ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 09, Issue, 05, pp. 27428-27432, May 2019

RESEARCH ARTICLE OPEN ACCESS

AGROECONOMIC IMPACT INDICATORS OF VARIUOS NOURISHMENT METHODS ON THE SOYBEAN CROP DURING 2017

***Adela Mujić, Besim Salkić, Emina Mešinović and Besima Buljubašić**

Faculty of Technology, University of Tuzla

ARTICLE INFO

Article History:
Received 24th February, 2019
Received in revised form
03rd March, 2019
Accepted 19th April, 2019
Published online 29th May, 2019

Key Words:

Soybean, Nourishment, Crop,
Weather conditions, Agrotechnics.

ABSTRACT

The breeding and cattle fattening is determined by providing quality food for their nutrition. The soybean is highly protein concentrated forage, and as such it is very important breeding culture for the production of animal feeds. Soy, more precisely its root, contains the ability to adopt atmospheric nitrogen. During its vegetation it can enrich the soil with nitrogen from 40 to 60 kg / ha. In addition to this, it is able to shift and activate foods from hardly soluble forms to easier ones, and to improve the structure of soil and fertility. This research paper is going to analyze the impact of variuos nourishment methods as well as the impact of weather conditions on the soybean crop sown during 2017 in Great Toplice field. , so as to emphasize the profitability of growing soy with or without fertilizer. The agricultural engineering was conducted in time and accurately, furthermore it was described through all the stages, from cultivating the land to harvesting. According to the conducted survey it can be concluded that soybean production with no use of organic or mineral fertilizers is possible but with lower crops. The aim of the experimental work was to determine the influence of climatic factors and various nourishmenrt methods on soybean crop, so as to examine the agroeconomic factors that prove the profitability of these two ways of soy nutrition.

Citation: Adela Mujić, Besim Salkić, Emina Mešinović and Besima Buljubašić. 2019. "Agroeconomic impact indicators of variuos nourishment methods on the soybean crop during 2017", *International Journal of Development Research*, 09, (05), 27428-27432.

INTRODUCTION

The importance of soybean growing

Soybean Glycine max (L.) is an old field crop that is grown over four thousand years. It has been the main source of food for people from the Far East, throughout the long centuries,. The first recorded production was in France in 1840, then it spreads over other European countries. Significance of soy comes from the quality of its grain (high protein and oil content), so it is one of the most important protein and oil cultures in the world (Vratarić i Sudarić, 2000.). It is very important for the production of animal feed, as highly protein concentrated animal feed. The optimal soil pH value for its cultivation is neutral (ph 6-8). To some extent, the soybeans tolerates acidic soils, for this reason the crops, generaly, tend to be very low. Successful production is very important as well as optimal balance of mineral matter. Soybean is usually grown on humus enriched land. This has a beneficial effect on the soil itself and water retention capacity.

Corresponding author: **Adela Mujić,**
Faculty of Technology, University of Tuzla

When choosing a plot, it is necessary to consider the ground slope, primarily because of the erosion phenomena (Danube Soya, 2015.). It is very important to point out the agrotechnical significance of soy. Soybean, more precisely its root, has the possibility of adopting atmospheric nitrogen. During its vegetation it can enrich soil with nitrogen from 40 - 60 kg / ha. Nitrogen phixation is conducted by bacteria *Bradyrhizobium japonicum*, which lives in symbiosis with soybean plant. Soybean is capable of shifting and activating foods from hardly soluble forms to easier ones, and to repair soil structure and fertility (Vratarić i Sudarić, 2008.).

