

Maize multiple cropping in irrigated conditions

Case Study 3b

Experimenting crop diversification and low input farming

Experimental plot of 1 ha with irrigated maize used for food and feed located in Zaragoza (Spain)



2 MULTIPLE CROPPING SYSTEMS WITH DIFFERENT NITROGEN FERTILIZATION RATES

1 PEA - MAIZE

2 BARLEY - MAIZE

AGRONOMIC BENEFITS

1. Multiple cropping of maize with barley or pea **maintained total grain production**
2. Over-fertilisation did not increase maize yield compared with **adjusted nitrogen fertilisation rates**
3. Decreasing nitrogen fertilisation rates of a maize crop after a pea crop **did not reduce yield**

ENVIRONMENTAL BENEFITS

1. Adjusting nitrogen fertilisation rates **decreased the emissions of soil nitrous oxide**
2. Maize multiple cropping with barley or pea **increased soil organic carbon** and soil total nitrogen
3. **Soil physical condition enhanced with cropp diversification**

SOCIOECONOMIC BENEFITS

1. The introduction of a multiple cropping system **optimised machinery amortisation**
2. Cropping diversification offers alternatives to the commercialisation of agricultural products, **minimising the risk of commercialising only one crop**
3. Reducing the use of nitrogen fertilizers **decreases production costs**



DIVERFARMING

WHY IMPLEMENT CROP DIVERSIFICATION?

In order to favor more sustainable and resilient cropping systems facing present/future threats such as global warming.

AGRONOMIC DRAWBACKS

Maize under monocropping results in higher grain yield than the maize after barley or pea

Legume phase showed lower resistance to detrimental soil physical conditions (i.e., soil sealing)

ENVIRONMENTAL DRAWBACKS

The multiple cropping system formed by pea-maize increased yield-scaled emissions compared greenhouse gas emissions with the maize monocropping

Over-fertilisation **increased soil nitrate content** in the soil profile with the concomitant risk of nitrate leaching

The growth of two crops per year meant limited time between the harvest and sowing the subsequent crop, impacting the **good establishment and growth of the second crop**

SOCIOECONOMIC DRAWBACKS

Multiple cropping systems, with different crops over the year, may need **extra farm equipment** with the associated cost

Reductions in maize yield in the multiple cropping system may **limit the gross margin and the final profit**

Multiple cropping in irrigated conditions **involves greater water consumptions and thus higher production costs**

FINAL CONCLUSION

Is it beneficial to adopt these sustainable practices?

In irrigation maize systems, double maize cropping systems with pea or barley together with the adjustment of nitrogen fertilisation rates are interesting options to enhance the overall sustainability of the systems



DIVERFARMING