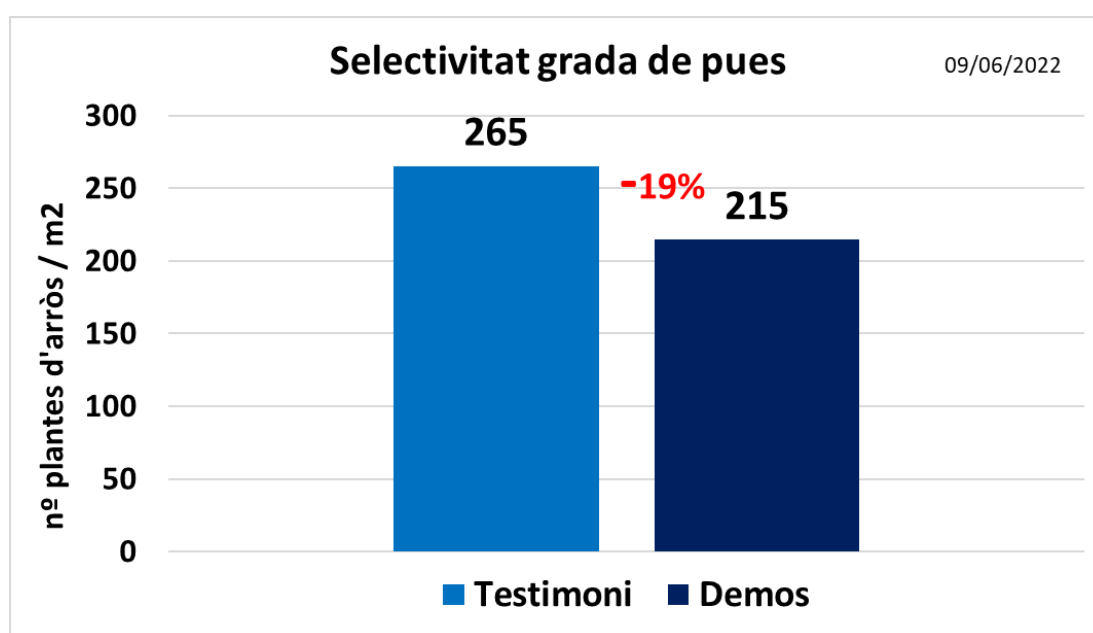


Figure 35: Selectivity of the tine harrow in terms of number of rice plants/m², calculating the average of the two controls and the two strategies.

Weed control in relation to mechanisation (coultter harrow)

Among the strategies proposed for the 2022 campaign, we introduced the coultter harrow as a mechanised control in more advanced weed stages, in order to improve the results of the tine harrow, bearing in mind that 14 days had passed between action A22 and the flooding and that the weeds that emerged during this period had grown significantly (BBCH 12-27, from two leaves to seven tillers), we took action in the middle of the plots with the tine harrow, just before flooding.

The coultter harrow increased the efficiency of the tine harrow by 22% for a cumulative efficiency of 90% (5 millet plants/m²).

In terms of selectivity, the coultter harrow caused a significant reduction in rice plants (37%), from 193 plants/m² to 122 plants/m² (figure 38).

STRATEGY 4 (LATE LASER)

Late laser + power harrow + dry seeding + tine harrow ABC

Late laser + power harrow + dry seeding + tine harrow ABC + coultter harrow D

Weed control in relation to technique

The late laser strategy seeks to delay the emergence of weeds by reducing their advantage with regard to the crop, without the need for control with the power harrow, as the laser itself used just before sowing, would control the emerged weeds.

In contrast to the early laser strategy, as we did not encourage early weed emergence, weeds emerged at a faster rate and in greater numbers after seeding, as the seed bank had not been reduced.

As can be seen in the graphs in figure 36, with the late laser, there were twice as many millet plants at the same time as in the early laser and up to three times as many in later assessments.

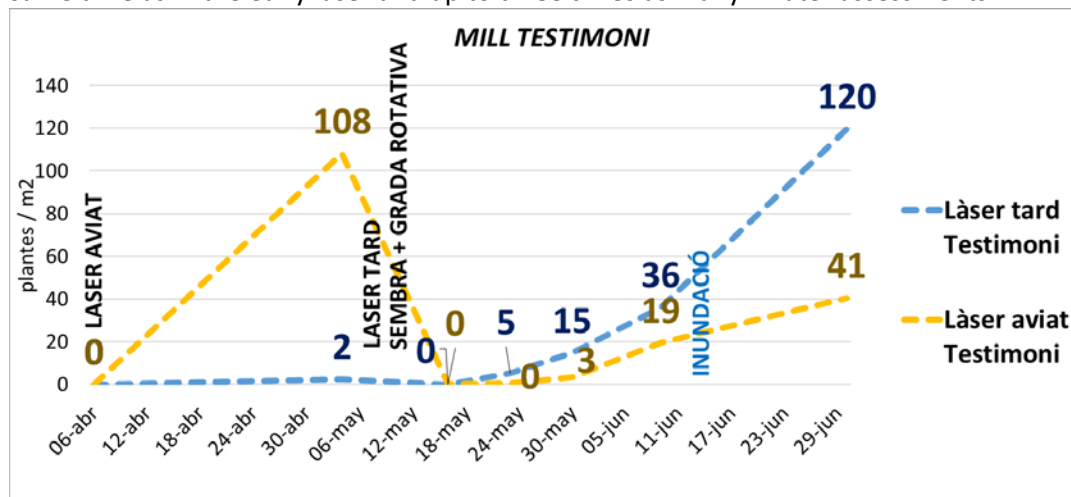


Figure 36: Effect on the emergence and subsequent development of millet (*Echinochloa* spp.) of different laser levelling strategies.

Weed control in relation to mechanisation (tine harrow)

The following actions were also designed in this strategy, based on the results from 2021, with the flexible tine harrow used at A8, A15 and A22 days after planting. All these actions provided very good results, similar to the laser strategy, preventing the establishment of weeds, acting from germination and the immediate stages after germination.

There are clear differences from time C (A22) onwards where the late laser strategy was notable for millet growth. As can be seen (figure 34), the trend was the same as in the control plot, although with lower values.

In terms of selectivity, we observed no differences between the early laser and late laser strategies.

Weed control in relation to mechanisation (coulters harrow)

As in the previous strategy, we introduced the coulters harrow for weed control at a more advanced stage. The coulters harrow also responded similarly in the two strategies, both in terms of effectiveness and selectivity, bearing in mind that the number of millet plants/m² was higher with the late laser strategy. Both at the time of intervention with the coulters harrow and in the last assessments, effectiveness increased by 34%, reaching a cumulative control of 90% with 12 millet plants/m², compared to 120 in the control.

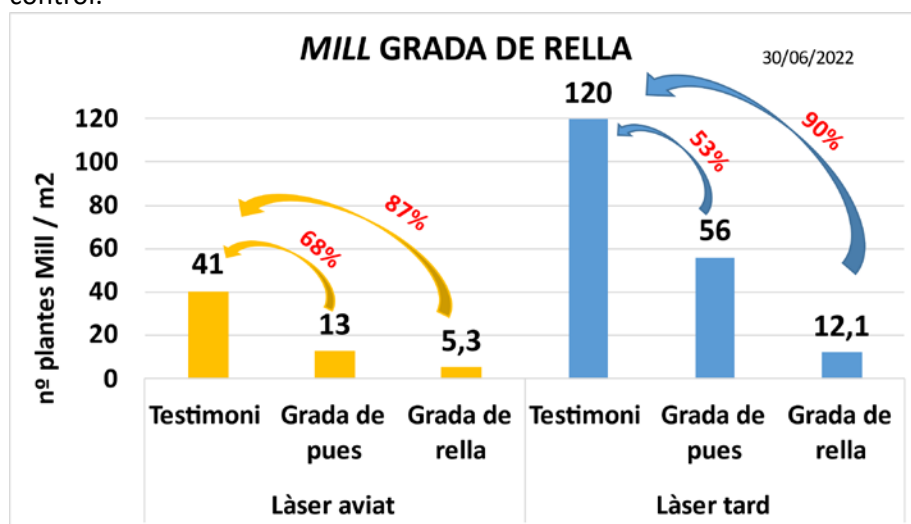


Figure 37: Effectiveness of the tine and coulters harrows compared to the control.

In terms of selectivity, the coulters harrow caused a significant reduction in rice plants (37%) from 193 plants per m² to 122 plants/m².

CONCLUSIONS

From the experience gained in the two campaigns of the GO EcoDE Task Force in 2021 and 2022 and from the point of view of weed control, the following conclusions can be drawn:

The first issue to consider when choosing a seeding strategy in organic production is the starting point.

Starting point for water seeding

The choice of water seeding for organic rice production and in terms of weed control is determined by a number of factors, both favourable and unfavourable, which influence the end results.

Favourable factors:

- Farming adapted to all types of conditions (salinity, soil types, water levels)
- Possible reduction in the emergence of grasses, especially millet, using different water levels.
- Low influence of weather conditions, especially rainfall for crop emergence and mechanical control actions.
- Possible mechanical weed control strategies pre- and post-flooding.

Unfavourable factors:

- Encourages the growth of aquatic weeds and sedges.
- Conditional on seeding dates, dangerous in late seeding under flooded conditions (Chironomidae).
- The plots should be limited to ensure good weed control in overflooding.

Starting point for dry seeding

The choice of dry seeding for organic rice production and in terms of weed control is determined by a number of factors, both favourable and unfavourable, which influence the end results.

Favourable factors:

- Good crop establishment under conditions suitable for dry seeding.
- Prevents and reduces the emergence of aquatic weeds and sedges even after flooding (crop establishment competition).
- Mechanised control prior to flooding, ease of implementation.
- No limitation on plot size.

Unfavourable factors:

- Favours the emergence of grasses, millet and wild rice prior to flooding.
- Mechanised control difficult after flooding.
- Possible emergence of weeds not usually associated with conventional rice farming.
- Strong influence of weather conditions, especially rainfall (problems in crop emergence due to soil “crusting”, increased salinity levels and difficulty in planning mechanical weed control).

Final conclusion on water seeding strategies 21-22

We tested the different strategies and drew the following conclusions for the two seasons in which we worked on weed control in flooded conditions:

2021 Row seeding + overflooding + mechanical control (roller)

This option involves precision seeding in rows, to be able to work between them using mechanical control, which makes mechanical implementation difficult.

