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SOIL WATER CONSERVATION PRACTICES FOR SUSTAINABLE CROP PRODUCTION UNDER CLIMATE CHANGE: A CASE STUDY OF THE BANAT PLAIN, ROMANIA

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Abstract: *Climate change is increasing the challenges associated with maintaining adequate soil water availability for agricultural production, particularly in regions experiencing high evaporative demand and variable precipitation. In the Banat Plain of western Romania, the relationship between precipitation and evapotranspiration represents an important factor influencing crop water availability and agricultural sustainability. In this context, soil water conservation practices may contribute to improving soil conditions and strengthening the resilience of agricultural systems. This paper aims to evaluate the potential of conservation tillage and cover crops to support soil water conservation and sustainable crop production under changing climatic conditions, with particular reference to the Banat Plain. A focused literature review will be conducted using peer-reviewed scientific publications addressing soil water storage, infiltration, evaporation, drainage, soil properties and crop productivity. Evidence from studies conducted in Romania and comparable temperate agricultural regions will be examined to identify the benefits, limitations and factors influencing the effectiveness of these practices. The review will also consider potential trade-offs, including competition between cover crops and subsequent crops for available soil water, as well as the influence of soil characteristics, precipitation patterns and management practices. The findings will provide a comparative assessment of the applicability of conservation tillage and cover crops to the agricultural conditions of the Banat Plain and identify priorities for future regional research. This study aims to contribute to the development of evidence-based soil management strategies supporting climate-resilient and sustainable agriculture.*

Keywords: *climate change; soil water conservation; conservation tillage; cover crops; sustainable agriculture; Banat Plain.*

INTRODUCTION

Climate change is one of the main challenges facing global agriculture today. Increasing temperatures, changing rainfall patterns and the increased frequency of drought periods can affect the availability of water in soils and compromise the productivity of agricultural crops. In this context, the conservation of water in the soil represents an essential issue to ensure the sustainability of agricultural systems and strengthen their ability to adapt to changing climatic conditions.

Soil water plays a fundamental role in the growth and development of plants, as it allows the absorption of nutrients and participates in the main physiological processes of crops. However, some of this water can be lost by evaporation at the soil surface, runoff or deep drainage. When rainfall becomes insufficient or irregular, these losses can accentuate the water stress of plants, reduce agricultural yields and increase the vulnerability of farms to climatic hazards. It therefore becomes necessary to identify and promote agricultural practices capable of preserving the soil's water resources.

Among the practices that can contribute to this objective are reduced tillage and cover crops. Reduced tillage, also called tillage conservation, consists in limiting the mechanical disturbance of the soil and, depending on the system used, in maintaining part of the plant residues on its surface. This practice can help limit erosion, preserve the structure of the soil and reduce certain water losses. Cover crops, on the other hand, are plants grown mainly to protect and improve the soil between two main crops. They can promote the infiltration of water, contribute to the improvement of the soil structure and reduce runoff. However, their effectiveness depends in particular on the climatic conditions, the type of soil, the plant species used and their growth period. In regions subject to a water deficit, cover crops can also consume part of the water available for the next crop.

The Banat plain, located in western Romania, constitutes a relevant territory for the study of these problems because of its agricultural importance and the need to adapt production systems to climatic variations. Changes in rainfall and thermal conditions can influence the water balance of soils and the water needs of crops. In this context, the study of water conservation practices in the soil is of particular interest to identify solutions likely to support the resilience of regional agriculture. Previous work has notably studied the effects of climate change on the availability of water for agricultural production in the Banat Plain (ŞMULEAC et al., 2020).

Thus, the objective of this study is to analyze the potential of reduced tillage and cover crops to improve soil water conservation and contribute to sustainable agricultural production in a context of climate change, considering the conditions of the Banat plain, in Romania. Based on an analysis of the scientific literature, this research aims to compare the advantages, limitations and factors that influence the effectiveness of these two practices. It also seeks to determine to what extent the results obtained in other agricultural regions may be relevant to the pedoclimatic context of the Banat plain.

