COMBINED USE OF SOLID AND LIQUID FERTILIZERS TO IMPROVE YIELD AND QUALITY OF WHEAT CROPS IN URZICUTA,DOLJ COUNTY

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Abstract

This research is important because there is a good time to apply each type of fertilizer and it is necessary to know it, as well as to interact these fertilizations of the wheat with the phytosanitary treatment.

The fertilizer doses can vary from one crop to another, but even so the main purpose is to ensure correct fertilization, without recording losses of products in the soil and, finally, with maximum production effects. As for the fertilizer dosage, it varies depending on the type of soil and how much nitrogen it contains, why fertilizers were applied to the fertilization in autumn, the planned production and the financial needs of the farmer involved.

In Romania in recent years, agriculture has seen a continuous development and therefore the productions have increased, of course, except for the situations in which drought has changed this course of things. We can see if we look at the statistics as wheat production increased from 1,541 to /ha in 2007 to 4,8 to ha in 2018 and the trend is increasing if the pedo-climatic conditions help us.

The fertilizers used play an important role in this equation. For example, in Urzicuța, Dolj County, several ways of fertilizing the wheat have been experimented on several ha in order to observe the correlation between the economic benefits obtained, the quality of the wheat obtained and the quantity. Fertilization with liquid nitrogen and solid nitrogen plus other elements proved to be the most efficient both in terms of the production obtained and the cost of production.

INTRODUCTION

The genesis and the evolution of the soils in Urzicuța Commune took place under the interaction in time of the pedogenetic factors presented in the previous chapter (relief, geology-lithology, hydrography-hydrogeology, climate, vegetation and fauna).Under the predominant influence of climatic and biological factors, the humification of organic matter led to the formation of humus that accumulated in the upper horizons in a layer with a thickness of 25 - 40 cm.In order to obtain high yields on wheat, having established the correct structure of the biomass, the plant needs to be maintained green until the final filling period of the grain, assimilating as much as possible the incident light and converting it to obtain high yields. Nitrogen, potassium and magnesium are of particular importance in maintaining a biomass of green leaves. Chlorophyll is a protein rich in nitrogen and magnesium, which gives the plant its green colour and is essential for effective photosynthesis. The relationship between the chlorophyll content of the leaves and nitrogen is well established, with more chlorophyll as a percentage of the leaf increases the dose of nitrogen.Magnesium is the central component of chlorophyll bound to four nitrogen molecules. The level of magnesium is also important for maintaining green biomass.

In addition to the size of the biomass, it is also important to ensure that the structure and architecture are maintained further improving the efficiency of the crop in order to capture light and convert it into production.Potassium plays a very important role in maintaining the resistance of the plant to drought, as well as the absorption of nutrients in the plant. As we can see from the description of the following authors;The era of application influences the effectiveness and size of the fertiliser dose, which is the subject of much research by the Fundulea Institute (Coculescu et al., 1967; Hera et al., 1968, 1970, 1973, 1982, 1987).Of the nutrients, as a contribution of the fertilizers applied on all the types of soil in our country and on most of the plants, nitrogen was the one that influenced the production the most (Hera et al., 1972; Hera and Mihăilă, 1979, etc.).The effectiveness of potassium fertilizers is weaker compared to those of nitrogen and phosphorus. Some research has shown that the effectiveness of potassium fertilizers depends on the nitrogen and phosphorus agrofond on which they were applied, being the lowest when applied alone or on phosphorus agrofond, the highest on nitrogen agrofond and the maximum on nitrogen and phosphorus agrofond. The need for potassium fertilisers arises especially when large amounts of nitrogen and phosphorus are used (Hera and Mihăilă, 1971; Hera et al., 1972). The effect of potassium fertilizers increases when applied with those with nitrogen, or with nitrogen and phosphorus, which shows a positive interaction K x N and K x NP (Hera et al., 1972).