2021 False seeding + row seeding + mechanical control (roller)

Apart from the disadvantage of the previous strategy, this one carries the risk of having to sow late, with the consequent threat of chironomid attack.

2021 False seeding + planting in rows + mechanical control (roller)

This option involves extra effort due to the logistics required for planting.

2022 Water seeding + eraser + mechanical control (three types of roller)

This option is insufficient for satisfactory control of all weeds.

2022 Water seeding with overflooding + eraser + mechanical control (three types of roller)

After the study, it was concluded that this was the best strategy for water seeding.

To sum up, among all the strategies carried out using water seeding, overflooding and, in particular, the implementation of the “eraser” concept as opposed to line seeding, together with mechanised operations with rollers proved the most successful combination, reaching very high weed control levels and very competitive potential production. This is shown by the example of 2022 with overflooding, when 19 bags per day, equivalent to 6,500 kg/ha, were produced.

Final conclusion on dry seeding strategies 21-22

During the 2021 and 2022 seasons, the following dry seeding strategies were tested:

2021 and 22 Late laser + power harrow + tine harrow

This option has the disadvantage of not reducing the seed bank sufficiently with the laser, so the effectiveness of the tine harrow is insufficient.

2022 Early laser + power harrow + tine harrow + coulter harrow

Although the coulter harrow increases efficiency more than the tine harrow, it does not compensate for damage to the crop.

2022 Late laser + power harrow + tine harrow + coulter harrow

This option significantly increases efficiency over the tine harrow and although it entails significant damage to the crop, this can be justified by weed control.

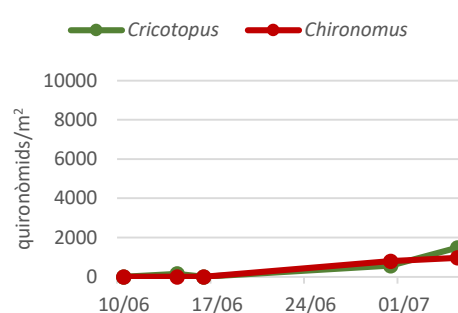
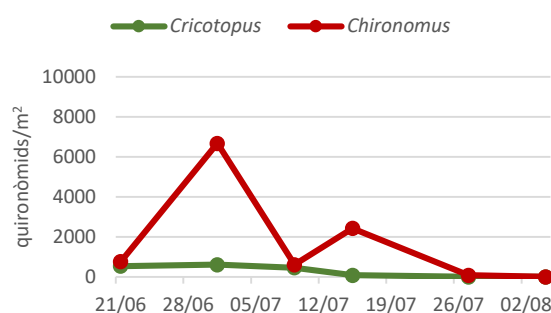
2021 and 22 Early laser + power harrow + tine harrow

from the study, we conclude that this is the best strategy in dry seeding.

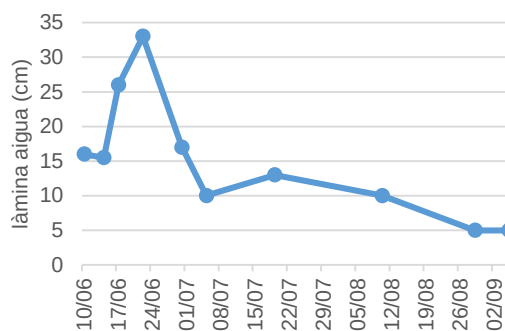
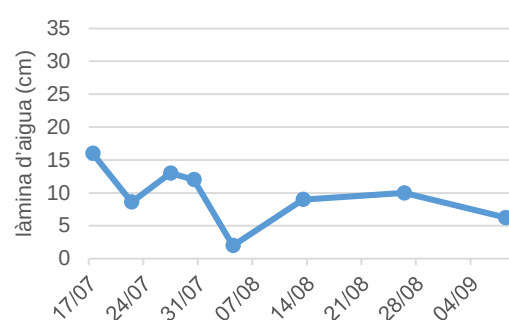
To sum up, among the dry seeding strategies, we would recommend early laser as a tool to promote weed emergence, followed by the power harrow incorporated into the seeder, to obtain a significant reduction in weed population prior to seeding. Continuing with two tine harrow operations after seeding provides a more balanced strategy in terms of mechanised weed control and the crop, making investment in manual weeding more viable, to complete the weed control.

AGRONOMIC PERFORMANCE OF VARIETIES IN ORGANIC PRODUCTION IN WATER SEEDING

The main agronomic results of experiment 1 are shown below. The graphs show the results for each year separately, as the two campaigns were quite different and statistically the averages of the two years cannot be plotted together.

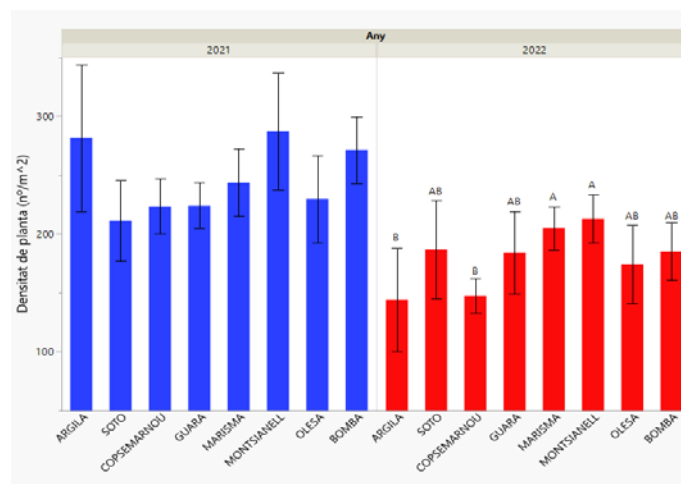
Monitoring of the chironomid population and water table

The chironomid population assessed in the two years of the trial was not high enough during the early stages of crop establishment to cause seed damage, as flooding and sowing occurred almost simultaneously, thus preventing proliferation of this pest. After two years of testing, the population increase occurred around 1 July, although a much higher level of larvae was reached in 2021 than in 2022 (graphs 1 and 2). At that time, the rice plants had already passed the germination and seedling stage and were no longer affected by the presence of chironomids in the field.



One of the weed control strategies in rice farming is to maintain a high water table during the early stages of cultivation so that flood-sensitive weeds cannot develop. This high level could not be maintained in 2021 due to a lack of water in the irrigation system (graph 3). By contrast, water levels of up to 30-35 cm were reached during the 2022 season (graph 4), thus achieving the desired effect on flood-sensitive weeds such as *Echinochloa* spp.

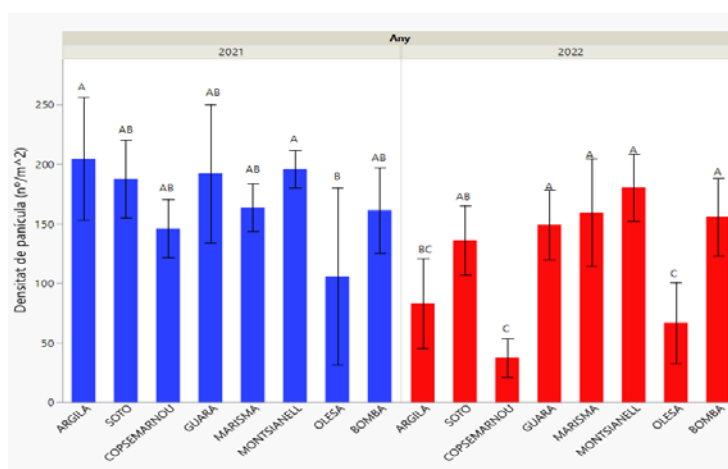
Plant density and crop establishment



Graph 5. Plant density (no. plants/m²) by variety in each trial year of experiment 1 (water seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

Average plant establishment in the trial was 27% in 2021 and 24% in 2022. These values are similar to average plant establishment in the Ebro Delta, which is 25% (Català, et al.). In the first season there were no significant differences between varieties, but in 2022 two main groups can be distinguished: firstly, the varieties that produced a higher number of plants/m² were Montsianell and Marisma, while Copsemar 9 and Arcilla had a lower number of seedlings (graph 5). The latter had a very low plant density in 2022 and a very high plant density in 2021. This result could be due to the fact that Arcilla is more sensitive to overflooding, as the water level in 2022 was much higher than in 2021.

Panicle density



Graph 6. Panicle density (no. panicles/m²) by variety in each trial year of experiment 1 (water seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

Panicle density is an agronomic component that generally has a direct influence on grain yield. Tables 16 and 17 and graph 22 in annex I show that the relationship between these two variables was significant in both years of the trial.

The average panicle density was 170 and 121 panicles/m² in 2021 and 2022, respectively. The varieties that stood out in both years as having the highest panicle density were Montsianell, Marisma, Guara and Bomba. Olesa and Copsemar 9 showed the lowest values (graph 6).

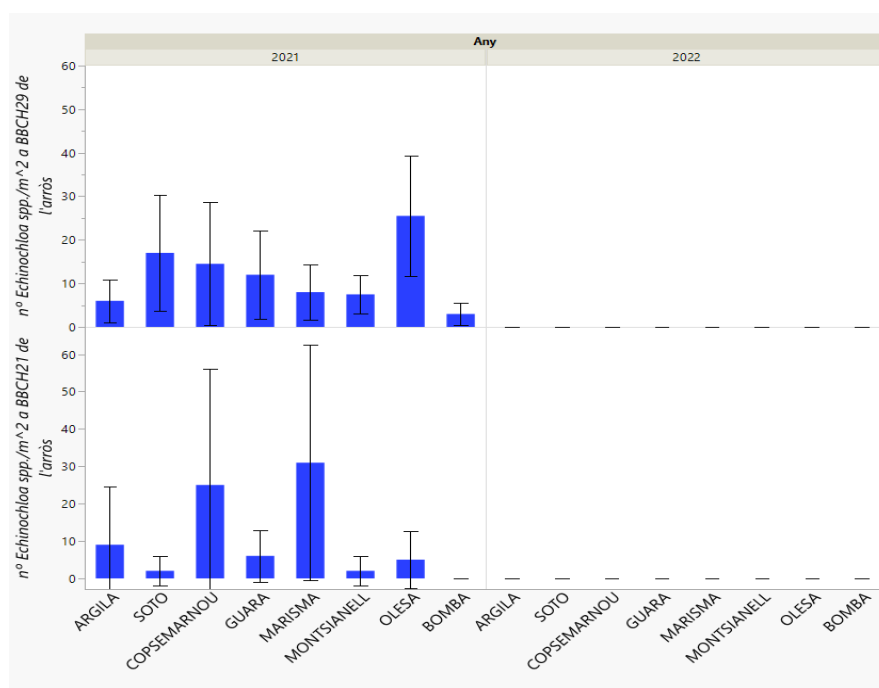
The ratio of number of panicles to plants was 0.6 in both years of the trial. In a conventional crop, this value is between 1 and 1.5, i.e. each plant can produce an average of between one and two panicles. Under the trial farming conditions, 0.6 panicles were produced per plant, from which it may be inferred that some of the plants were eventually lost, possibly due to competition from weeds.