MATERIAL AND METHODS

Geographic Location

The present study is part of the agroclimatic context of the Banat plain, located in western Romania. The agricultural production systems of this region are exposed to a variability of rainfall and to thermal conditions likely to modify the water needs of the crops, the dynamics of the soil moisture and the availability of water during the growing season. In this context, the evaluation of water conservation practices requires a joint consideration of soil characteristics, climatic conditions and the water requirements of crops.

The analysis focuses on two agronomic practices: reduced tillage and direct sowing (reduced tillage and no-tillage), on the one hand, and cover crops, on the other hand. These practices are examined with regard to their effects on infiltration, evaporation, water storage in the soil profile, evapotranspiration and crop productivity. The objective is to determine under what conditions they contribute to improving the availability of water and under what circumstances their effects may be limited or even adverse.

The Banat plain constitutes the regional interpretation framework for the study. The results of the work carried out in this region are distinguished from those obtained in other pedoclimatic environments. The data coming from comparable regions are mobilized to complete the analysis of the agronomic mechanisms, without assuming that their results are directly transposable to the soils and the cultivation systems of Banat.

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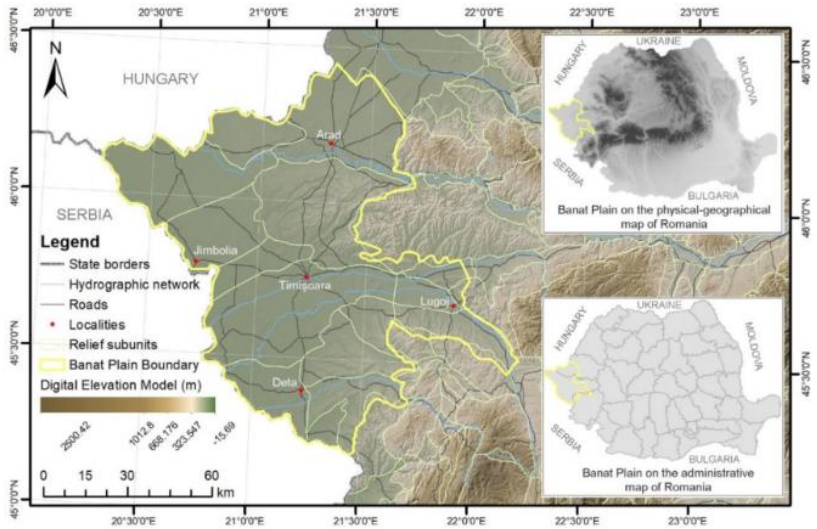


Figure 1. Study area: Banat Plain, western Romania

Bibliographic research and data sources

Targeted bibliographic research was carried out in order to identify scientific publications on soil water conservation practices and their effects on agricultural production in a climate change context. The research focused mainly on scientific articles and review articles dealing with reduced tillage, direct sowing, cover crops, soil moisture, water storage and crop yield.

Google Scholar was used to identify relevant publications, in addition to examining the bibliographic references of the selected articles. Particular attention has been paid to studies carried out in Romania and in other temperate agricultural regions with climatic conditions comparable to those of the Banat plain.

Selection of scientific publications

The publications were selected according to their relevance to the objective of the study and the availability of information concerning the conservation of water in the soil and agricultural productivity. Studies on the effects of agricultural practices on soil moisture, infiltration, evaporation, evapotranspiration and crop yield were preferred.

The results of the selected publications were examined in order to identify common trends, differences between agricultural practices and factors likely to explain the observed variations.

Comparative analysis of water conservation practices

A qualitative comparative analysis was carried out in order to examine the potential effects of reduced tillage, direct sowing and cover crops on water conservation and agricultural productivity.

The analysis took into account the influence of soil characteristics, rainfall, temperature, crop type and agricultural management practices. Particular attention has been paid to the advantages

and limitations of cover crops, which can improve soil protection while consuming part of the water available for the next crop.

The results were then interpreted taking into account the environmental conditions of the Banat plain. The conclusions are based on data published in the scientific literature; no field measurements or original experiments were carried out as part of this study.