MATERIALS AND METHODS

The research was carried out in 2019-2020 in Dolj County, Urzicuța Commune. The plant sown was adesso c1 wheat. Wheat is one of the plants that reacts positively to the application of organic and mineral fertilizers in all climatic conditions in our country. The plant does not have a high consumption of nutrients, but wheat is very demanding for fertilization, for several reasons. Firstly, its root system is poorly developed and it cannot use the heavy soluble substances in the soil, the nutrients are absorbed in large quantities in a short amount of time, from the beginning of the straw to the ripening in milk, so that the plants can no longer ensure their needs in the following period. The fertilization of wheat ensures a constant flow of nutrients to the wheat, so that the production obtained is as high as possible. On October 20, 2019 we sowed the adesso c1 variety characterized by high content of protein and gluten, high production capacities, stability of productions each year, adapted to all the conditions of culture in the country. From a technological point of view, we can say that it is an aristate variety with twinning in the spring, the optimal period of sowing: October 1 – October 20, and the quantity of seed is 300 b.g./sqm. Other characteristics would be the following: Hectolitric mass: > 81Kg, protein content: > 16%, Height: medium – large and the appearance of the ear is semi-late.

The solid fertiliser used is DAP 18 46 0. Chemical composition: Total nitrogen18%P2O5 total46%. Granulometric structure: Between 1 and 4 mm min 96%, between 4 and 5 mm max 4%. As recommendations: It is completely soluble in water and has an acid physiological reaction. High content of active substance, complete solubility and excellent physical attributes make this fertilizer to be used more and more. Being completely soluble in water, it can be applied to the soil surface and incorporated into the working surface of the soil. It is recommended for both autumn and spring crops.Uan was used for liquid fertilization.The liquid fertilising product UAN (UREAN) is an aqueous solution that

holds 32% N-total (15.5% of AN and 16.5% of urea). The fertilising value results from the high content of the active substance, its solubility and the stability of the solution obtained by dissolving AN and urea, without the risk of crystallisation during storage and handling, at temperatures higher than 0 °C. The fertilising solution to be applied shall have a pH of 7,5 ± 0,5.Suitability for use in agriculture: UAN has multiple applications with incorporation in the soil (at concentrations of 32%), but also foliar (in dilutions at 1.5-2% N-total in the solution to be applied):1. It is used with good results in the preparation of the seedbed, on stubble, at the specific concentration of 32% N, incorporated by ploughing at 20-22 cm or even more superficial ones. The efficiency of UAN application in this technology increases if it is evenly distributed over the harvested plant remains of the preliminary crop (shredded to 5-8 cm), as such a measure increases the speed of decomposition of plant matter, rectifies the C/N ratio in it and favours quality humification. A good incorporation of the fertilizer combination with the vegetable residues, the uniformity of the work and a dosage of the fertilizer at 40-60 kg N/ha (100-150 l/ha) is pursued here. This application can be achieved by spreading on the entire surface with herbicide equipment or those for phytosanitary treatments equipped with anti-corrosion.

2. More frequent use refers to the application of this liquid fertilizer with N, phasial-supplementary, between the rows of hoes to most spring crops, without dilution concurrently with mechanical maintenance work by equipping the tractor and cultivators with tanks and pipes equipped with anti-corrosion. In this alternative, if basic fertilization was normally achieved by balanced NPK or NP assortments, UAN can be applied at the dose level of 60-70 kg N s.a./ha (200-250 l/ha). In such a technological alternative, the effect of the application of UAN as a phasal fertiliser may have a similar result to that of the application of other types of N, solid and granular (AN, CAN, urea) (attached table).

3. In foliar application of UAN, on cereal straw crops (8-10% UAN in the herbicide solution) or other crops, dilutions of UAN must ensure that the solutions used have a concentration of no more than 1,5-2% N. If fertigation is used, the solution that reaches the plants must not exceed 2% N.The advantages of UAN application in fertilization systems are due to the coefficient of use of the active substance over nitrogen in solid fertilisers, low production, handling, administration costs, precision in technology and dosage and use in several application alternatives.The benchmarks taken were conventional wheat sowing with ploughing and unconventional with minimum tillage. The fertilization variants were applied for both types of sowing, where b1 means the unfertilized version, b2, b3, b4 and b5 have the fertilization applied as shown in their

description.A – Soil works - a1-conventional and a2-minimum tillage

B- Fertilization – b1 – Non-fertilized (N0, P0, K0)