Soybean production in Bosnia and Herzegovina: In Bosnia and Herzegovina, soybeans are grown so far over only cca 5,000 ha, due to the fact that the country is still building up its potential. The average crop in BiH for the year 2016 was cca 3 t / ha, and in the previous years it was slightly smaller. Bosnia and Herzegovina imports large quantities of soy (about 35 tonnes per year) and soybean meal (about 75 tonnes per year), meaning that in the bh market there is a large number of soybeans which were imported, and more oftenly they are GMO. It is also possible to produce even bigger amount of

soybeans in Bosnia and Herzegovina. For the first time in the postwar period, Bosnia and Herzegovine produced 10000 t of soybeans. The realization of the project "Danube Soy" is currently in procedure. Its main goal is to increase the volume of production of quality genetically unmodified soybeans, which is why Bosnia and Herzegovina has great capacities for economically sustainable, ecologically acceptable and socially responsible soy production..

Soybean production in the region: In the European Union, soybeans were planted over 420,000 ha with average crops of 2,56 t / ha. EU participation in the world's total soybean covered soils in 2013 was 0.38%. The participation of R.Serbia, in the overall world area, is 0.14%, and in comparison to the EU it is 38.10%. (Lj. Živanović, V. Popović 2016). Republic Croatia breeds soybean over 55000 ha and owns soils that bring 3-4 t / ha of crops.

MATERIALS AND METHODS

For writing this research paper, an experiment was conducted over the area of 1 hectare on the rented plot Great Toplice field in Živinice, planted by Plant ltd.. There were used data from the Federal Meteorological Institute of BiH for meteorology station Tuzla,in the perod from May to September 15, 2017. All data is statistically processed and necessary soy analysis was conducted on the Perten IM 9500, as shown in the results. Land analysis is made in the Federal Institute for Agropedology, Laboratory Research. Results of the land analysis indicates that the soil is acidic or less acidic in reaction with pH in H 2 O 6,22 or pH 5,03 in KCl. This indicates that the soil tested in terms of the reaction was slightly suitable for growing soy. CaCO 3 content is not detected. The humus content in the soil is 2.36%, which indicates the low presence of humus in the soil. The total amount of N is 0.16%, which indicates a low level of soil richness with this element. The content of K 2 O is 25.57 mg / 100 g of soil, indicating it is enriched with this element. To make the soil adequately prepared for soybean cultivation, it was used mineral NPK fertilizer 200 kg / ha, formulations 15:15:15, and well-blended cattle fertilizer in the amount of 35-40 t / ha. An experiment was carried out in a hectare of the field, consisting of two parts, fertilized and unfertilized segment. Furthermore, three varietes were analised: NS Apollo, NS Galina and NS Valjevka from the Novisad Institute of Field and Vegetable Crops. NS Apolo class belongs to (I) a ripening group. It is a medium-grain class, and its crop potential is over 6 t / ha. It is presented with high and stable crop. The optimum composition is 450,000 plants / ha. The grain is medium size with yellowish glow and a membrane which has the same colour. Galina class belongs to (0) group of ripening and it is an early variety as well. The crop potential is over 5.5 t / ha. High and stable crops are obtained under different conditions of cultivation. The grain is medium size with a yellow seed and a membrane that is yellow. The optimum composition is 500,000 plants / ha. Valjevka class belongs to (0) group of ripening and it is an early variety. The crop potential is over 5.5 t / ha. The grain is medium size with yellow seedlings and yellow membrane. The optimum composition of plants is 500,000 plants / ha.