Levels of disease

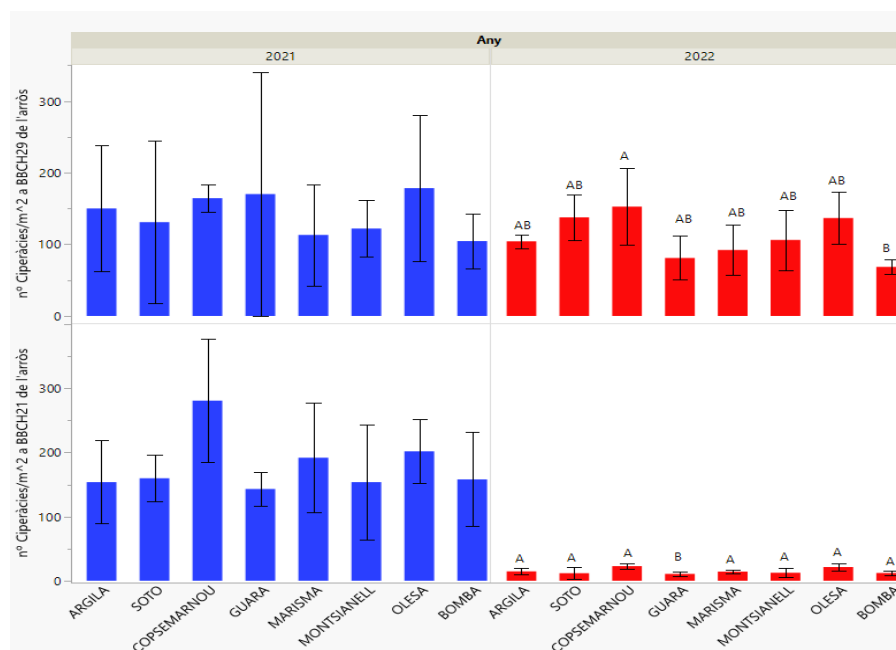
The level of rice blast in most of the varieties in the two trial years was low (level 3 on the scale 1-9), except with the Bomba variety, which was affected more severely in 2021. For this reason, in the second year it was decided to treat this variety with an organic fungicide (Thiopron); hence the level of rice blast was lower in 2022.

Infection from helminthosporiosis was also very low in both years. The Marisma variety showed the most symptoms of this disease but only reached a maximum level of 5 on the 1-9 scale of affectation.

Weed density and height



Graph 7. Density of *Echinochloa* spp. at two points in crop growth (tillering, BBCH 21 and panicle initiation, BBCH 29) by variety, for each trial year of experiment 1 (water seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

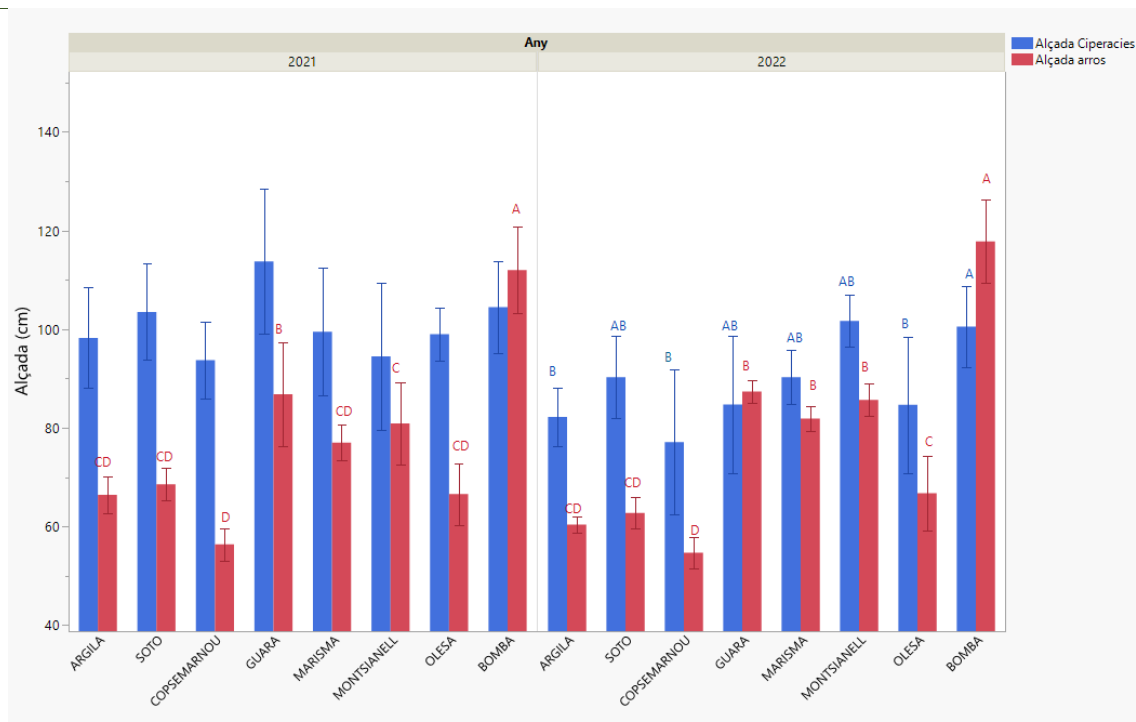


Graph 8. Density of sedge at two points in crop growth (tillering, BBCH 21 and panicle initiation, BBCH 29) by variety, for each trial year of experiment 1 (water seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

As shown in graphs 7 and 8, weed density was assessed twice: at the germination stage (BBCH 21) and at the panicle initiation stage (BBCH 30).

Generally speaking, in water seeding, the weed family that most affects the crop is sedge, as the grasses, and especially *Echinochloa* spp., can be controlled by overflooding. However, due to the situation in 2021, a sufficiently high water level could not be maintained and therefore the density of *Echinochloa* spp. was an average of 11 plants/m² in the first year (graph 7). There were no statistically significant differences between varieties. The presence of this weed species was not detected in 2022.

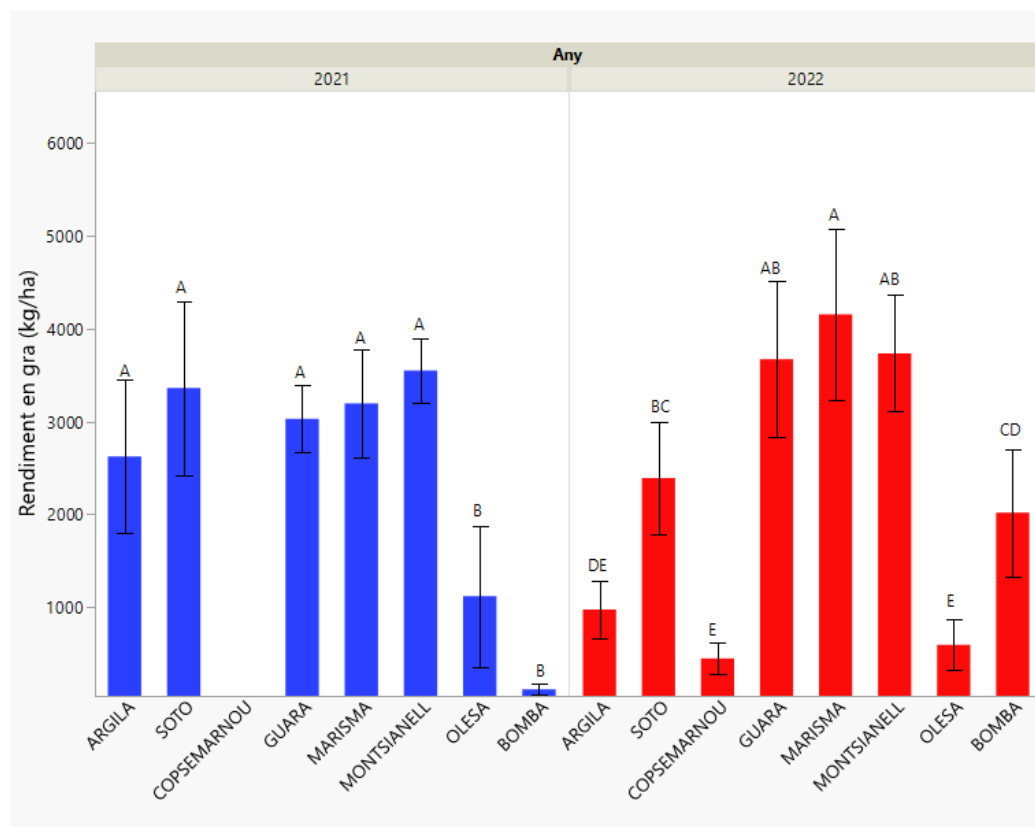
The average density of sedge in 2021 and 2022 was 141 and 109 plants/m², respectively (graph 8). These were very high figures for weeds, causing heavy competition with the crop. It should be noted that the density of rice plants was 246 plants/m² in 2021 and 180 plants/m² in 2022. In the last year, there were significant differences between varieties: Copsemar 9 showed the highest density of sedge, which may be due to lower plant establishment and panicle density, favouring greater weed proliferation. Of note were the varieties Guara in the first assessment and Bomba in the second, which had the lowest density of sedge. It should be borne in mind that the height of these two varieties may provide an advantage when competing with weeds.



