

JOINT CROPS OF THE WINTER WHEAT WITH MEDICAGO (LUCERNE) - THE FUTURE OF PLANT GROWING

Zelenskiy N.A., Zelenskaya G.M., Avdeenko A.P.

Don State Agrarian University,
Rostov Region, Russia

Recently in different regions of Russia the process of mass passing to adaptive plant growing has begun. The industrial managers understand this passing in different ways, not completely understand the main idea and methods of intensification of adaptive plant growing. A.A.Zhuchenko (2004) a member of the Academy says: "The strategy of intensification of adaptive plant growing is directed towards the enlargement of productional but also environment improvable function of agro ecosystems and agro landscapes."

In the Rostov Region the amount and quality of the crop basically depends on the nature's caprice, therefore, while inculcation of adaptive plant growing in agricultural practice, it is necessary to pay more attention to the reduction of risk degree while getting high and stable crops of the main cereal in the Region – the winter wheat. And there is a necessity to select sorts adaptive in concrete conditions of the growing process, and mostly to develop technologies of cropping according to the special features of forming of crop rotation in modern conditions, with limited amount of cultivated cropper.

This strategy of adaptable cropper is based on the fact that recently most of the soil quality is practically used in the various Regions of Russia. The crop is got only due to the nutrients in the soil, the fertilizer is applied on the limited acres, and in those farms which have protectors or belong to the firms occupied with implementation of chemical means of plant protection or fertilizer in the territory of Russia.

Some economic executives misunderstand the notion of D.N.Pryanishnikov, who marked a special role of fertilizer and getting heavy crop. He wrote: "The heavier is the harvest the less is getting of it using only nutrients from the soil

itself and the greater is the importance of fertilizer for providing the crop with all necessary amount of nutrients." The disparity of farm and fertilizer prices make bare proprietors to cultivate crop not looking after safety without mentioning of the growth of the soil fertility for the future generation.

The territory of the Rostov Region is in a certain degree an undulating plain at an elevation from 30 m. till 300 above the sea. The highest area is located on the north-east, where the outskirts of the Don Ridge run, and more than a half of the farm fields are located on the slopes of different steepness and are liable to the wind and water erosion.

The growth of the yield of the cultivated crops must be accompanied by the rising of soil capabilities. But the biggest obstacle to the future development of the agricultural manufacture is a soil erosion. The eroded soils are less rich than the soils without erosion; hereupon the yield of crops here is dropped by 12-62 %. In the Rostov Region the square of such area is about 2 million ha; more than 4 million ha is in urgent need of protection from the erosion.

One of the fundamental elements of agro technologies in dry conditions of the Rostov Region is a complete fallow – the best precursor of the winter crops. It is also known that the complete fallow has some material weaknesses. That is why there have been many discussions about the optimal square of the complete fallows in the structure of ploughed fields among the specialists of agriculture. But the complete fallow has an effect only while qualitative cultivation of the soil and technical measures, which provide getting high and stable crops during all the rotation of crops.

The intensive water erosions are observed at the Don River in winter, spring and summer

periods. Therefore the autumn fallow erosion processes have been occurring from the moment of the primary processing and till the dropping of winter crops.

One of the most effective ways to stop the snow and protect the soil from the erosion is using the Medicago hedges. In winter period the Medicago facilitates detention and even distribution of the snow in the field, and better wintering of the winter crops and water collection. The soil itself reinforced with the coulisse plant roots and mulched with plant fragments, better protected from the water and wind erosion, and also from the insolation in the period of fallowing.

Using the Medicago hedges in fallows is a promising method of crop yield rising. The Medicago is drought-resistant and able to weather the 30 degree frost in the hard non-snowy winters. Its root takes phosphorous, calcium and other elements from the deep soils. These elements are involved in the process of structural soil outfit generating, accumulate in the plough-layer and make feeding schedule better. The Medicago contributes greatly to soil detachment, makes lower soil discharge and slows down the process of the plowing layer salting.