Agricultural engineering and sowing: The soy is sown as a monoculture for the fourth year in a row On the Great Toplice field. The production was successful even though monoculture is not recommended to be sown over two years in sequence due to increased risk of disease, pests and weeds. The weed is slightly more presented , but with the use of adequate pesticides it can be successfully controlled. The basic soil treatment, on the Great Toplice Field, is done in the autumn, at a depth of 30 cm. When it comes to additional treatment, it is done immediately before sowing in order, to preserve the soil moisture. Additional soil treatment is performed by a rotary cultivator, owned by Plant ltd. Soybean, as a spring crop, is sown almost at the same time as a corn, which certainly depends on the climatic conditions of the growing area. The safest sowing is when the temperature of the soil surface layer is 8 c, more accurately between 8 0 and 10 0 C. On the Great Toplice Field, the sowing of soybean began on 12.05. with a pneumatic sowing machine, which sows seven soy rows with a row spacing of 50 cm. The seed placing depth is 4 cm. Soybean seed inoculation on the Great Toplice Field plot was conducted in the same day as the sowing of soybeans, with the formulation called nitrogen phixation, and containing *Bradyrizobium japonicum spp*. Bacterium. The soybean germination should be considered as a mandatory measure in the technology production. This procedure increases content of protein in the soybean grain and saves nitrogen fertilizers for the next crop. Soy requires less fertilizers than other crops, which primarily depends on soil fertility and crop levels. It has the ability to make a symbiotic relationship with soil bacteria which is involved in the process of nitrogen phixation.

Moreover the soy partially enriches its needs with atmospheric nitrogen. The amount of mineral fertilizer recommended for each parcel should be based on the agrochemical soil analysis (Vukadinović and Lončarić, 1998). According to the soil analysis performed, on the Great Toplice Field, it was inserted 200 kg / ha of mineral fertilizer NPK formulation 15:15:15. In this experiment that was conducted over the area of 1 ha, only 0.5 ha was treated with fertilizers , while the other half of the hectare was not treated with it. The plant configuration in the unfertilized part of the sample is 258.200 plants / 0.33 ha, and in the fertilized part is 245.400 plants / 0.33ha. On the fertilized part of the plot the plants were exposed to the stress due to improper application of the herbicides, and for this reason the composition of plants in this part is less than in the unfertilized part. Chemical protection is primarily related to weed control, moreover to the application of herbicides after germination. They occupy plant's overg-round and underground space, shade the plant, and in the end the plant gets suffocated (Šarić, 1991; Hulina, 1998). The most common weeds that harms soy growth are *Abutilon theophrasti, Ambrosia artemisiifolia, Amaranthus retroflexus, Chenopodium album*. At the Great Toplice Field, weed protection is done in two treatments. In 2017, two treatments were performed, with the correction of the first one:

- First treatment in combination Wing P (3.5 L / ha) + Mistral (0.5 kg / ha)
- Corum correction Corum (1L / ha) + Basagran (0.5L / ha)
- Another Corum treatment (1L / ha) + Basagran (0.5L / ha)

Disease and pest protection will be applied only if there is the symptom of the desease or the presence of pests (Compendium of Soybean Diseases 1989). Soybean harvest is still the biggest challenge in the process of soybean production. Harvesting should be started when the grain moisture drops to 13-14%. If

the harvest begins earlier, it is necessary to dry the grains, and the delay of harvest increases losses and decreases grain quality. The losses of soybean grains may occur even before harvesting due to the cracking of the seedpod. The varieties which seedpods tends to break should not be sown. However, in some years and areas extreme climatic conditions occur, so it may happen that the seedpods partially crack and this can be the case with the variety that has solid seedpod as well (Vratarić and Sudarić, 2000). On the sample part of the plot, the harvest was done on 15.09.2017., and the results are to be displayed in Chapter Discussion Results.

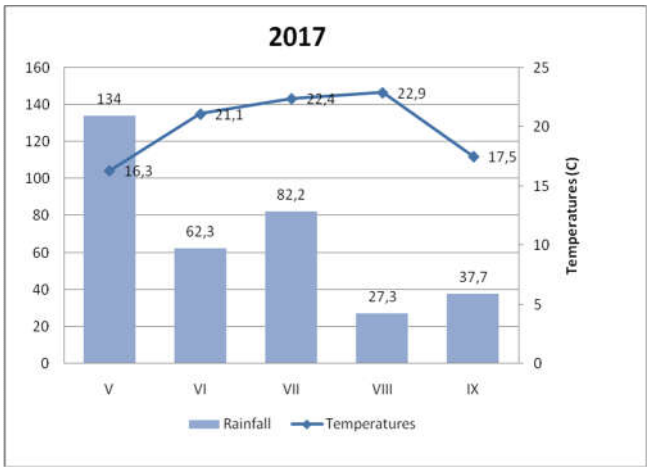
Weather conditions in 2017: According to the data of the Federal Bureau of Hydrometeorology (Table 1) it can be noticed that the amount of rainfall during the first months of soybean vegetation did not significantly deviate from the perennial average, whereas in August the temperatures were quite higher, and as a result this affected the decrease of the expected crops.