Graph 9. Height of rice (in red) and sedge (in blue) by variety for each trial year of experiment 1 (water seeding). Assessment carried out at the phenological stage of pasty grain rice (BBCH 83). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

As mentioned above, the height of the rice plant is an agronomic characteristic that can lead to better competition with weeds. In this respect, at the gelatinous grain stage (BBCH 83), the height of the sedge and rice plants was measured. Graph 9 shows that three groups stand out among all the varieties assessed: firstly, the Bomba variety was the tallest, followed by the group consisting of Guara, Marisma and Montsianell, and finally the Olesa, Arcilla, Soto and Copsemar 9 varieties were the shortest. In all cases, the sedge was higher than the rice, except for the Bomba variety and Guara in 2022.

Finally, it should be noted that the sedge density correlated significantly to the final production obtained in 2022 (table 17 and graph 23, annex I) and is therefore considered one of the factors that could limit grain yield in the trial, under the farming conditions used.

Grain yield

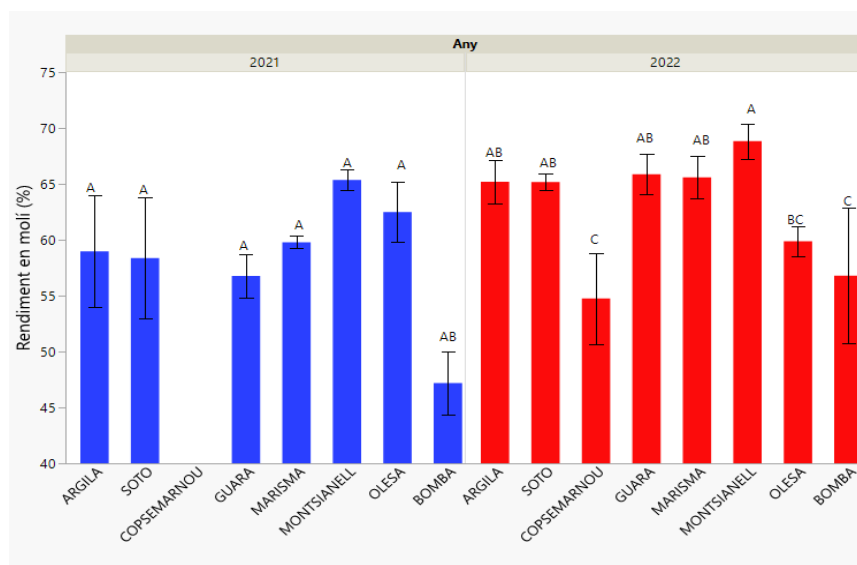
Graph 10. Rice grain yield (kg/ha clean at 14% moisture) by variety for each trial year of experiment 1 (sown in water). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

The average grain yields for 2021 and 2022 were 2803 and 2585 kg/ha, respectively (without including the Copsemar 9 variety, due to an incident in 2021, or the Bomba variety, as it was considered less productive than the other varieties). The latter produced 112 kg/ha in 2021 and 2016 kg/ha in 2022 (graph 10).

As mentioned above, the high density of sedge created strong competition with the crop, resulting in fewer established plants, lower production of panicles and, finally, a low grain yield.

The varieties that maintained the best production over the two years of the trial were Marisma, Montsianell and Guara. By contrast, Bomba, Copsemar 9 and Olesa had the lowest grain yield.

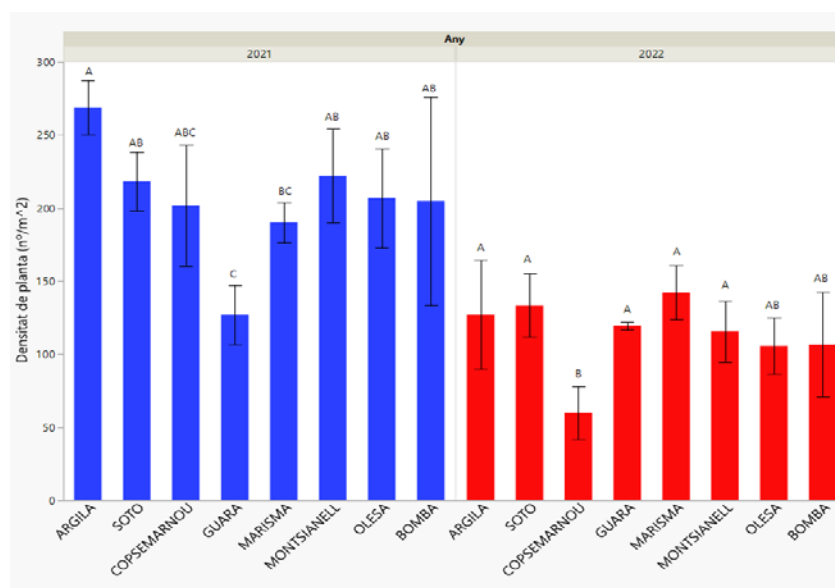
The Argila and Soto varieties showed variable grain yields in the two trial years, being high in 2021 but low in 2022. They were therefore more vulnerable to changes in growing conditions.

Milling yield

Graph 11. Milling yield (percentage whole kernels) by variety for each trial year in experiment 1 (water seeded). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

The milling yields for most of the varieties assessed were between 60-70% of whole grains (graph 11). The lowest yielding varieties were Bomba and Copsemar 9.

AGRONOMIC PERFORMANCE OF VARIETIES IN ORGANIC PRODUCTION IN DRY SEEDING

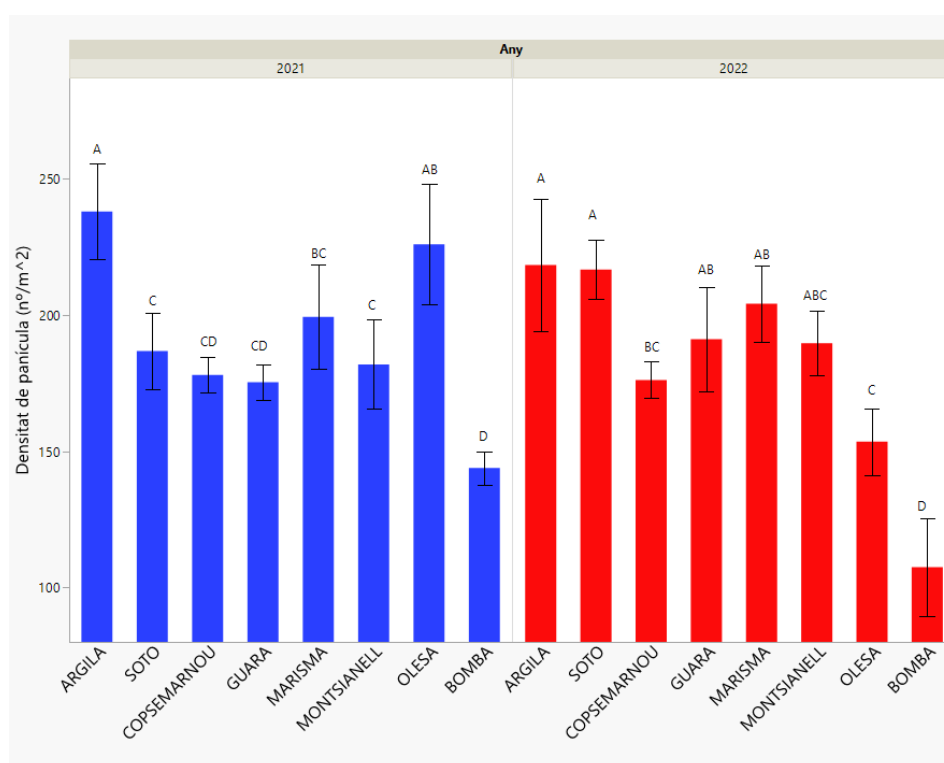
Plant density and crop establishment

Graph 12. Plant density (no. plants/m²) by variety in each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

Overall, the plant density in the 2021 season (46% establishment) was higher than in the 2022 season (26% establishment).

As shown in graph 12, the most notable varieties in terms of good seedling production with dry seeding were Arcilla, Soto, Montsianell, Olesa and Bomba. Copsemar 9 had the lowest plant density and Guara and Marisma showed very different results in the two seasons.

Panicle density and plant height

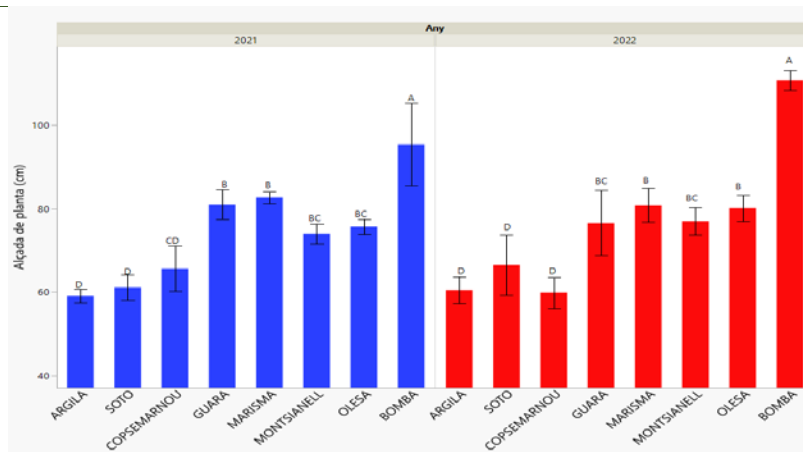


Graph 13. Panicle density (no. panicles/m²) by variety in each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

As shown in graph 13, the average panicle density for the two seasons was quite similar, hence plant density had no effect on the panicles produced. The ratio for the number of panicles per plant was 0.9 in 2021 and 1.6 in 2022. The ability of rice plants to compensate for low plant density with higher panicle production should be taken into account.

In 2021, the varieties Arcilla, Olesa and Marisma showed the highest values for panicle density while Arcilla, Soto, Marisma, Guara and Montsianell did so in 2022. The Bomba variety had the lowest number of panicles in the two years of the trial.

Finally, as in experiment 1, there was a significant correlation between the number of panicles and grain yield (tables 18 and 19 and graph 24 in annex I).



Graph 14. Rice plant height by variety for each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

Three groups can be distinguished in terms of plant height: firstly, the Bomba variety was the tallest, followed by the group of Marisma, Guara, Montsianell and Olesa, while the shortest varieties were Arcilla, Soto and Copsemar 9 (graph 14). This pattern, being a characteristic of the varieties, was maintained over the two years of the trial.