b2 – N100P50K0

b3 - N100P50K50

b4 - N150P50K50

b5 –N100P0 K0

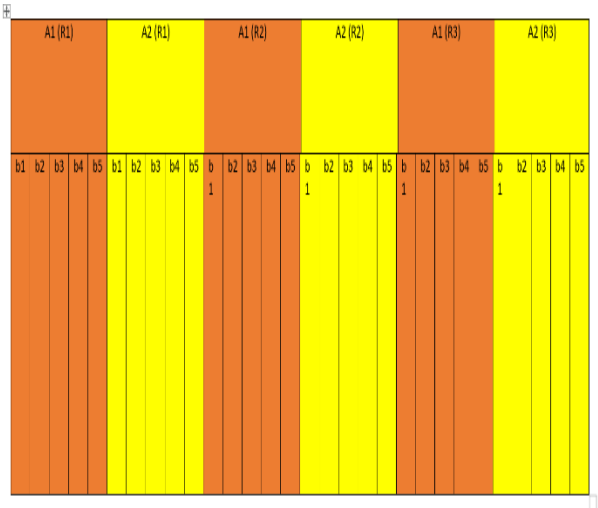
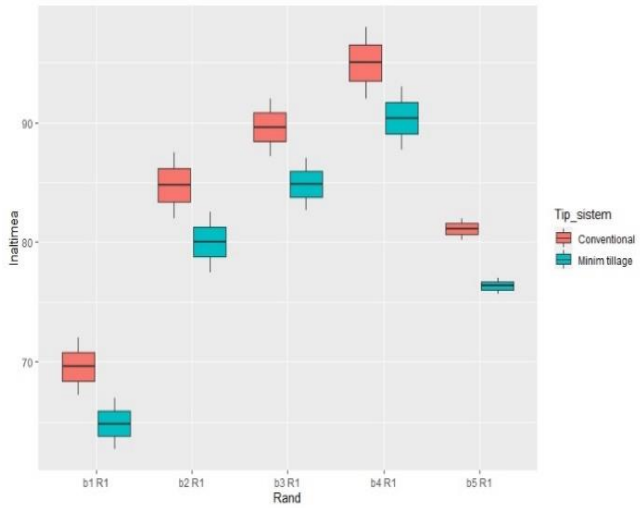


Table No 1 Application of fertiliser doses

Date of fertilization	Name of fertilizer	(ha)	Fertiliser amount	N (Kg)	P2O5 (kg)	K2O	Motivation.
10.10.2019	DAP	1.0	150.0	27.0	69	0	provides plant nutrition at sprouting
25..10.2019	UREAN-UAN	1.0	100.0 L	32.0	0	0	provides the necessary nitrogen for plant nutrition
17.03.2020	UREAN-UAN	1.0	190.0 L	60.8	0	0	provides the necessary nitrogen for plant nutrition
25.04.2020	AMS (AMMONIUM SULPHATE)	1.0	100.0 kg	21.0	0	0	provides the necessary nitrogen for plant nutrition and quality indices

As it can be seen from the measurements, fertilisation of wheat plays a very important role in achieving competitive yields. We can see that for an unfertilised crop, the yield goes down a lot, but it is also important to prepare the land. My research has shown that we get higher yields in wheat if we use ploughing and mixed solid and liquid fertilisation

Chart no. 1 plant height



Height of wheat plants in 2020 in conventional system

	Maximum plant height (cm)	Minimum plant height (cm)	Average plant (cm)
b1 R1	72	67.2	69.6
b2 R1	87.5	82	84.75
b3 R1	92	87.2	89.6
b4 R1	98	92	95
b5 R1	82	80.2	81.1

Height of wheat plants in 2020 in minimum tillage system

	Maximum plant height (cm)	Minimum plant height (cm)	Average plant (cm)
b1 R1	67	62.7	64.85
b2 R1	82.5	77.5	80
b3 R1	87	82.7	84.85
b4 R1	93	87.7	90.35
b5 R1	77	75.7	76.35

Weight of wheat plants 2020 in conventional system

Conventional system	Plant weight/m2	Weight of leaves/m2	Strain weight/m2	ROOT WEIGHT/m2	Weight of ear/1 m2
b1 R1	385.6	14	90	20	261.6
b2 R1	840.1	18	120	45	657.1
b3 R1	884.6	20	135	55	674.6
b4 R1	921.4	20	150	70	681.4
b5 R1	684.4	18	100	35	531.4

Weight of wheat plants 2020 in minimum tillage system

Minimum tillage system	Plant weight/m2	Weight of leaves/m2	Strain weight/m2	ROOT WEIGHT/m2	Weight of ear/1 m2
b1 R1	367.6	14	85	17	251.55
b2 R1	825.1	18	115	45	647.1
b3 R1	872.6	20	135	53	664.6
b4 R1	906.4	20	150	65	671.35
b5 R1	669.4	18	95	35	521.35

