

Review
of the article “Remediation of degraded arable steppe soils in Moldova using vetch as green manure” written by M. Wiesmeier, M. Lungu, R. Hubner and V. Cerbari

The article is dedicated to one of the most important topics of modern agriculture in Republic of Moldova – reduction of soil fertility and productivity for the majority of field crops on arable chernozems from the steppe region of Moldova.

Authors were studying cover crop for green manuring in two localities of Moldova from central and southern regions. Winter hairy vetch was sown in September 2010 in Orhei district and in September 2012 in Cahul district in the mixture with winter wheat (the ratio between components – 80:20%, respectively). As subsequent crops corn for grain and sunflower were sown in Cahul and Orhei districts, respectively.

The experimental data for one year in different regions of Moldova are proving the real benefits of using green manure for improving physical and chemical properties of arable chernozem soils. The scientific methods used by authors are credible. The overall presentation is well structured and clear. The article is written in an accessible language.

The obtained experimental results can serve as a good incentive for the initiation of multidisciplinary researches based on holistic approach to sustainable farm management.

Cover crops are one of the component part of the cropping system. They should be examined as the additional source for enriching soils with soil organic matter in the crop rotation, especially if to take in consideration that the probability of success in growing cover crops is determined by many biotic and abiotic factors. The capacity of cover crops alone to improve soil fertility is problematic. Their beneficial influence can be enhanced only in combination with an optimal crop sequence together with optimal systems of soil tillage and soil fertilization.

The weather conditions in the experimental years have been very favorable for growing an abundant biomass of vetch, both aboveground and belowground biomass. But the efficiency of humification of this biomass depends in great extent by the ratio C/N.

We have determined this index from author’s experimental data from tab.1. The content of nitrogen in the aboveground biomass of vetch has consisted 4.2% for Orhei and 4.1% for Cahul district. For the belowground biomass the content of nitrogen was the same – 1.8% in both localities. The content of carbon in the aboveground biomass has consisted 42.3% for Orhei and 39.3% for Cahul districts. In the belowground biomass the content of carbon has consisted – 35% in Orhei and 37.5% in Cahul districts.

The C/N for the aboveground biomass in Orhei and Cahul districts has consisted 10.1 and 9.6, respectively.

The C/N for the belowground biomass in Orhei and Cahul districts has consisted 19.4 and 20.9, respectively.

The speed of decomposition of such a biomass, especially for the aboveground biomass of vetch is very high, because of the excess of nitrogen and lack of carbon. For comparison, content of nitrogen in the straw of winter wheat and stalks of corn for grain is equal to 0.5 and 0.7%, respectively. The C/N for the straw of winter wheat and stalks of corn for grain is 80-90 and 60, respectively.

The above mentioned circumstances create the danger of increasing the decomposition of soil organic matter as a source of carbon, mainly in the first year after incorporation of the green mass. There is also a danger of nitrogen leaching in deeper soil layers for a short period of time in the spring. Authors have determined the positive influence of green manure on the stocks of soil organic matter for the 0-20 cm soil layer. We suppose the labile fraction is dominating in the total amount of soil organic matter, which has a lower storage capacity. The authors are mentioning a high potential of carbon storage capacity for chernozem soils, because of high proportion of silt and clay (>90%), but the mineralization of soil organic matter for yield production is also very high.

A simple calculation proves the amount of nitrogen taken up from the soil by the yield of sunflower and corn for grain obtained by authors of the article after incorporation in the soil of green manuring – 96 kg/ha (2.4 t x 40 kg/t) and 167.9 kg (7.3 t x 23 kg/t), respectively for sunflower and corn for grain. The amount of nitrogen mineralized under row crops in reality is 1.6 times higher, according the coefficient proposed by the academician Lîcov A.M. (2004). It means that the total amount of mineralized nitrogen under sunflower and corn for grain is equal to 153.6 kg and 268.6 kg, respectively. The ratio between C/N in the soil is 10:1. So, the amount of mineralized soil organic matter (on carbon) is equivalent to 1536 kg for sunflower and 2686 kg for corn for grain, respectively. The authors have found an increase of 3 tons in the stocks of soil organic matter under the influence of incorporated green manure for the soil layer 0-20 cm in both Orhei and Cahul districts (tab.3).

It is evident that the mineralized amount of soil organic matter (on carbon) is very close to the accumulated (after one harvest) amount of soil organic matter, especially for corn for grain.

In order to evaluate the real changes in time of the stocks of soil organic matter a longer period of time is required. The interaction should be taken in consideration between cover crops for green manuring and sequence of crops in the crop rotations, systems of soil tillage and systems of fertilization etc. The methods and time of green manure incorporation influence on soil moisture stocks. Authors are affirming in the conclusions a possible increased infiltration and water holding capacity under the influence of green manuring, without experimental data which prove such a statement. In general, proper management of cover crops for a more efficient use of nutrients and water for the subsequent crops in crop rotation is crucial for their successful implementation.

I am recommending the article “Remediation of degraded arable steppe soils in Moldova using vetch as green manure” written by M. Wiesmeier, M. Lungu, R. Hubner and V. Cerbari for publication in the scientific journal *Solid Earth*.

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