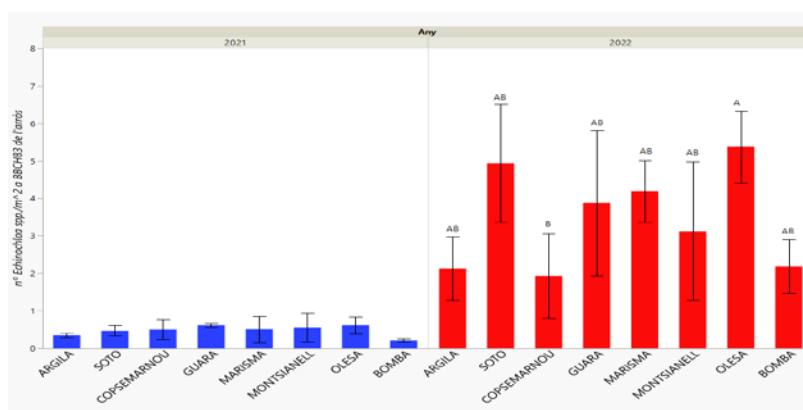
Levels of disease

Overall, the level of rice blast was low (level 3-4 on the 1-9 scale) in both years of the trial. It should be noted that the Bomba variety is more sensitive to this disease and was severely affected in 2021. Therefore, in the last season, the decision was made to protect it by using an ecological fungicide, thus it was less affected by rice blast.

The varieties that showed low levels of rice blast in the two years of the trial were **Olesa, Copsemar 9 and Montsianell**.

As for helminthosporiosis, levels were low with no statistically significant differences between varieties.

Level of weeds

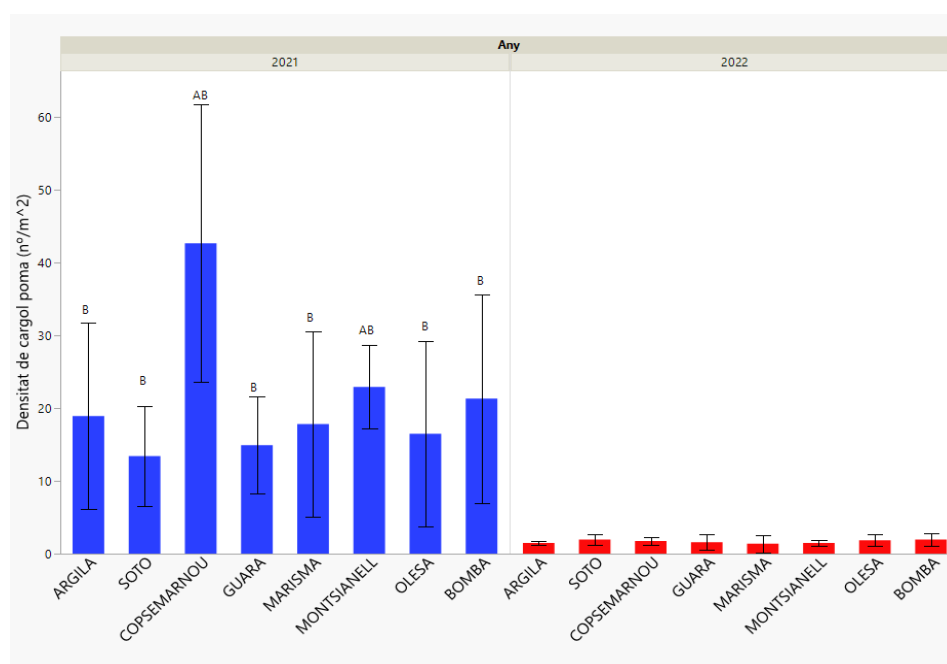


Graph 15. Density of *Echinochloa* spp. at the phenological gelatinous grain stage (BBCH 83) by variety, for each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

Weed infestation can be a limiting factor when growing organic rice. For this reason, the different weed species that appeared were monitored throughout the entire crop (in the 4-leaf stage, at the beginning of the

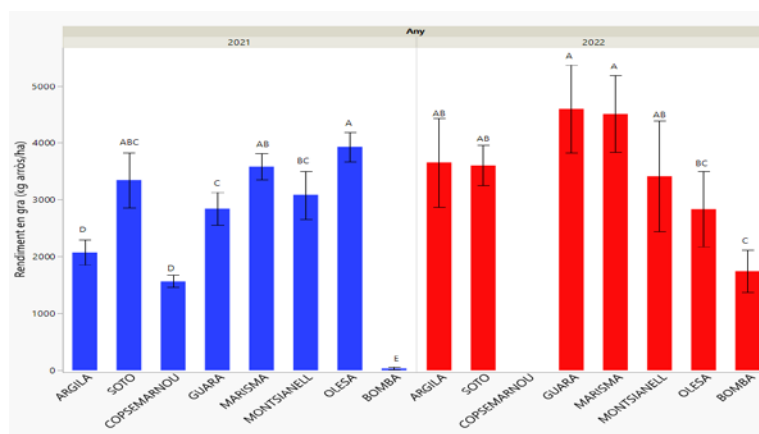
panicle and at the gelatinous grain stage). Graph 15 shows the density of *Echinochloa* spp. at the gelatinous grain stage, the moment when the highest values were observed. In all assessments in both years, the presence of other weed species was very low, and non-existent in the case of sedge (data not shown). In this respect, the seeding system had a major effect on the weed species occurring in the field. In water seeding, sedge was the most abundant weed while in dry seeding it was *Echinochloa* spp. However, it should be noted that the level of weed infestation in the dry seeding trial was low (an average 3.47 plants of *Echinochloa* spp./m² in 2022) compared to the water-seeding trial (140 plants of sedge/m²). However, the level of *Echinochloa* spp. in 2022 increased compared to the previous year in dry seeding and could, therefore, pose a threat to the crop in the long term due to the accumulated seed bank of this weed. There were no significant differences between varieties, as weed pressure was not high.

Apple snail population density



Graph 16. Apple snail population (no. of individuals/m²) by variety, for each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

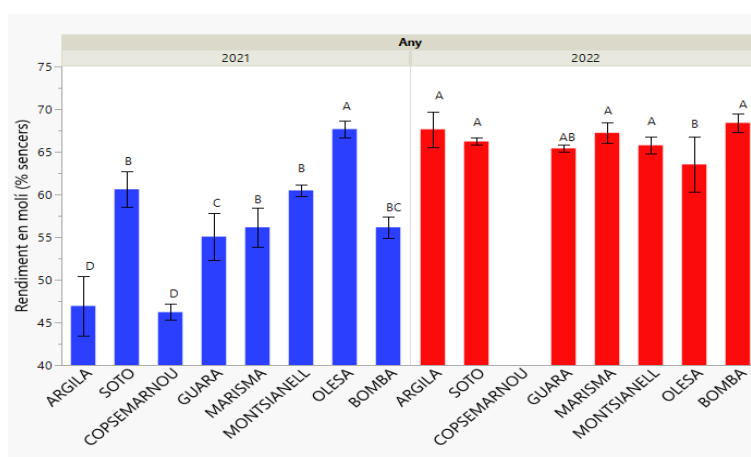
The apple snail population in 2022 was lower than in 2021 and there were no significant differences between varieties (graph 16). However, in 2021, a greater number of individuals was observed in the Copsemar 9 paddy fields, which may be due to the phenological development of the variety, as it has a longer and more differentiated cycle than the rest.

Grain yield

Graph 17. Rice grain yield (kg/ha clean at 14% moisture) by variety for each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

With regard to the final production obtained (graph 17), an average yield of 3144 kg/ha was obtained in 2021 and 3771 kg/ha in 2022 (without taking into account the Copsemar 9 variety, due to an incident in 2022, or the Bomba variety, as it is considered less productive than the other varieties). The latter yielded 31 kg/ha in 2021 and 1741 kg/ha in 2022.

Considering that the panicle density was similar for the two seasons, one would expect yields would also follow the same pattern, but this was not the case. This is attributed to the fact that in the last season, fertilisation with mulch was carried out, which favoured larger panicles and, as a consequence, higher production. In this sense, the varieties that had good results in both years were **Marisma and Soto**. In contrast, the lowest yields were obtained from the varieties Copsemar 9 and Bomba. It should be noted that the production from the Bomba variety increased over the two seasons, which was also attributed to fertilisation adapted to the needs of this particular variety and also to protection against rice blast by applying an organic fungicide.

Milling yield

Graph 18. Milling yield (percentage large whole) by variety for each trial year of experiment 2 (dry seeding). The absence of letters or the same letter above the columns indicates there were no significant differences between varieties, based on the Tukey method at 5% significance, for each year of the trial.

According to graph 18, the average milling yield of the tested varieties was 56% in 2021 and 66% in 2022. Most varieties showed high values except Arcilla and Copsemar 9 in 2021.

ECONOMIC STUDY

Economic study

The data from the economic study are presented with reference to the common varieties, which do not require specific crop management, and with reference to the Bomba variety, which does require differentiated crop management.

The partial costs associated with the crop are shown in tables 6, 7, 8 and 9.

As shown in tables 6 and 7, the costs for water seeding vary less than for dry seeding. The biggest increase in 2022 in dry seeding was due to the change in fertiliser strategy, both in bottom and top fertilising, and the application of a fungicide to the Bomba variety (table 7).

Table 6. Specific costs incurred in organic rice farming production for common varieties not requiring specific management.

costs associated with organic farming (€/ha)				
Varieties	water seeding		dry seeding	
	2021	2022	2021	2022
SOIL PREPARATION	328	179	294	344
FERTILISER	274	332	360	1068
SEED	223	239	149	160
ORGANIC PLANT PROTECTION PRODUCTS	0	0	0	0
TOTAL	825	750	803	1572

Table 7. Specific costs incurred in implementing organic rice production for the Bomba variety.

costs associated with organic farming (€/ha)				
TASKS	water seeding		dry seeding	
	2021	2022	2021	2022
SOIL PREPARATION	328	179	294	344
FERTILISER	274	241	360	362
SEED	575	598	383	399
ORGANIC FUNGICIDE	0	266	0	266
TOTAL	1176	1283	1037	1370

In non-organic production (tables 8 and 9), the difference between years is due to updating the prices of the different actions.

Table 8. Costs incurred for carrying out non-organic production of rice cultivation in common varieties not requiring specific management.

Costs associated with NON-organic farming (€/ha)				
TASKS	water seeding		dry seeding	
	2021	2022	2021	2022
SOIL PREPARATION	55	79	55	46
FERTILISER	362	760	380	681
SEED	224	240	149	126
PLANT PROTECTION PRODUCTS	373	409	401	445
TOTAL	1014	1488	985	1298

Table 9. Costs incurred in non-organic production of the **Bomba** rice variety.