Chart no. 2 weight of wheat plants

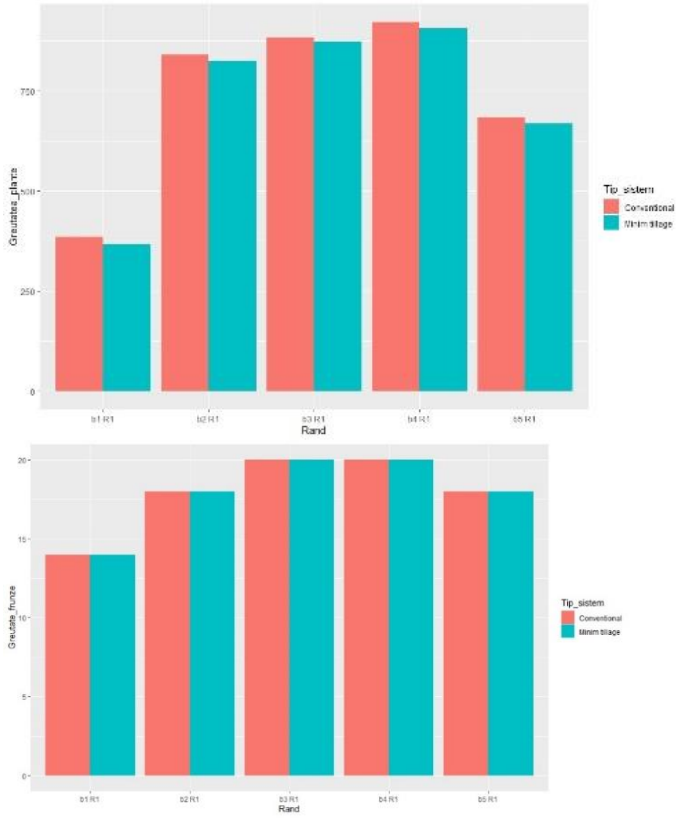


Chart No. 3 Weight of Leaves
Chart No. 4 Strain Weight

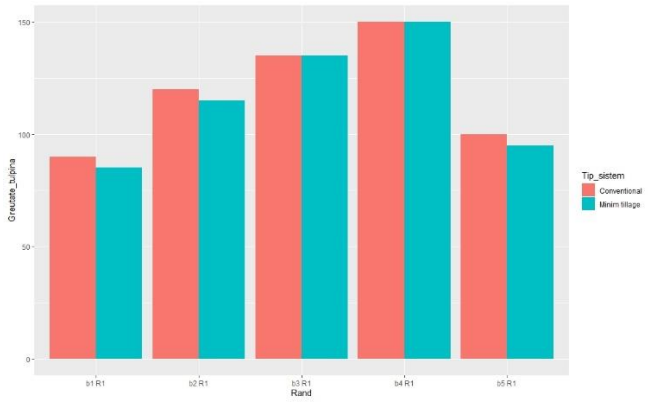
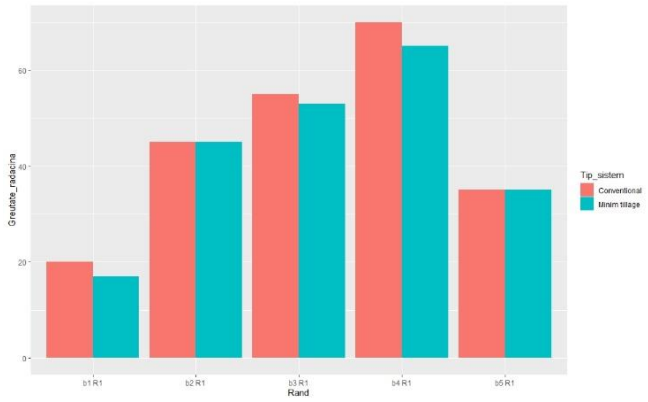
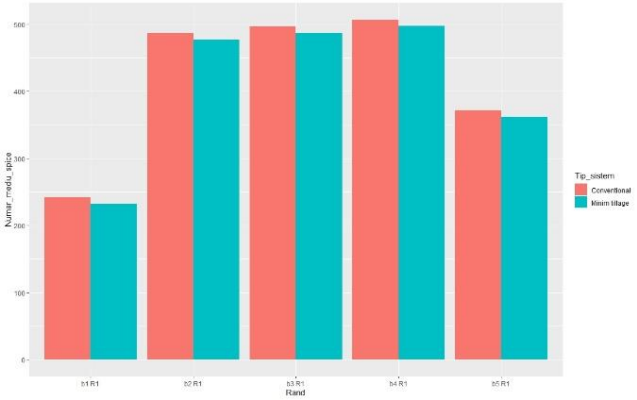


Chart No. 5 Root Weight Wheat Plants



We can see how the weight of the plants is influenced by field preparation, but also by fertilization.