Table 1. Average monthly temperatures and rainfall sums during the period of soybean vegetation during 2017

Month	Average monthly temperature (°C)	Average monthly rainfall sums (mm)
May	16,3	134,0
June	21,1	62,3
July	22,4	82,2
August	22,9	27,3
½ September	17,5	37,7

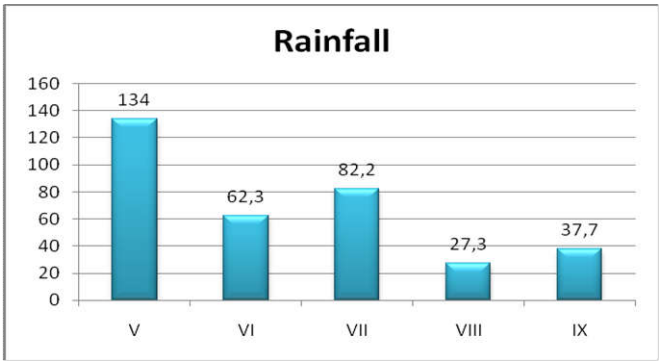
RESULTS

The temperature-precipitation ratios for the Soybean vegetation period in 2017 were presented by Heinrich Walter diagram (Graph 1). The amount of precipitation in the soybean vegetation period was considerably lower in comparison with the annual average for even 86.21 mm (Graph 3), while according to average recorded temperatures it can be noticed an increase of 3.28 o C in average air temperature. During agrotechnical measures, i.e. the pre-seasonal preparation and sowing of soybeans (02.05.-12.05.2017), large amounts of rainfall were recorded, for ~ 40 mm higher compared to perennial average (Graph 5). In the period of flowering and grain formation, the recorded air temperatures were higher for 1.2 ° C and the average precipitation was ~ 27 mm (Graph 2). Due to high temperatures the side nodes were not formed on soybean stem, therefore there was less seedpods in the stem, which influenced the decrease of crops. During the harvest time, precipitation was within normal limits, so harvest was done without any problems. An experiment of 1 hectare was set up on the Great Toplice Field. The experiment consists of two parts: fertilized and unfertilized one. On both parts of the experiment, the three varieties were sown: NS Apolo, NS Galina and SS Valjevka. In order to determine what variety gves the best corp the plants were treated with different plant nutrition. The following measurements were made: the mass of each variety, the hectolitre mass and the mass of 1000 grains. Analysis of the obtained data determined significant differences between two ways of soy nutrition. The soybean crop was bigger on the fertilized soil part, as a result the mass of 1000 grains was larger and the hectolitre weight was smaller, which shows higher quality of soy (Table 2). Vratarić and Sudarić (2000) state that soybeans are the most sensitive to the lack of water in the soil during the formation of seedpod and swelling of the seed.

