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ABSTRACT BOOK

INNOVATIVE CROPPING AND FARMING SYSTEMS FOR HIGH QUALITY FOOD PRODUCTION SYSTEMS

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6. CONSERVATION AGRICULTURE

PoS1-35

Impact of Different Cover Crops Management on Soil Water Profile and Dynamics

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Abstract: Cover crops are known to provide a large number of ecosystem services such as nitrate catch crop and green manure effect. However, the impact of cover crops on water balance is little studied. References reported an increase of evapotranspiration through an increase of cover transpiration that could decrease water drainage. Nevertheless, according to the cover crops management the volume of this modification. There is no consensus on available water for the next cash crop and on the changes in soil water profile which could be explained by the temporal distribution of the rainfall in interaction with cover crop growth rate and date of destruction.

We set up an experiment to measure the impacts of cover crops and their management on soil water dynamics during the fallow period between two main cash crops. Ethiopian mustard and crimson clover were sown on July 31 as a mixture cover. A bare soil serves as control. We tested two dates of destruction, in November for a short growing period and in April for a long cover crop growth period. For cover crops destroyed in November, we used two types of residues management, i.e. i) one part of cover crop was destroyed by crushing and left in mulch and ii) the other part was destroyed by ploughing. These four modalities were replicated in four blocks in a spilt-plot design. We measured soil water profiles by gravimetric measurements once a month until 1.2 meter depth by layers of 0.2 meter. Experiments will finish in April 2018.

At the present time, we have compared the effect of cover crops versus bare soil on water content in soil profiles. At initial state, both soil water content were equivalent. Therefore, it allows evaluating effect of cover crops on soil water content during the experiment period. Five weeks after sowing, we could see less water in the first part of soil between surface and 0.5 m depth, indicating the water uptake by cover crop, even if the difference was not significant. Three months after sowing we observed a significant lower water content in soil under the cover crop treatment, reduced by ca.50 mm for the whole profile. The measurements also indicated the presence of cover crop roots in deep layers after only 2 months of growth.

Two weeks after cover crops destruction, without rainfall, the difference between the cover crop and the bare soil was again ca.50 mm, confirming the important uptake of water. This difference raises questions about the management of cover crops and the impact of the date of destruction on the amount of water available for the next crop. In the French southwestern conditions, this result could be a crucial issue for the emergence and the development of the subsequent cash crop.

For the end of the experiment, we expected to measure differences between the three cover crops treatments and the bare soil in order to quantify the effect of cover crop and its mode of destruction on the soil water profile.

Keywords: Cover crops destruction; mulch; plowing

PoS1-36

Cover Crops to Secure Low Herbicide Weed Control Strategies in Maize Grown with Reduced Tillage

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Abstract: As a key-element of conservation agriculture, the occasional or systematic suppression of full-inversion ploughing implies an adaptation of the cropping system. To assess the ability of cover crops to control weeds in a subsequent maize crop grown with reduced tillage, three annual experiments were implemented at the research station of Agroscope Changins, Nyon, Switzerland. Ten non-wintering cover crop (CC) species were sown in mid-summer and compared to a bare soil treatment in strip-plot experiments including different weeding strategies according to integrated weed management rules. In case of a predictable impasse for weed control, an alternative management option was chosen 1) at the end of winter: total herbicide application instead of no herbicide application, 2) at the beginning of May before maize sowing: minimum soil tillage instead of no tillage. The ability of cover crop species to control weed was evaluated at the stage 2-4 leaves of maize. The shoot dry matter yield of maize was measured at harvest at the end of August.

At the beginning of November, mean CC dry shoot biomass varied between 1.2 and 11.1 t DM ha-1 depending on experimental year and CC species. On average over the three years, Asteraceae (*Helianthus annuus* and *Guizotia abyssinica*) showed the highest shoot dry matter among the tested species (> 6.0 t DM ha-1). Legume species (*Pisum sativum arvense*, *Trifolium alexandrinum* and *Vicia sativa*) and *Brassicaceae* species (*Brassica campestris oleifera* and *Raphanus sativus longipinnatus*) presented the lowest 3-year mean shoot biomass (≤4.0 t DM ha-1). At the end of winter, the three legume species and *Avena strigosa* showed the highest plant residue soil cover and *Brassicaceae* species the lowest one. CC residue soil cover at the end of winter was only slightly positively correlated with CC autumn shoot biomass.

In three out of eight cases, the chosen weeding strategy was very efficient in terms of weed control at the stage 2-4 leaves of maize. In the remaining five cases, the weeding strategy did not succeed in preventing weed infestation at the beginning of maize development. A mean weed cover higher than 15% was observed when no total herbicide and/or no tillage was applied before maize sowing. In three out of these five cases, a significant CC effect on weed cover could be observed. CC species able to produce high amounts of biomass in autumn appeared to be useful in terms of weed control. The most efficient CC species varied from year to year: *G. abyssinica* in 2011, *H. annuus* in 2012 and *A. strigosa* in 2014. CC effect on maize yield was significant in a single case, but the effect of CC species tended to be positive compared to the control treatment without CC. Despite only partial efficacy, the use of cover crops is recommended for limiting weed incidence in cropping systems aimed at reducing soil tillage and herbicide use.

Keywords: cover crop, reduced soil tillage, total herbicide, weed cover, maize performance