Criteria for analysis and comparison of agricultural practices

The comparative analysis is based on several criteria to assess the potential of reduced tillage, direct sowing and cover crops in terms of soil water conservation. The main parameters considered are water infiltration, surface runoff, evaporation, moisture storage in the soil profile and evapotranspiration. These indicators make it possible to examine the effects of agricultural practices on water flows in the soil-plant system. The work of BASCHE and DELONGE (2019) and BLANCHY et al. (2023) emphasize the importance of these processes for understanding the effects of soil management practices on water regulation.

The analysis also takes into account the characteristics of the soil, in particular its texture, structure and organic matter content, as well as climatic conditions, such as the distribution of precipitation, temperatures and the frequency of dry periods. These factors can influence the effectiveness of the practices studied and explain the differences observed between the studies. Particular attention is paid to cover crops, which can protect the soil surface and promote infiltration, but also consume part of the water available for the next main crop when there is insufficient rainfall.

Finally, the practices are compared according to their reported effects on water availability and crop productivity, as well as their advantages, limitations and application conditions. The results obtained from the Banat plain will be distinguished from those obtained in other temperate agricultural regions. This distinction will make it possible to evaluate the relevance of the practices studied for regional conditions, without assuming that the results obtained elsewhere can be directly transposed. When quantitative data are available and comparable, they will be taken into account; in other cases, a qualitative synthesis of the results will be preferred.

RESULTS AND DISCUSSIONS

Effects of reduced tillage and direct sowing on soil water conservation

Reduced tillage and direct sowing are agricultural management practices that can improve certain physical properties of the soil and contribute to better management of water resources. Reduced work consists in reducing the intensity and frequency of mechanical interventions, while direct sowing allows the crops to be planted without prior plowing. Depending on the system adopted, these practices can be associated with the maintenance of plant residues on the surface of the soil, which plays an important role in protecting its structure and regulating water exchange. However, their effects depend on climatic conditions, soil properties, crop rotations and the duration of application. A synthesis of 49 meta-analyses carried out by TAMBURINI et al. (2022) emphasizes in particular that the benefits of conservation agriculture cannot be attributed solely to the absence of plowing, since the maintenance of plant residues is also a determining factor.

One of the main mechanisms associated with these practices concerns water infiltration and the reduction of surface runoff. When plant residues remain on the surface, they cushion the impact of raindrops, protect soil aggregates and can limit the formation of a superficial crust. These effects

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are likely to promote the penetration of water into the soil profile and reduce runoff losses. BASCHE and DELONGE (2019), in a meta-analysis devoted to infiltration rates under different agricultural management systems, found an average increase of 34.8% associated with cover crops, while the overall effect of direct sowing alone was not statistically significant. This difference underlines that the results observed for one practice cannot be automatically attributed to another. It also shows the importance of considering complementary practices, in particular the management of residues, in the evaluation of water conservation.

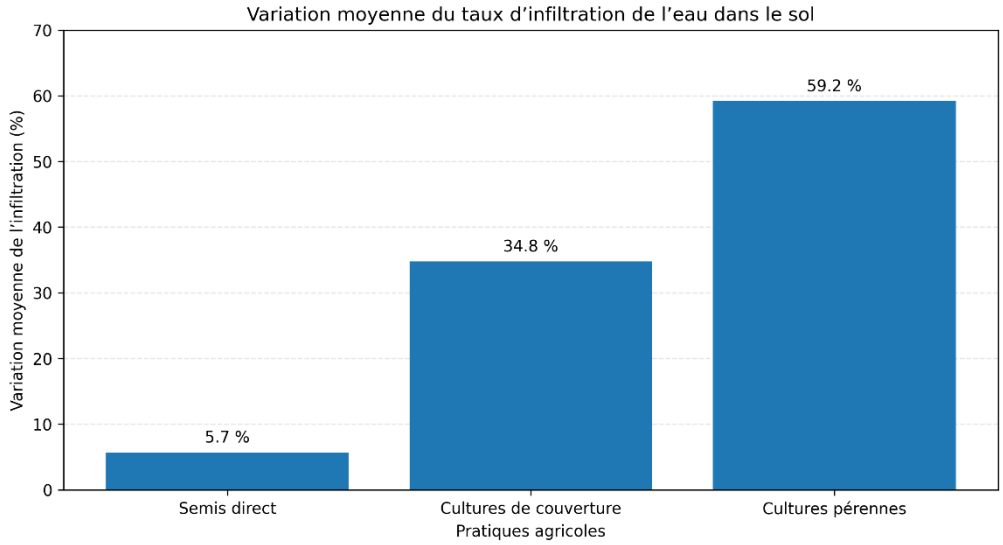
Maintaining a cover of residues on the soil surface can also contribute to limiting direct evaporation. By reducing the exposure of the surface to solar radiation and wind, residues can slow down surface drying and promote the maintenance of moisture between two rainy episodes. This function can be particularly interesting in agricultural systems exposed to high temperatures and irregular rainfall. Nevertheless, the conservation of surface moisture does not necessarily mean that all the extra water will be available for the roots. The amount of water accessible to crops also depends on the depth of rooting, the texture and structure of the soil, drainage as well as losses by evapotranspiration. Therefore, the water efficiency of these practices must be evaluated at the scale of the pedological profile and the cultural cycle, and not only from the humidity measured at the surface (BLANCHY et al., 2023).