The Medicago uses nodulating plants for nitrogen fixation. That was proved that the roots and afterharvesting residues of this cropper collect 100-150 kg and more nitrogen per hectare that keeps in scale with 4-6 of nitrogen fertilizer.

We worked out, put to an evaluation test in practice and applied in industry a new way of using the http://www.multitrans.ru/c/m.exe?t=1571020_1_2 legume grasses (Medicago Varia) in the screen fallows for the production of cereal grain of the winter wheat and soil conservation (patent № 2260929 of the RF)

The researches have been conducted in the fields of the Don Cultivar experimental study center called *Don State Agrarian University* since 2000.

The Medicago is used for creating a hedge-mulching fallow. It must be overdrilled by the row-crop planter SUPN-8 (or other model) between the spring barley; the spacing – 70 cm and seeding rate up to 2,5-2,8 kg/ha. Thus,

compared with the traditional Medicago undersow, there is a significant economy of bean culture seeds. After spring barley gathering the Medicago overwinters, then in spring the intercultivation is organized and in autumn the winter wheat is sowed.

On an average over the years of survey, in the second year the harvest of the Medicago Varia herbage was 9,2 ton/ha, roots – 2,0 ton/ha, crop remains (остатки) – 1,2 ton/ha. The share of roots of the crop remains is about 65-70%. The most effective Medicago root system developed in the first year, in the second year – the field mass.

The organics are admitted into the soil after the bean culture harvesting and has great importance both for supplying the soil with fresh energy material and fertilizer elements. It all goes to show that there are favourable backgrounds of having positive balance of organics and fertilizer elements in the soil. The amount of the nutrients in the soil depends on the percentage of these elements. We have found out the chemical composition of the Medicago Varia plant remains (%): N - 2,34; P₂O₅ - 0,29 and K₂O - 1,28.

The 2002 and 2004 years were wet and favorable for collecting fertilizer elements in the plant remains, the NPK content here was for Medicago Varia - 82,5-98,3; 9,7-12,2; 50,0-51,3 kg/ha. In dry 2003 NPK content decreased – 35,2; 5,8; 26,9 kg/ha properly. According to our research the average content of the NPK in the plant remains of the Medicago Varia is 76, 9, 42 kg.

The intense occurrence of the water erosion on the Don River is observed in winter, spring and summer. That's why the erosion processes on the autumn fallow have been proceeding since the moment of the main cultivation and until the winter crops dropping. The coulisse fallow in this regard is more preferred than the autumn fallow. The value of the soil loss on the various fallows essentially differs on the slope areas of 3,8⁰.

The scientific Institutions found out the annual losses of the melt waters are 50-60 bln m³.

If it is possible to stop even a half of them in the fields, that will give a possibility to increase the whole yield of the crops about 8-10 Mio ton.

Each 10 mm of the melt waters (100 ton), saved and rationally used; there are 2 extra centner of the winter crops and 1 centner of the spring crops.

The *Medicago Varia* sowed across the slope, further formation of more water-stable structure and better moisture absorption. While soil preparation, the erosion preventive bunds are conforming – the prototype of the swathing in the complete fallows.

The more stable element is a complete fallow, in which the erosion has been since the main cultivation and till the dropping of the winter crops. So, the complete fallow causes the total soil loss of 154 m³/ha in the period of 3 years (2003-2005), and the *Medicago* fallow was 7 times less.