Costs associated with NON-organic farming (€/ha)				
TASKS	Water seeding		dry seeding	
	2021	2022	2021	2022
SOIL PREPARATION	55	79	55	46
FERTILISER	188	379	203	336
SEED	490	509	287	299
PLANT PROTECTION PRODUCTS	373	409	401	445
TOTAL	1106	1376	946	1126

The estimated yields for the economic balance are shown in table 10.

Table 10. Yield (kg/ha) estimated from DACC and experimental data.

Production system	estimated production (kg/ha)			
	water seeding		dry seeding	
	other varieties	Bomba	other varieties	Bomba
organic	3144	2017	3939	1741
non-organic	6853	3078	6853	3078
difference	3709	1061	2914	1337

The partial income associated with the sale of rice and the subsidy is shown in tables 11 and 12, with regard to two scenarios: the selling price of organic rice the same as non-organic rice (table 11); and the selling price of organic rice twice that of non-organic rice (table 12), except for the Bomba variety, which is considered at four times the price of conventional rice.

Table 11. Production-related income and specific support for organic or agri-environmental production. The price of organic rice = non-organic, organic and non-organic Bomba price = 2.5 x price of the rest.

Production system	income from production (€/ha) + subsidy			
	water seeding		dry seeding	
	other varieties	Bomba	other varieties	Bomba
organic	1835	2689	2193	2379
non-organic	3413	3792	3413	3792
difference	1578	1103	1220	1413

Table 12. Production-related income and specific support for organic or agri-environmental production. Price of organic rice = 2 x non-organic, price of organic Bomba = 4 x price of the rest. Bomba price = 2.5 x other varieties.

Production system	revenue from production (€/ha)			
	water seeding		Dry seeding	
	other varieties	Bomba	other varieties	bomba
organic	3250	4051	3965	3554
non-organic	3413	3792	3413	3792
difference	163	-259	-552	238

The gross margins were assessed on the basis of the data shown in the income and expenditure tables. The data show how an organic product, if sold at the same price as a non-organic one, lowers profitability (table 13). If organic production can be sold at twice the price of non-organic production, profitability increases, with the exception of Bomba, where the drop in production is not compensated by the price.

Table 13. Gross margin: gross income - partial costs for 2021 associated with the farming system.

Gross margin = revenue - partial costs associated with organic farming (organic price = conventional price)				
Production system	water seeding		dry seeding	
	other varieties	bomba	other varieties	bomba
organic	1085	1313	620	1008
non-organic	1925	2416	2115	2666
difference	-841	-1103	-1495	-1657

Table 14. Gross margin: gross income - partial costs for 2021 associated with the farming system.

Gross margin = income - partial costs associated with organic farming (organic price = 2* conventional price)		
Production system	water seeding	dry seeding

	other varieties	bomba	other varieties	bomba
organic	2499	2768	2393	2184
non-organic	1925	2416	2115	2666
Difference	574	352	278	-482

COMPARATIVE STUDY OF BIODIVERSITY BETWEEN ORGANICALLY AND CONVENTIONALLY FARMED FIELDS

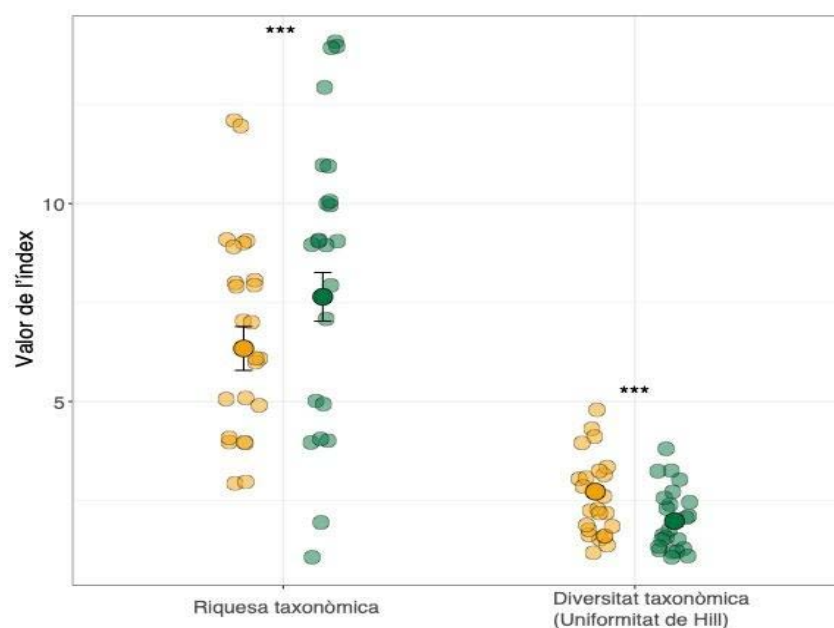
Macroinvertebrate diversity

Table 15. Taxonomic groups sampled in the experimental plots with the average abundances and trophic level of each taxon.

Rate	Medium abundance		Trophic level
	Conventional	Organic	
Phylum: Annelida			
Class: Clitellata			
Order: Arhynchobdellida	137	40	Predators
Class: Oligochaeta	514	238	Herbivores
Phylum: Arthropoda			
Class: Arachnida			
Order: Trombidiformes	28	37	Predators
Class: Branchiopoda			
Order: Cladocera	1373	4872	Herbivores
Class: Copepoda	840	314	Herbivores
Class: Entognatha			
Order: Collembola	747	371	Omnivores
Class: Insecta			
Order: Coleoptera	140	267	Pred./ Omniv./ Herbiv.
Order: Diptera	2681	2698	Herbivores/ Predators
Order: Ephemeroptera	18	36	Herbivores
Order: Hemiptera	603	856	Herbivores/Predators
Order: Lepidoptera	11	54	Herbivores

Order: Odonata	718	1774	Predators
Order: Trichoptera	-	22	Omnivores
Class: Malacostraca			
Order: Decapoda	16	25	Omnivores
Class: Ostracoda	1062	10545	Filters
Phylum: Cnidaria			
Class: Hydrozoa			
Order: Anthomedusae	11	11	Predators
Phylum: Cnidaria			
Class: Gastropoda			
Order: Basommatophora	2447	3606	Herbivores
Phylum: Nematoda	315	11.11	Herbivores

During the entire phenological crop cycle (May-September), a total of 116,760 macroinvertebrates were caught in 2021, of which 10,502 are considered generalist aquatic predators, i.e. they prey on a wide range of other organisms, such as chironomids (table 15). In addition, the total number of chironomids sampled was 32,334 individuals.

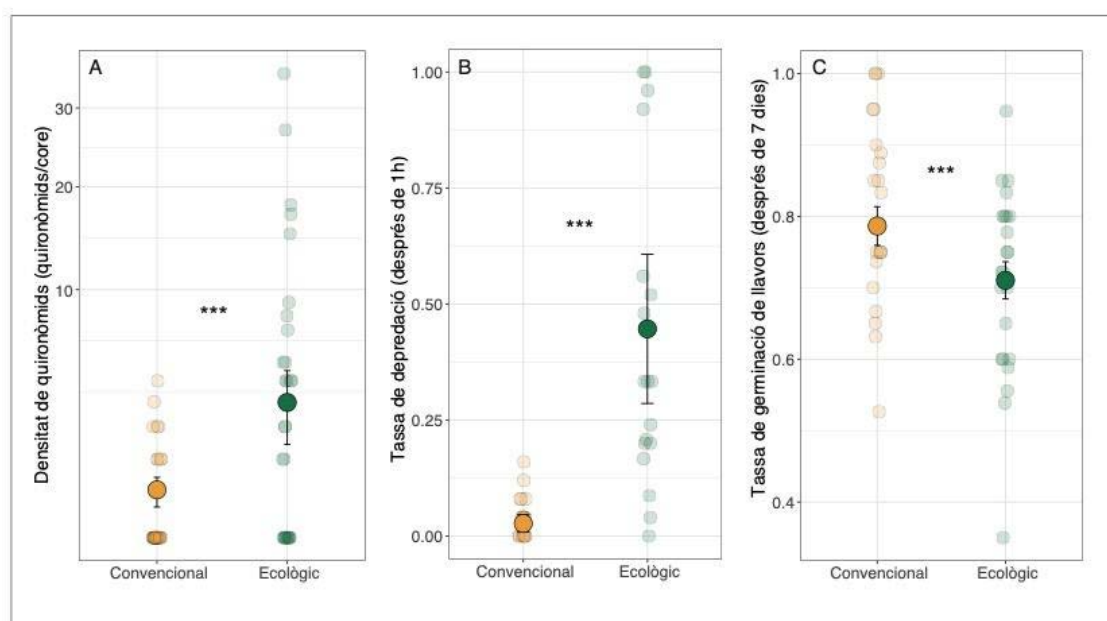


Graph 19. Taxonomic richness and diversity in conventional (yellow dots) and organic (green dots) production fields. Each point represents the taxonomic index value on a plot and sampling date. The larger solid dots and the error bar indicate the model estimates and the associated standard error. The asterisk indicates significant differences between the two types of management ($p < 0.001$).