The effects of direct seeding on water storage and agricultural productivity may vary depending on environmental conditions. In a global meta-analysis devoted to wheat and maize systems under rainfed conditions, ZHANG et al. (2024) observed that conservation tillage practices could improve rainfall storage, water storage in the soil at the time of sowing and water use efficiency. The answers nevertheless varied according to the texture of the soil, the rainfall and the thermal conditions. These results indicate that reducing mechanical disturbances may be of interest for regions facing a water deficit, but they do not allow us to conclude that there is an identical benefit in all agricultural systems. It is also worth considering the possible difficulties related to compaction, weed management and adaptation of equipment, which can influence agronomic results.

In the Banat plain, these practices are of potential interest due to variations in rainfall and changing thermal conditions that may affect the availability of water for crops. ȘMULEAC et al. (2020) studied the evolution of rainfall, evapotranspiration and water accessibility for agricultural production in this region over a long period of time. Their study provides a relevant regional context for examining strategies to improve water management in agricultural soils. In this context, the reduction of tillage and the maintenance of plant residues can be considered as practices to be evaluated in addition to other water management measures, depending on the characteristics of the soils and the needs of the crops.

Overall, the literature indicates that reduced tillage and direct sowing can contribute to water conservation, especially when combined with adequate surface coverage. However, their effects are neither uniform nor automatic. For the Banat plain, it is therefore necessary to distinguish the general results from international studies from the effects actually demonstrated in the region. In the absence of comparative local measures, these practices must be considered as promising agronomic options whose water efficiency and the consequences on yields require an assessment in regional pedoclimatic conditions.

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Source : Basche et DeLonge (2019). Le résultat du semis direct (+5,7 %) n'est pas statistiquement significatif. Ces valeurs proviennent d'une méta-analyse, et non de mesures directes dans la plaine du Banat.

Figure 2. Mean Change in Soil Water Infiltration under Different Agricultural Practices

Role of cover crops in soil water conservation

Cover crops represent a promising agricultural practice for improving water conservation in agricultural production systems exposed to increasing climate variability. They maintain vegetation cover between two main crops and contribute to protecting the soil surface against the direct impact of rainfall. This cover can limit surface crust formation, reduce runoff, and promote water infiltration.

According to BASCHE and DELONGE (2019), cover crops are associated with an average increase of 34.8% in water infiltration rates across the studies analysed. This finding highlights their potential to improve water infiltration into the soil. Furthermore, crop residues left on the soil surface can reduce direct exposure to solar radiation and wind, thereby contributing to lower water losses through evaporation.

However, the effects of cover crops depend on climatic conditions, soil type, the selected plant species, and the timing of cover crop termination. In particular, a living cover crop may consume part of the available soil water before the establishment of the main crop. This competition for water may become problematic when precipitation is insufficient or when dry periods are prolonged.