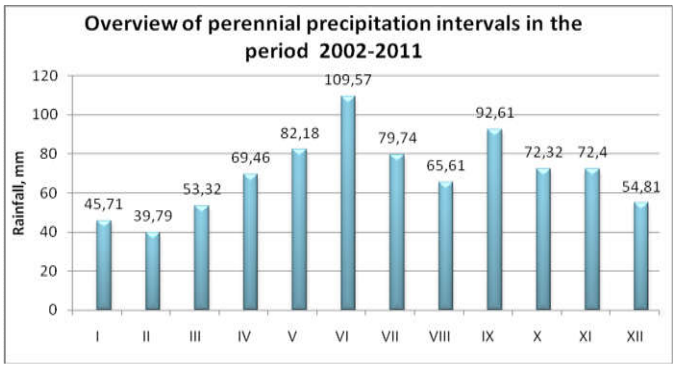


Graph 1. Heinrich Walter diagram for the Soybean period in 2017

Drought in this stage can reduce the grain crop of sensitive varieties from 40-60%, and the precipitation in this stage can be very beneficial for the graincrop.

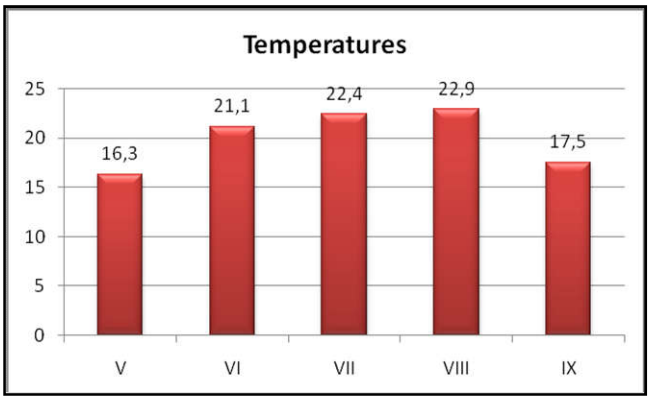


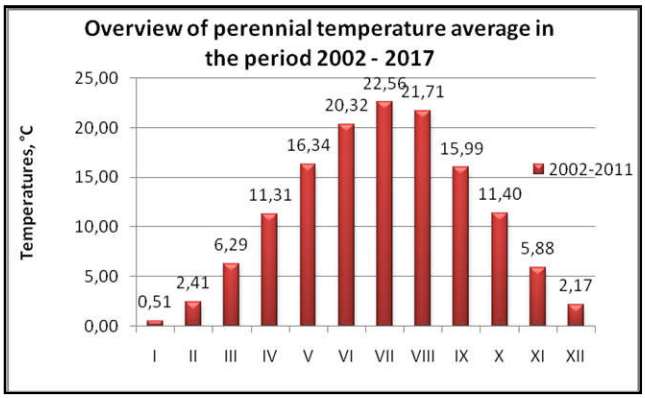
Graph 1. Rainfall sums for the Soybean period in 2017



Graph 2. Overview of perennial precipitation intervals in the period 2002-2011

Therefore, observing the precipitation regime in the soybean vegetation period (Graph 3) it can be concluded that the amount of rainfall was smaller in relation to the perennial average, which influenced the corp reduction. The land moisture was favorable in the period from spring to flowering. The need for water is growing as the soybean grows. The observed average temperatures (Graph 4) also deviated from the perennial (Graph 5), for 3.28 o C. High temperatures with less moisture can cause poorer formation of the seedpods, and this leads to developing smaller grain, as well as a smaller mass of 1000 grains, finally this leads to a decrease in corps (Table 2).





Graph 4. Average temperatures for the Soybean period in 2017

Graph 5. Overview of perennial temperature average in the period 2002 – 2017

Table 1. Results of soybean crops

Nonfertilized part				Fertilized part		
Variety	Mass (kg/ha)	Hectolitre mass (kg/hL)	Mass of 1000 seeds (kg)	Mass (kg/ha)	Hectolitre mass (kg/hL)	Mass of 1000 seeds (kg)
Apolo	1764,02	72,6	0,144	3283,5	71,8	0,162
Galina	1897,1	74,3	0,124	2678,02	73,6	0,142
Valjevka	2391,9	74,5	0,120	2983,5	74,5	0,134

