



Review

Are basin and reservoir tillage effective techniques to reduce runoff under sprinkler irrigation in Mediterranean conditions?



Luis L. Silva

Rural Engineering Department, School of Sciences and Technology and Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM), University of Évora, Apartado 94, 7002-554 Évora, Portugal

ARTICLE INFO

Article history:

Received 17 January 2017

Received in revised form 5 June 2017

Accepted 8 June 2017

Keywords:

Runoff

Basin tillage

Reservoir tillage

Sprinkler irrigation

Conservation tillage

ABSTRACT

The increasing use of low pressure moving sprinklers irrigation systems, like center-pivot irrigation systems, has increased surface runoff problems. Runoff decreases the irrigation system application efficiency, increasing the operational costs. It can also be responsible for environmental problems, such as soil erosion and the contamination of surface waters. Basin tillage and reservoir tillage have proved to be an effective practice to prevent runoff in many situations and can be an option to reduce surface runoff under moving sprinkler irrigation systems operating in Mediterranean conditions. However, even though it is a common practice in some Mediterranean regions, there are very few studies quantifying the effect of these tillage practices under moving sprinkler irrigation systems in Mediterranean countries. Many farmers are still not convinced that this is the best practice to prevent runoff. Some of them are converting to conservation agriculture, using no-till or minimum tillage, but the results of these tillage systems in the prevention of runoff are not always consistent. The industry is also creating new implements used to create the basins and reservoirs that apparently have some advantages over the old ones. But more studies are still required in order to be able to identify the better solutions for different soil, crop and irrigation management situations.

© 2017 Elsevier B.V. All rights reserved.

Contents

1. Introduction.....	50
2. Causes of surface runoff under sprinkler irrigation moving systems.....	51
3. Basin (BT) and reservoir (RT) tillage definition.....	52
4. Runoff results with basin and reservoir tillage.....	52
5. Comparison of BT and RT runoff results with other conservation tillage practices.....	54
6. Conclusions and future perspectives.....	54
References.....	55

1. Introduction

Sprinkler irrigation is one of the most common irrigation systems used worldwide. They can be used to irrigate almost all annual crops and are easy to adapt to different topography and soil situations, thus being one of the preferred options for farmers. The increase in the price of energy required by sprinkler irrigation systems has stimulated the use of low-pressure operating systems to achieve lower operational costs. Additionally, whenever it's possible the farmer's primary option is to use large sprinkler irrigation

machines, like center-pivots or linear moving laterals, because of their higher degree of automation, thus being easier to operate, a higher water application efficiency compared to other sprinkler irrigation systems (Keller and Bliesner, 1990) and because they allow a lower investment cost per hectare in equipment as the irrigated area increases.

However, the decrease of operating pressure causes a decrease of sprinklers wetted diameter (Keller and Bliesner, 1990) which leads to an increase in water application rate (DeBoer et al., 1992). In many cases the use of low pressure irrigation systems and small irrigation times implies the use of application rates that exceed 100 mm h^{-1} at the outer end of the center-pivot lateral (e.g., Valadas, 1997; Fernandez et al., 2004). According to Addink et al.

E-mail address: llsilva@uevora.pt