In the Banat Plain, where water availability represents a challenge for agricultural production due to increasing rainfall variability and rising temperatures, the selection of cover crops must therefore be adapted to local conditions. The selection of suitable plant species, a carefully managed growing period, and sufficiently early termination can contribute to balancing the benefits

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of soil cover with the water requirements of the subsequent crop. Nevertheless, local field trials would be necessary to determine the most appropriate species and management schedules.

Applicability of practices to the conditions of the Banat plain

The Banat Plain, located in western Romania, constitutes an agricultural region in which the availability of water represents an important factor for the sustainability of crop production. The study by ŞMULEAC et al. (2020), based on historical series of temperatures, precipitation and evapotranspiration, highlights a warming trend as well as changes in the precipitation regime. The authors also emphasize the importance of increasing evapotranspiration during the vegetation period, when the water needs of crops are high. These developments reinforce the interest of agricultural practices making it possible to better conserve soil moisture and to use the available rainfall more efficiently.

Table 1

Summary of the advantages, limitations and applicability of soil water conservation practices in the Banat Plain

Agricultural practice	Potential benefits	Main limitations	Interest for the Banat
Reduced tillage of the soil	Reduces soil disturbance	Results vary according to the soil and the climate	To be evaluated according to local conditions
Demi-finales directes	Limits mechanical work and can preserve residues	Effect on infiltration not systematically significant	Potentially interesting practice
Maintenance of plant residues	Protects the surface and can limit evaporation	Depends on the quantity and management of residues	To be combined with an adapted soil management
Cover crops	Protect the soil and can improve certain water functions	Risk of water consumption before the next crop	Choose the species and the dates of destruction carefully

Effects of reduced tillage and maintenance of plant residues

In this context, reducing the intensity of tillage and maintaining plant residues on the surface constitute conceivable strategies to improve water management. Residues can protect the soil from the direct impact of precipitation, limit the exposure of its surface to solar radiation and reduce certain water losses by evaporation. Reduced tillage can also contribute to preserving the structure of the soil, although its effects on infiltration depend on the properties of the soil, the climate and the cultivation system. BASCHE and DELONGE (2019), in an international meta-analysis, found that the average effect of direct seeding on infiltration was not statistically significant when all studies were considered. Therefore, direct sowing should not be considered as a sufficient solution on its own: its results also depend on the management of residues and pedoclimatic conditions.

Potential and limitations of cover crops

Cover crops represent another possibility to protect the soil surface between two main crops. They can limit runoff, promote infiltration and provide plant residues contributing to the protection of the soil after their destruction. However, their effect on the water balance is not systematically positive. MEYER et al. (2019) showed, in a meta-analysis carried out in temperate climates, that cover

crops reduced water drainage by about 27 mm on average compared to a soil left bare. This decrease is linked in particular to the consumption of water by the plants and can represent an advantage or a disadvantage depending on the management objectives and local conditions. Similarly, WANG et al. (2021), based on 117 international studies, have shown that the effects of cover crops on water storage vary according to soil depth, climate and residue management. These results underline the need to simultaneously consider the protection of the soil and the availability of water for the next crop.

The Banat plain has variable soil and drainage conditions. ŞMULEAC et al. (2020) describe in particular the influence of historical hydraulic developments on the groundwater level and on the soil water regime. Thus, conservation practices must be adapted to the characteristics of each plot, in particular to the texture of the soil, its water retention capacity, its drainage and the local risks of excess or water deficit. An appropriate practice in a well-drained plot will not necessarily produce the same effects in a low-lying area with problems of excessive humidity or salinity.

In view of these elements, a strategy combining the reasoned reduction of tillage, the maintenance of plant residues and the adapted use of cover crops could be studied in the Banat plain. The choice of cover species, their sowing period and their destruction before the main crop is planted should take into account the expected rainfall and soil water reserves. In particular, a sufficiently early destruction can be envisaged when the risk of competition for water is significant. However, these guidelines constitute avenues based on the scientific literature, and not recommendations that have already been validated for all farms in the region.

In conclusion, soil conservation practices have potential to improve water management in the Banat Plain, but their effectiveness depends on the interaction between climate, soil characteristics and agricultural management choices. Local trials comparing conventional tillage, reduced tillage, direct seeding and different cover crops would be necessary to quantify their effects on soil moisture, infiltration, yield and water use efficiency in the main cropping systems in the region.