Model results show that the type of agricultural management influenced macroinvertebrate taxonomic richness, i.e. the number of different taxa. Specifically, the results show that the average richness over the crop cycle was higher with organic production (7.6 ± 0.6 ; mean $\pm$ standard error) than in conventional production (6.3 ± 0.5) (graph 19). However, when abundance information for each taxon is taken into account

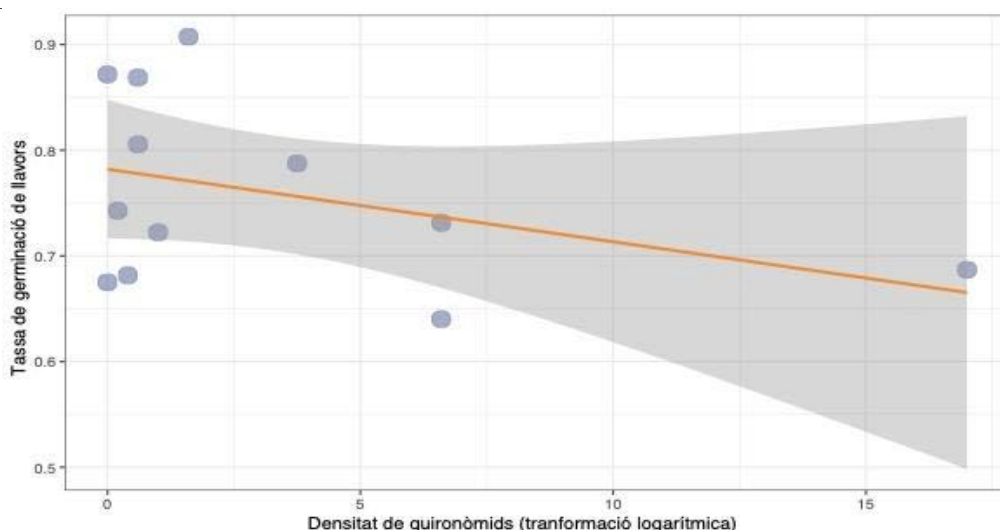
(using Simpson's Diversity Index), the model shows that diversity is significantly higher in conventional production fields (2.7 ± 0.1) compared to organic production fields (2.0 ± 0.1) (graph 19). Therefore, the results suggest that, although conventional farming filters out the rarest species of the macroinvertebrate community (the least abundant), it is able to maintain high taxonomic diversity dominated by the different species that are most common in both types of production. This highlights, firstly, the capacity of organic production to host a wide range of organisms, probably as a result of the greater heterogeneity of habitats available within each plot (e.g. the presence of other macrophytes) and the reduced use of plant protection products. Secondly, the high taxonomic diversity found in conventional production plots indicates the capacity of this type of production to promote good coexistence among the most common species in the community, probably those better adapted to the more homogeneous habitat structure provided by conventional farming.

Chironomid monitoring and impact on germination



Graph 20. Chironomid density (panel A), chironomid predation rate (panel B) and rice germination rate (panel C) in conventional (yellow dots) and organic (green dots) production fields. Each point in panel A represents the number of chironomids in each core, in panel B the predation rate on each observation plate with chironomid larvae and in panel C the germination rate on each seed plate. The larger solid dots and the error bar indicate the estimates of each model and associated standard error. Asterisks (***) indicate significant differences between the two management types ($p < 0.001$).

Model estimates show a higher density of chironomids per core in organic fields (3.0 ± 1.5) than in conventional fields (0.3 ± 0.2 ; graph 20A). This difference in chironomid abundance is probably related to the use of seed treated with Chlorantraniliprole, an effective insecticide for preventing seed damage during germination. In contrast, the predation rate of chironomid larvae (experimentally characterised using observation plates) was much more efficient in organic fields than conventional fields. Specifically, the mean percentage of chironomid predation ranged from 45% ($\pm 16\%$) in organic fields to 3% ($\pm 2\%$) in conventional production (graph 20B). This pattern is related to a higher abundance of aquatic predators during that phenological time (crop initiation). Although the efficiency of biological control seems to be higher in organic plots, the lower abundance of chironomid larvae observed in conventional fields suggests that biological control is less efficient than chemical control with regard to controlling chironomid populations during the critical time for the crop.



Graph 21. Relationship between chironomid density and rice germination rate. Each point represents the average per field.

Finally, the correlation between greater chironomids abundance in organic production and a lower seed germination rate was assessed. The results from the model indicate that the seed germination rate was indeed approximately 8% lower in organic fields ($71.0\% \pm 3.0$) compared to conventional fields ($79\% \pm 3.0$; graph 20C). Furthermore, when chironomid abundance was related to germination rate using the applied model, a negative correlation between both variables was observed, indicating, as expected, a negative impact of chironomid populations on rice germination (graph 21).

CONCLUSIONS

Agronomic performance of varieties in organic production in water seeding.

- The **agronomic development** of the trial carried out using water seeding was similar for both years of the trial. The main difference was in the water table during the early stages of cultivation. Due to water shortage problems, it was not possible to maintain a high level in the field in 2021, although it was possible in 2022. This difference had an impact on the type of weeds that emerged: sedge was present in both years of the trial (reaching a density of 140 plants/m²) but in 2022 *Echinochloa* spp. did not appear.
- The plant establishment achieved by each variety can provide an advantage in terms of competition from weeds. In this respect, the varieties **Montsianell** and **Marisma** were notable for obtaining the highest number of plants per m². In contrast, the Copsemar 9 variety had a lower plant establishment figure over the two years with the resulting higher level of sedge.
- The **average grain yield** in the trial (excluding the Bomba and Copsemar 9 varieties) was 2803 kg/ha for 2021 and 2585 kg/ha for 2022.
- The varieties that produced the highest panicle density and production, and which are therefore proposed for organic water seeding rice farming, are **Montsianell**, **Marisma** and **Guara**.

Experiment 2. Agronomic performance of organic production varieties in dry seeding

- The initial crop growth was quite different in each year of the trial, with 46% **plant establishment** in the first year and 26% in the second. In this sense, the most successful varieties for seedlings in the two years were: Arcilla, Soto, Montsianell, Olesa and Bomba.
- The **panicle density** did not vary much between the two years but the varieties that produced higher numbers of panicles were: Argila and Marsh. This agronomic parameter should be stressed, as a significant effect on final yield was observed.
- It should also be noted that the **level of rice blast** in both years was low, but the Olesa, Copsemar 9 and Montsianell varieties were the least affected by the disease.
- In terms of final production, the addition of a cover crop increased the grain yield. The average yield was 3144 kg/ha for 2021 and 3771 kg/ha for 2022 (excluding the Bomba and Copsemar 9 varieties). In this sense, the varieties **Marisma and Soto** were notable for providing the best results in both years.
- As for the Bomba variety, the application of organic fungicides and adapted fertilisation also improved its grain yield and therefore its use in an organic dry-seeded rice production system should not be ruled out.
- In general terms, it should be noted that one constraint that could affect organic dry-seeded rice cultivation in the long term is **weeds**, specifically *Echinochloa* spp., as a significant increase in the number of plants was detected in the two years of the trial. No differences were detected between the varieties in terms of better competition with weeds because the weed densities were not very high. It should be borne in mind that the starting point was a very low level of weeds. Dry seeding seems to provide advantages in controlling sedge, as it was absent in the two years of the trial.
- Finally, further work is needed on **optimising fertilisation** for this farming system, as it seems to provide a direct improvement in the final production obtained.

Conclusions

- **The study of the agronomic behaviour of different varieties is a useful tool for optimising organic rice farming**, since significant differences were found with regard to the farming system. This study helps select the rice varieties with the most suitable characteristics for organic farming.
- Thus, the varieties providing the best agronomic results (crop establishment, panicle density, weed competition, disease tolerance and grain yield) and which were shown to be compatible with organic rice farming were:
 - **Marisma, Montsianell and Guara**, for water seeding.
 - **Marisma and Soto**, for dry seeding.
- The following considerations should be taken into account for the rest of the varieties:

- **Copsemar 9:** this showed high tolerance to rice blast but it can be ruled out for organic farming due to its low plant density, an excessively long growth cycle and a very low grain yield in both types of seeding.
 - **Argila:** this provided highly variable results depending on the trial year and is therefore sensitive to changes in farming conditions. In water seeding plant establishment was very low when grown in high water levels, leading to lower production. In dry seeding, it produced a very low grain yield in the first year of the trial.
 - **Olesa:** the grain yield from this variety in the two seeding systems was low, although it was higher with dry seeding than water seeding. It is worth noting that it is tolerant to rice blast.
 - **Bomba:** Due to the particular characteristics of the variety, the yield was low but there was good competition with weeds. Fertilisation must be adapted to provide a lower dose of nitrogen than for the other varieties and the crop must be protected from rice blast using fungicide treatments such as Thiopron.
- The **economic study** based on data obtained from the experiments, leads to the conclusion that it is possible to maintain profitability with organic production, as long as a minimum production of the crop is maintained, which entails optimising the agronomic management of the varieties. The threshold for this minimum production that guarantees the profitability of the farm depends on market prices, which will determine both production costs and the income from the sale of the rice.
 - From the comparative study of **biodiversity** it may be concluded that:
 - Aquatic macroinvertebrate richness was higher in organic fields than in conventional fields, but taxonomic diversity, which takes into account the abundance of organisms, was higher in conventional production.
 - The abundance of chironomids was higher in organic than conventional production, indicating higher pest pressure in organic production.
 - The chironomid predation rate in organic production was considerably higher than in conventional production. However, given the abundance of chironomids observed in both types of production, this higher predation efficiency is not sufficient to match the efficiency of chemical control observed in conventional production.
 - The seed germination rate was approximately 8% lower in organic fields than in conventional fields, suggesting that the higher abundance of chironomids observed in organic production may increase seed damage during the germination phase.

Leader of the Operational Group

ORGANISATION: Arrossaires del Delta de L'Ebre, SCCL

Coordinator of the Operational Group

ORGANISATION: Association of Agricultural Producers of the Ebro Delta (prodelta)

Other members of the Operational Group (grant recipients)

ORGANISATION: Càmara Arrossera del Montsià i Secció de Crèdit, SCCL

ORGANISATION: Comunitat General de Regants del Canal de la dreta de l'Ebre

ORGANISATION: Comunitat de Regants Sindicat Agrícola de l'Ebre

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: Agroserveis.Cat SL

ORGANISATION: Agrupación de Defensa Vegetal del Arroz y otros cultivos en el Delta del Ebro (ADV)

ORGANISATION: IRTA - Institute of Agrifood Research and Technology

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Tarragona	Baix Ebre Montsià

Dissemination of the project (publications, conferences, multimedia, etc.)

Two dissemination conferences were held in which the test fields were shown and the results of the project presented. These conferences were open to all interested persons and were publicised through press releases, for both the call for participants and the results of the project.

Lastly, to conclude the project, a final conference was held to present the results and conclusions of the two years of pilot tests.

G.O. PRODUCCIÓ ECOLÒGICA D'ARRÒS AL DELTA
PROVES PILOT 2021

PRESENTACIÓ

Sota el títol *Producció ecològica d'arròs en zones amb limitacions naturals* com el delta de l'Ebre, el 2019 es va crear un Grup Operatiu específic del sector arrosar al delta de l'Ebre per tal d'establir un sèrie de recomanacions a l'hora de dur a terme la producció ecològica d'arròs al delta tot optimitzant el control de males herbes, ús de varietats, diferents metodologies de maneig d'aigua i sembra a la vegada que també se'n mesura l'efecte sobre la biodiversitat en els camps de cultiu.