According to the period of the fallowing the various rainfalls precipitated during the years of research. The duration of the fallowing period also depended on the fallows under study. Over the period of the research this duration was: in the complete fallow – 164 days, in the coulissee fallow -101 days. It is necessary to mark the *Medicago Varia* ripens in 63-72 days since the re-vegetation. The amount of the loss water, considering the past precipitation in the complete fallow, over the period of the fallowing was 288 mm that is 105-107 mm higher than in the coulissee fallow. However, the certain advantage of the complete fallow over the other fallows is that by the moment of the winter wheat dropping there is more moistness than after the coulissee fallow. In the complete fallow the amount of the past precipitation over the period of the fallowing is lost as the evaporation and the surface discharge (поверхностный сток), as the part of the moistness collected over the autumn and winter period. The moisture, lost in the complete fallow during the fallowing, is efficiently used by the *Medicago* in the coulissee fallow for the yield formation.

In autumn the winter wheat is sowed according to the seeding rate, recommended for the breed and the area of cultivation. The winter wheat is sowed at an angle of 15-30 degrees toward the *Medicago* rows. The winter wheat and the *Medicago* overwinter and in spring the *Medicago* contributes to the decreasing of the erosion processes caused by the snowmelt. The

soil loss in the winter wheat dropping in the complete fallow was 16-20 m³/ha, and in the coulissee fallow – 3-4 m³/ha.

The structure is also an important characteristic of the soil physical state. It determines the favorable plowing layer of the soil, its water, physical-mathematical and technological features.

By the moment of the winter wheat dropping the various soil structures have been forming, depending on the type of the fallow. In the complete fallow the soil is breaking cause of numerous cultivation and shower rains that leads to the decreasing of the valuable elements (10-0.25 mm). The soil is being structured, i.e. the amount of the water and wind stable aggregates (агрегатов) is decreasing. Over the period of research in the complete fallow the aggregates (in size down to >1 mm in the layer of 0-5 cm and to >0,25 in the layer of 0-20 cm) were properly 45,3 and 36,5 %. In the coulissee fallow (кулисный пар) fallow the amount of the aggregates (in size down to >1 mm in the layer of 0-5 cm and to >0,25 in the layer of 0-20 cm) increased 1,6 and 1,8 times.

The largest containing of the water stable aggregates in the soil was in the variants of the coulissee fallow (кулисный пар), that provides (обеспечивает) the growth of the infiltration of water up to 2,96 m/min.

By the time of the winter wheat harvesting the *Medicago* has begun to blossom, and on some side twigs the seedpods are forming. It is necessary to mark the essential condition of harvesting of the binary crop is a separate method. The harvester-shredder should be used for shredding and dispersion of the chaff and the *Medicago* – thus creating the mulch cover that protects the soil from the overheat and water loss. The crop yield of the winter wheat in the coulissee and mulch fallow over the years 2001-2005 was 40,3 hundreds kilograms per hectare. That is lower than the crop yield in the complete fallow – 42,7 centner per ha, but the great positive side is that there is more than 3 months before the frost, and that is enough for the *Medicago* to grow, blossom and bear. So we get the grain of the winter wheat and also according to the aim of using – the *Medicago* herbage and corns. Since 2001 and until 2005 the harvest of the *Medicago* corns was from 0,8 and to 1,6 ha

(the middle yield of the Medicago – 1,2 centner per ha) in the year of the winter wheat harvesting. It is easy to count up that the good farmer will get about 8000 extra rubles above the sum of the price 8000 rubles per 1 ton of the Medicago corns.

The quality of the wheat fibrin has a great importance in the feeding. The high quality of the fibrin determines the high quality of the flour for baking process. On the average over the years of research the high containing of the raw fibrin was found in the coulisse fallow – 32,3%, in the complete fallow – 30,7%. And the greatest vitreousness was in the coulisse fallow

– 62%, that is 2 % more than in the complete fallow.

The other important corn quality level is a cup weight, characterizing the yield of flour and the plumpness. The higher cup weight was formed in the coulisse fallow (764g/l).

Thus, the coulisse fallow as the complete fallow furthers getting the winter wheat corns of high quality and even is better.

On the farms with developed animal agriculture the Medicago Varia is necessary to be sewed with the winter triticales and winter barley in the coulisse and mulch fallow in order to conserve the forage.