CONCLUSIONS

The conservation of soil water is a major challenge for the sustainability of agricultural systems, especially in a context marked by climate change, rising temperatures and rainfall variability. In the Banat plain, located in western Romania, the availability of water represents an important factor for maintaining agricultural productivity. The evolution of climatic conditions thus underlines the need to adopt soil management practices capable of limiting water losses, preserving water resources and strengthening the resilience of crops to periods of water deficit. In this perspective, the present article examined, through a bibliographic analysis, the potential of reduced tillage, direct sowing, maintenance of plant residues and cover crops to improve water conservation in agricultural systems.

The analysis of the scientific literature highlights that the effects of these practices depend on several factors, in particular the physical properties of the soil, the climatic conditions, the amount of plant residues, the duration of application of the techniques and the type of cultivation. Reduced tillage and direct sowing can help to reduce the disturbance of the soil structure and, when plant residues are kept on the surface, to protect it from the direct impact of precipitation and to limit

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evaporation. However, their effects on water infiltration are not systematically significant. The quantitative synthesis of BASCHE and DELONGE (2019) shows in particular that the infiltration responses vary according to the practices studied and the experimental conditions. These results underline that it is necessary to distinguish the potential benefits of soil conservation from the effects actually measured on the availability of water.

Cover crops also have an interesting potential to improve the protection of the soil surface, reduce exposure to erosion and contribute to the regulation of the water cycle. However, their effectiveness depends on the choice of species, the sowing period, the duration of growth and the management of their destruction before the implantation of the main crop. Indeed, although these crops can favor certain water functions of the soil, their water consumption can reduce the reserves available for the next crop when rainfall is insufficient. Their use must therefore be adapted to the climatic conditions and the growing calendar in order to find a balance between soil protection and the conservation of water useful for agricultural production.

For the Banat plain, these observations suggest that the implementation of conservation practices should not be based on a single technique, but on a reasoned combination of measures adapted to local pedoclimatic conditions. The reduction of tillage, the maintenance of plant residues and the use of cover crops selected according to their water needs could constitute complementary elements of a sustainable water management strategy. Nevertheless, their effectiveness cannot be considered uniform across the entire region, since the characteristics of the soils, the drainage conditions, the availability of rainfall and the water needs of the crops can vary from one plot to another. An approach adapted to each production system is therefore preferable to the generalized application of identical recommendations.

It is also worth highlighting an important limitation of this study: the conclusions presented are based on a synthesis of the scientific literature and do not result from experiments directly conducted in the Banat plain. The results obtained in other agricultural regions provide useful indications on the mechanisms and the potential benefits of the practices studied, but their transposition to the local context requires validation. Experimental research on a regional scale would therefore be necessary to quantify the effects of these practices on soil moisture, infiltration rates, runoff, evaporation, yields and water use efficiency. It would also be relevant to compare different species of cover crops, several levels of maintenance of plant residues and different tillage systems during several agricultural seasons, in order to take into account the interannual variability of weather conditions.

Ultimately, the conservation of soil water in the Banat plain requires an integrated management that combines the protection of the physical properties of the soil, a reasoned use of water resources and an adaptation of agricultural practices to local climatic conditions. The practices studied offer promising avenues to strengthen the sustainability and resilience of production systems, but their effectiveness must be evaluated taking into account the interactions between soil, water, climate and crops. The combination of scientific knowledge, local trials and adapted agricultural management could thus contribute to the development of water conservation strategies reconciling productivity maintenance, preservation of natural resources and adaptation of agriculture to climate change.

BIBLIOGRAPHY

ADIL et al. (2024) – A global meta-analysis assessing the effects of no-tillage on soil water storage, grain yield, and water use efficiency in dryland wheat and maize cropping systems. https://doi.org/10.1071/FP23267

ADIL et al. (2024) – A global meta-analysis evaluating the long-term effects of tillage and fallow management practices on soil water storage, wheat yield, precipitation storage efficiency, and water use efficiency. https://doi.org/10.1111/ejss.13541

BASCHE and DELONGE (2019) - a meta-analysis that compares the effects of alternative agricultural practices, in particular direct sowing and cover crops, on the infiltration of water into the soil.