El projecte forma part de la línia d'ajuts cofinançada amb el FEADER de cooperació per a la innovació en matèria de productivitat i sostenibilitat agrícola i que és regulat per l'ORDRE ARP 133/2017.

En aquest grup, les entitats Arrossaires del Delta de l'Ebre, Càmera Arrossera del Montsià, Comunitat General de Regants del Canal de la dreta de l'Ebre i Comunitat de Regants - Sindicat Agrícola de l'Ebre, lider i membres beneficiaris respectivament són les que duren a terme el projecte amb la direcció i coordinació de PRODELTA i la participació de l'Agrupació de Defensa Vegetal de l'arròs al delta de l'Ebre (ADV). Per a l'execució dels assajos de control de males herbes es comptarà amb l'empresa AgroservisCat i IRTA/EEC com a centre de recerca. A més a més, es comptarà amb la col·laboració i seguiment dels Serveis de Sanitat Vegetal a TITE.

PROGRAMA

- 8:45 h Arribada (Finca La Palma)
- 9:00 h Presentació del Grup Operatiu - Motivacions i objectius
Sr. Marc Ibeas, Coordinador del Grup Operatiu - PRODELTA
- Visita als camps de proves pilot:
- 09:05 h Mecanització del control de males herbes en diferents estratègies de cultiu com la sembra en sec i la inundació (La Palma)
Sr. Alex Navarro, AgroservisCat
Sr. Alfred Palma, AgroservisCat
- 10:30 h Comportament agronòmic de varietats amb producció ecològica i diferents manejos de cultiu (Finca Sabatero)
Sra. M. Mar Català, IRTA - Estació Experimental de l'Ebre
- 11:15 h Estudi comparatiu de la biodiversitat entre camps cultivats en producció ecològica i producció convencional (Finca Riet Vell)
Sr. Nestor Pérez, IRTA - Estació Experimental de l'Ebre
- 13:00 h Fi de la jornada

LLOC DE LA JORNADA

Camps d'assaig del Grup Operatiu
La jornada començarà en els camps ubicats a la finca de La Palma
Coordenades GPS: <https://goo.gl/maps/qUcmf9d41m0022>

El contingut d'aquesta jornada s'emmarca dins les activitats de transferència de resultats del GO Producció Ecològica d'arròs en Zones amb Limitacions Naturals cofinançat pel DARF i la UE. Projecte finançat a través de l'operació 16.01.01 (cooperació per la innovació) del PDR de Catalunya 2014-2020.

Aquest Grup Operatiu s'emmarca en l'operació 16.01.01 del PDR de Catalunya 2014-2020.

ORGANITZA COL·LABORA

PRODELTA ADV IRTA⁹ agroservis.cat

Generalitat de Catalunya Departament d'Agricultura, Alimentació i Agenda Rural Fons Europeu Agrícola de Desenvolupament Rural: Europa inverteix en les zones rurals

G.O. PRODUCCIÓ ECOLÒGICA D'ARRÒS AL DELTA
PROVES PILOT 2022

GO EcoDE

PRESENTACIÓ

Sota el títol *Producció ecològica d'arròs en zones amb limitacions naturals* com el delta de l'Ebre, el 2019 es va crear un Grup Operatiu específic del sector arrosar al delta de l'Ebre per tal d'establir un sèrie de recomanacions a l'hora de dur a terme la producció ecològica d'arròs al delta tot optimitzant el control de males herbes, ús de varietats, diferents metodologies de maneig d'aigua i sembra a la vegada que també se'n mesura l'efecte sobre la biodiversitat en els camps de cultiu.

En aquest grup, les entitats Arrossaires del Delta de l'Ebre, Càmera Arrossera del Montsià, Comunitat General de Regants del Canal de la dreta de l'Ebre i Comunitat de Regants - Sindicat Agrícola de l'Ebre, lider i membres beneficiaris respectivament són les que duren a terme el projecte amb la direcció i coordinació de PRODELTA i la participació de l'Agrupació de Defensa Vegetal de l'arròs al delta de l'Ebre (ADV). Per a l'execució dels assajos de control de males herbes es comptarà amb l'empresa AgroservisCat i IRTA/EEC com a centre de recerca. A més a més, es comptarà amb la col·laboració i seguiment dels Serveis de Sanitat Vegetal a TITE.

PROGRAMA

- 8:30 h Arribada (finca La Palma)
- 8:45 h Presentació de la Jornada
Sr. F. Jesús Gómez, director dels Serveis Territorials a les Terres de l'Ebre
- 8:55 h Presentació del Grup Operatiu - Motivacions i objectius
Sr. Marc Ibeas, coordinador del projecte pilot - PRODELTA
- Visita als camps de proves pilot:
- 09:00 h Mecanització del control de males herbes en diferents estratègies de cultiu com la sembra en sec i la inundació (La Palma)
Sr. Alex Navarro, AgroservisCat
Sr. Alfred Palma, AgroservisCat
- 10:45 h Comportament agronòmic de varietats amb producció ecològica en sembra en sec (Finca Sabatero)
Sra. M. Mar Català, IRTA - Estació Experimental de l'Ebre
- 12:00 h Comportament agronòmic de varietats d'arròs amb producció ecològica en sembra amb aigua (Finca Riet Vell)
Sra. M. Mar Català, IRTA - Estació Experimental de l'Ebre
- 12:45 h Avaluació del control biològic de quilonòmids en producció ecològica d'arròs (Finca Riet Vell)
Sr. Nestor Pérez, IRTA - Estació Experimental de l'Ebre
- 13:00 h Fi de la jornada

LLOC DE LA JORNADA

Camps d'assaig del Grup Operatiu
La jornada començarà en els camps ubicats a la finca de La Palma
Localització a G. Maps: <https://goo.gl/maps/qUcmf9d41m0022>

El contingut d'aquesta jornada s'emmarca dins les activitats de transferència de resultats del GO Producció Ecològica d'arròs en Zones amb Limitacions Naturals cofinançat pel DARF i la UE. Projecte finançat a través de l'operació 16.01.01 (cooperació per la innovació) del PDR de Catalunya 2014-2020.

Aquest Grup Operatiu s'emmarca en l'operació 16.01.01 del PDR de Catalunya 2014-2020.

ORGANITZA COL·LABORA

PRODELTA ADV IRTA⁹ agroservis.cat

Generalitat de Catalunya Departament d'Agricultura, Alimentació i Agenda Rural Fons Europeu Agrícola de Desenvolupament Rural: Europa inverteix en les zones rurals



Jornada de resultats i conclusions GO EcoDE

Producció ecològica d'arròs en zones amb limitacions com el Delta de l'Ebre

Jornada tècnica
Dillibre, dimecres 8 de febrer de 2023

Presentació

Sota el títol "Producció ecològica d'arròs en zones amb limitacions naturals com el Delta de l'Ebre", el 2019 es va crear un Grup Operatiu per tal d'establir un sèrie de recomanacions a l'hora de dur a terme la producció ecològica d'arròs al delta tot optimitzant el control de males herbes, ús de varietats, diferents metodologies de maneig d'aigua i sembra a la vegada que també la mesura de l'efecte sobre la biodiversitat en els camps de cultiu.

La jornada es centrarà en difondre els resultats i conclusions del projecte pilot que s'ha dut a terme durant les campanyes 2021 i 2022 així com les motivacions i objectius d'aquest grup operatiu.

Projecte finançat a través de l'Operació 16.01.01 (cooperació per a la innovació) del PDR de Catalunya 2014-2020.

Lloc de realització

Sala d'actes de la cooperativa d'Arrossaires del delta de l'Ebre
Ctra. Camarles-Deltebre, km 6.5
43560 Deltebre

Inscripcions

A través de RuralCat: [inscripcions](#)
Per a més informació:
Així: [ajuda@ruralcat.cat](#)

Programa

10.00 h	Registre d'assistents
10.20 h	Presentació de la jornada Sr. F. Jesús Gómez, director dels Serveis Territorials del DAOC a Terres de l'Ebre.
10.30 h	GO EcoDE: Motivacions i objectius Sr. Marc Ibañez, coordinador del projecte pilot – PRODELTA.
10.35 h	Mecanització del control de males herbes en diferents estratègies de cultiu com la sembra en sec i la inundació Sr. Àlex Navarro, Agroservis.cat.
11.20 h	Comportament agronòmic de varietats amb producció ecològica en sembra en sec i sembra en inundació Sra. M. Mar Català, IRTA Amposta.
11.55 h	Avaluació de la biodiversitat i control biològic de quironòmids en producció ecològica d'arròs Sr. Néstor Pérez, IRTA Amposta.
12.15 h	Cloenda de la jornada

Organització

 PRODELTA

Col·laboració







 Generalitat de Catalunya
Departament d'Acció Climàtica,
Alimentació i Agricultura Rural

PLAN ANUAL 2023
 DE TRANSFERÈNCIA TECNOLÒGICA
2.00

Press releases:

<https://www.aguaita.cat/noticia/22388/general/el-cultiu-ecologic-de-larros-permet-un-control-biologic-de-la-plaga-de-quironomids>

<https://youtu.be/9EINmP1cQk>

<https://www.ccma.cat/catràdio/alcarta/el-primer-sector/arros-ecologic-al-delta-de-lebre-molt-minoritari-tot-i-que-nhi-ha-demanda-i-es-paga-be/audio/1095563/>

<https://twitter.com/ruralcat/status/1549333332118441985?s=20&t=tROleX15BmwFaiWjAAsxmg>

<https://youtu.be/r7O9GEagpN8>

<https://ebredigital.cat/2022/07/28/se-celebra-la-ii-jornada-de-camp-demostrativa-dassajos-sobre-produccio-ecologica-darros-al-delta-de-lebre/>

Project website

News, results and conclusions were published on the websites of the beneficiary member organisations.

The final reports of results and conclusions are available to download free from the website of the Ebro Delta Rice ADV: <http://www.advdelta.cat/GO-sembra-en-sec/>

More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2020	Total budget: €209,032.00
Completion date (month-year): September 2022	DACC funding: €85,427.04
Current status: Completed	EU funding: €64,444.96
	Own funding: €59,160.00

With funding from:

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014-2022.

Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1531/2019, of 28 May, announcing the call for the grant.

