

Diversified annual crop rotations in Italy

Case Study 7b

Experimenting crop diversification and low input farming

Experimentation plot of 12 ha with durum wheat and tomato or bare fallow located in Foggia – Apulia Region (Italy)

DIVERSIFICATIONS WERE EXPERIMENTED

- 1** Durum Wheat - Tomato - Durum Wheat
- 2** Tomato - Durum Wheat - Field Bean
- 3** Field Bean - Durum Wheat - Tomato

*Crop residue management was included in diversifications, and for tomato, irrigation was reduced by 20%

AGRONOMIC BENEFITS

1. The yield of durum wheat improved considerably with rotations (+34.5% on average)
2. As expected, the level of protein in durum wheat grain was higher in the control treatment (18.0% dry matter basis) than in the rotations
3. The rotation 1 positively affects the 1000-kernel weight

ENVIRONMENTAL BENEFITS

1. With the management, a fraction of the organic carbon and nitrogen was recovered and returned to the soil with the tillage
2. Decreases in irrigation quantity can represent a good compromise between yield and grain quality
3. Considering the type of residue that returns to the soil and the agronomic practices adopted, rotation with legumes can be considered the best treatment with residues richer in nitrogen and carbon, and with the least use of natural resources



WHY IMPLEMENT CROP DIVERSIFICATION?

Although the continuous cultivation of durum wheat is very widespread in southern Italy, especially on farms where the water supply for irrigation of crops is limited, it is necessary to find agricultural strategies to reduce the environmental impact and improve the soil organic matter and consequently its productive potential.

Hence, a strategy that can combine rotations and water consumption without having negative effects on the production is essential

AGRONOMICS DRAWBACKS

1. The yield of durum wheat receives the positive effects due to the succession of two improving crops (tomato and legume) but the protein level should be improved by dividing the nitrogen given in the covering phase of the growing season of the durum wheat
2. The yield and the grain quality are satisfactory, but the yield of the durum wheat could increase slightly, providing more nitrogen to the crop

ENVIRONMENTAL DRAWBACKS

1. Excessive use of soil tillage, in particular ploughing during the summer season which exposes the organic matter of the soil that is more subject to oxidative processes due to air and solar radiation
2. Consumption of fossil fuels due to the use of agricultural vehicles with consequent production of CO₂
3. Water expenditure for tomato irrigation.

FINAL CONCLUSION

Based on the results obtained from the three years of studies, it is possible to attribute a main role to crop rotations as regards the effects on yield and grain quality. For example, both rotations studied are similar but differ in the crop succession that precedes durum wheat. If a farmer is more interested in quantity, rotation 1 meets his expectations whilst rotation 2 might be preferred by a farmer who makes an agreement with a milling or pasta industry. The control rotation could be improved by replacing tomato with legume.