BLANCO-CANQUI et al. – A review of the agroecological functions of crop residues under conservation agriculture, including their contribution to soil protection, water infiltration, and the regulation of soil moisture. https://publications.cirad.fr/une_notice.php?dk=585101

BOSCO et al. (2024) – A systematic review of scientific evidence on farming practices that improve sustainable water management, including soil water retention, water use efficiency, runoff, and water quality. https://publications.jrc.ec.europa.eu/repository/handle/JRC137742

HOLLAND, J. M. (2004). The environmental consequences of adopting conservation tillage in Europe: Reviewing the evidence. Agriculture, Ecosystems & Environment. https://doi.org/10.1016/j.agee.2003.12.018

LI et al. (2019) – A global meta-analysis examining how crop residue retention and minimum tillage influence soil physical properties, aggregate stability, and available water capacity. https://doi.org/10.1016/j.still.2019.06.009

LI et al. (2020) – A global meta-analysis examining how crop residue retention combined with minimum tillage influences soil organic carbon accumulation and supports conservation agriculture. https://doi.org/10.1016/j.scitotenv.2020.140147

LU (2020) – A meta-analysis investigating the effects of crop residue return on crop yields and water use efficiency under different climatic, soil, and management conditions. https://doi.org/10.1371/journal.pone.0231740

MEYER, N., BERGEZ, J.-E., CONSTANTIN, J., & JUSTES, E. (2019). Cover crops reduce water drainage in temperate climates: A meta-analysis. Agronomy for Sustainable Development, 39, 3. https://doi.org/10.1007/s13593-018-0546-y

MEYER, N., BERGEZ, J.-E., CONSTANTIN, J., & JUSTES, E. (2019). Cover crops reduce water drainage in temperate climates: A meta-analysis. Agronomy for Sustainable Development, 39, 3. https://doi.org/10.1007/s13593-018-0546-y

SCAVO, A., FONTANAZZA, S., RESTUCCIA, A., et al. (2022). The role of cover crops in improving soil fertility and plant nutritional status in temperate climates: A review. Agronomy for Sustainable Development, 42, 93. https://doi.org/10.1007/s13593-022-00825-0

SCHNEIDER et al. (2023) - a synthesis devoted to soil management practices and their effects on water regulation, relevant for European agriculture.

ŞMULEAC, L., et al. (2020). Impact of Climate Change in the Banat Plain, Western Romania, on the Accessibility of Water for Crop Production in Agriculture. Agriculture, 10(10), 437. https://doi.org/10.3390/agriculture10100437

ŞMULEAC, L., RUJESCU, C., ŞMULEAC, A., IMBREA, F., RADULOV, I., MANEA, D., IENCIU, A., ADAMOV, T., & PAȘCALĂU, R. (2020). Impact of climate change in the Banat Plain, Western Romania, on the accessibility of water for crop production in agriculture. Agriculture, 10(10), 437. https://doi.org/10.3390/agriculture10100437

TAMBURINI, G., et al. (2022). Net effects of conservation agriculture principles on sustainable land use: A synthesis. This synthesis examines the respective contributions of direct sowing and maintenance of residues. Consult the publication

VERMA AND PRADHAN (2024) – A review of the effects of mulching on soil moisture conservation, evaporation, soil properties, crop productivity, and water use in agricultural systems. https://doi.org/10.18805/ag.R-2243

WANG, J., ZHANG, S., SAINJU, U. M., GHIMIRE, R., & ZHAO, F. (2021). A meta-analysis on cover crop impact on soil water storage, succeeding crop yield, and water-use efficiency. Agricultural Water Management, 256, 107085. https://doi.org/10.1016/j.agwat.2021.107085

ZHANG, Y., et al. (2024). No-tillage enhances soil water storage, grain yield and water use efficiency in dryland wheat (Triticum aestivum) and maize (Zea mays) cropping systems: A global meta-analysis. Consulter la publication.