Weight of wheat ears and grains 2020 in conventional system

Chart no. 6 Weight of ears

Chart no. 7. Weight of wheat grains

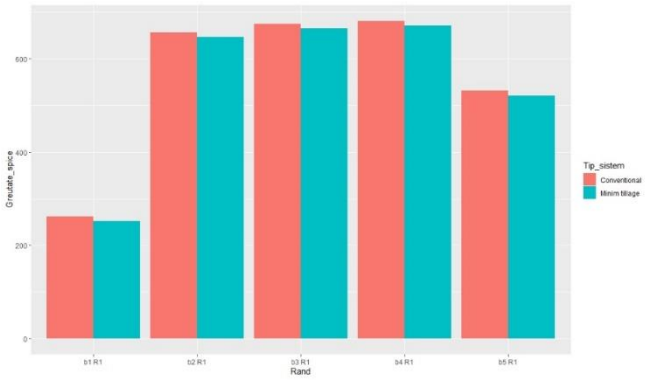


Chart no.9 Average number of grains per ear

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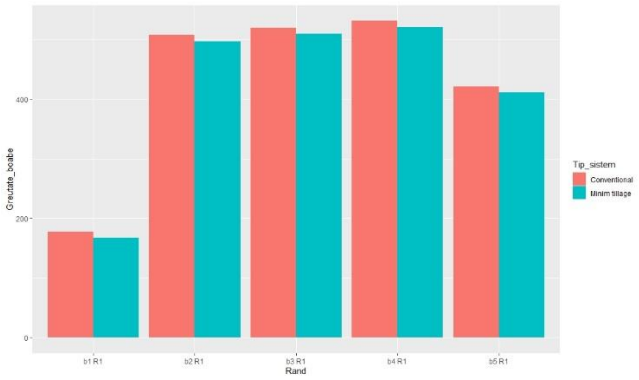


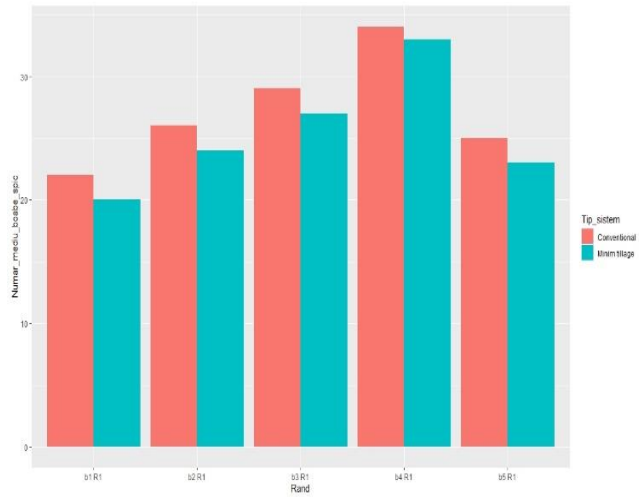
Green -min tillage,orange -conventional

Conventional System	Weight of wheat ear per 1 m2	Weight of wheat grains per 1 m2	Average number of ears	Average number of ear grains	MMB before sowing
b1 R1	261.6	176.9	241.5	22.0	33.3
b2 R1	657.1	507.5	487.0	26.0	33.3
b3 R1	674.6	520.0	496.5	29.0	33.3
b4 R1	681.4	531.0	506.5	34.0	33.3
b5 R1	531.4	421.0	371.5	25.0	33.3

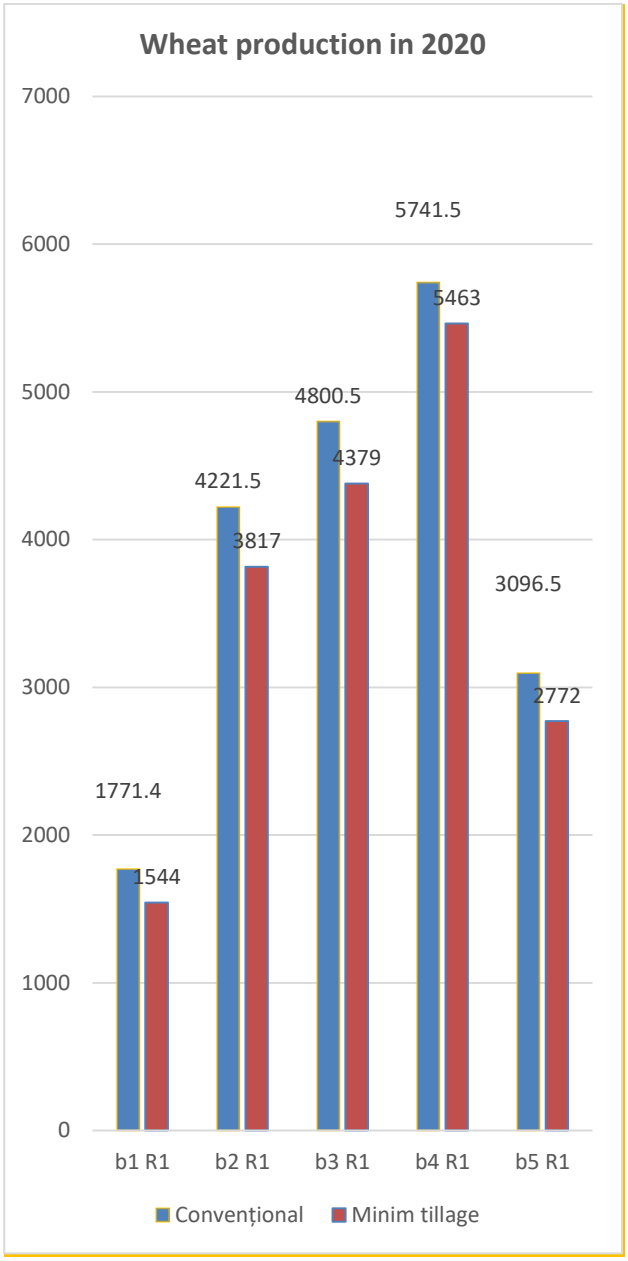
Chart No. 8 Average number of ears

Weight of wheat ears and grains 2020 in minimum tillage system

Minimum tillage system	Weight of wheat ear per 1 m2	Weight of wheat grains per 1 m2	Average number of ears	Average number of ear grains	MMB before sowing
b1 R1	252	167	232	20	33
b2 R1	647	497	477	24	33
b3 R1	665	510	487	27	33
b4 R1	671	521	497	33	33
b5 R1	521	411	362	23	33



Wheat production in 2020



CONCLUSIONS

.The research carried out in Urzicuța, in the south of Dolj County, analyses how the two modes of solid and liquid fertilisation influence the growth and development of the plant and the production potential.

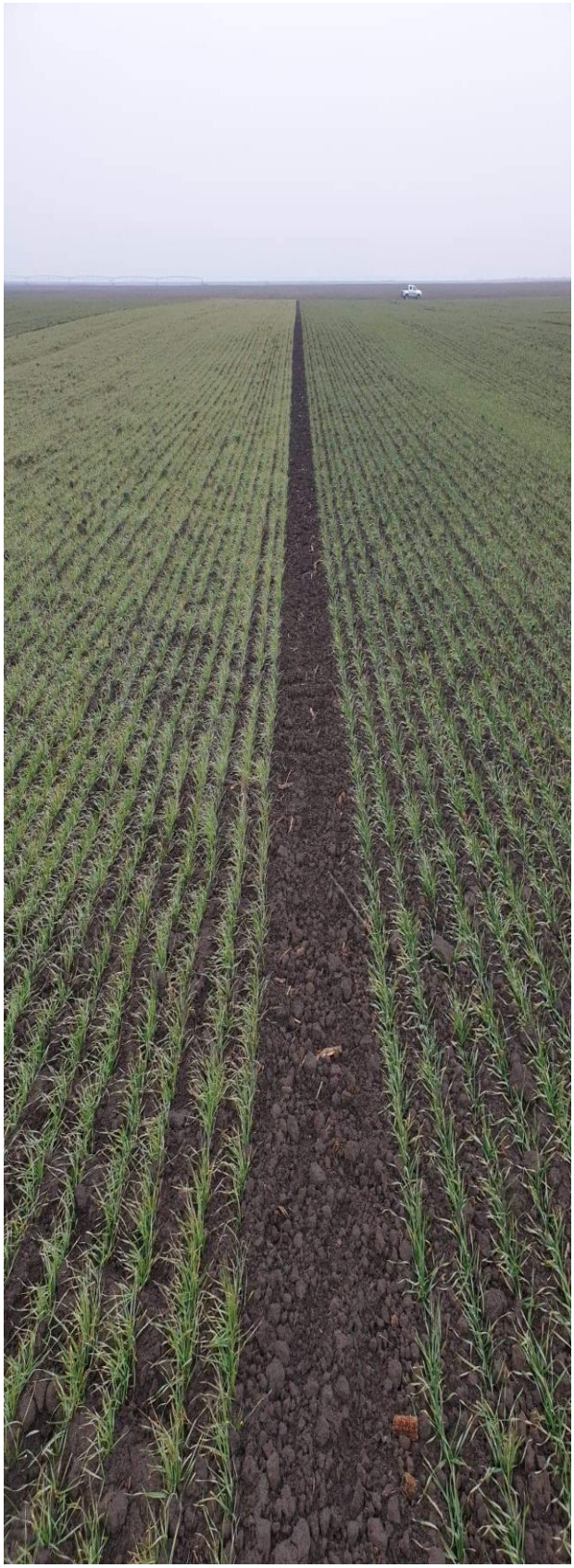
It is very good to alternate the two fertilization methods for a balance of production costs but also for production yield. Liquid fertilizer ensures evenness of its application on the crop. We can see that the conventional variant of land preparation and mixed fertilization brings an extra yield.

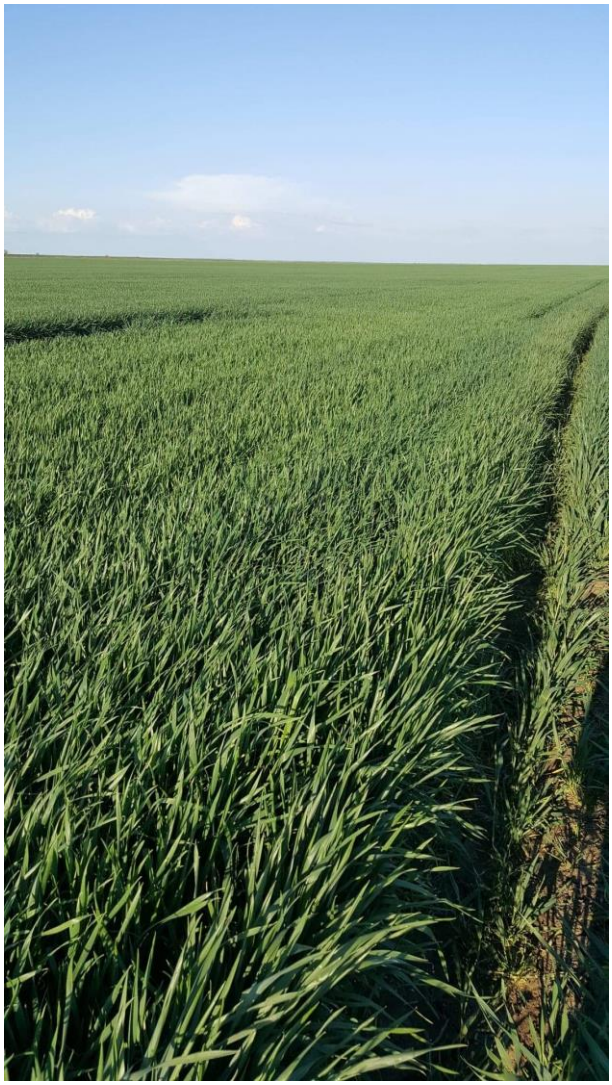
From the observations made, where we used ploughing weeds were slow to appear, and so the fertilizer was used exclusively for the main plant. Part of the plant treatment could be inserted together with the liquid fertilizer in one pass.

Wheat production in 2020 was favourable even though the soil and weather conditions were not favourable. The timely fertilisation of the wheat crop using the two methods solid and liquid was of the essence, applying the treatments in time for rainfall harvesting.

I think that 5.74 tonnes per hectare for conventional sowing and 5.46 tonnes per hectare for minimum tillage sowing is quite satisfactory in a dry year.

As fertilisation decreases, we see that yield decreases as well.





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