Table 2. Economic Indicators of Soil Feeding Performance

	Nonfertilized part			Fertilized part		
Variety	Unit price of soy KM/kg	TOTAL Soybean crops /KM	NPK 15:15:15 200kg/ha	Fertilizer application /ha	TOTAL Soybean crops /KM	TOTAL with all costs
Apolo	0,73 KM	1287,73 KM	130 KM	1,80 KM	2396,95 KM	2265,15 KM
Galina	0,73 KM	1384,88 KM	130 KM	1,80 KM	1954,95 KM	1823,15 KM
Valjevka	0,73 KM	1746,10 KM	130 KM	1,80 KM	2177,95 KM	2046,15 KM

The following table (table 3) are presented the economic indicators of the (non)fertilization of soybeans. It is important to emphasize that Plant ltd. has a steady employed worker (tractorist), therefore the labour payment cost was not considered since, in this case, this is the fixed company cost. The unit price of soy is the same for both soy parts of the sample, and the prices are expressed in value added tax. Although non- fertilizer soybean production is possible, we have proved that it is more profitable to use fertilizer in the production, since it affects crops and income growth.

Conclusions

The largest part of the area of Great Toplice field, that is leased by Plant ltd, is sown with soybean that is not genetically modified. Soy is a culture that represents the future of agriculture production, due to its wide usage, primarily in human nutrition, but also in cattle breeding. By analyzing the production of the Great toplice field plot, we come to the following conclusions:

The surface area of the placed experiment is 1 hectare. The experiment consists of two parts, unfertilized and fertilized.

- Agrotechnics has been conducted according to the rules of the profession.
- The varieties that were sown were NS Apolo, NS Galina and NS Valjevka.
- Herbicide protection was performed in two treatments, with correction of the first treatment: Wing P + Mistral
- with correction and Corum + Basagran
- The protection against the disease was not conducted since the crop did not show the symptoms of the disease.
- The c of the unrooted part of the sample, depending on varieties, ranged from 1.75 t / ha to 2.4 t / ha.
- The crops of the fertilized part of the sample, depending on varieties, ranged from 2.7 t / ha to 3.3 t / ha.
- Soybean production without the use of fertilizers is possible, but with significantly lower crops compared to production of soybeans using fertilizers.
- The amount of rainfall in the soybean vegetation period was smaller in relation to the perennial average, which Influenced the crop decrease.
- The average daily temperatures recorded were significantly higher than the perennial average especially in critical stages of soybean development, such as grain swelling, and this is why the crop was reduced.
- From an agroeconomic point of view, the soybean production in which fertilizers have been used is more profitable an as a result we have an increased crops, further the price of fertilizer and its implementation does not significantly affect the decrease of total income.

REFERENCES

Banaj, Đ., R. Zimmer, V. Duvnjak, R. Emert. 1998. Uporedba trošenja standardnih i poboljšanih oštrica motičica kultivatora. Poljoprivreda. 4,1:1-9, Osijek

Compendium of Soybean Diseases 1989. Third Edition. APS PRESS. The American Phytopathological Society

Dadaček, N., Peremin-Volf, T. 2009. Agroklimatologija. Visoko Gospodarsko učilište Križevci. Bibliografija.

Gagro, M. 1997. Žitarice i zrnate mahunarke. Zagreb. Hrvatsko agronomsko društvo. Zagreb. ISBN: 953-6485-05-2.

Hulina, N. 1998. Korovi. Udžbenici sveučilišta u Zagrebu. Školska knjiga. Zagreb.

Mihalić, V. 1985. Opća proizvodnja bilja. Školska knjiga. Zagreb

Priručnik za gajenje soje 2015. Danube Soya Regionalni Centar, Novi Sad, Srbija

Šarić, T. 1991. Korovi i njihovo uništavanje herbicidima. Sarajevo, Bosna i Hercegovina.

Skender, A., Knežević, M., Đurkić, M. 1998. Sjemenje i plodovi poljoprivrednih kultura i korova na području Hrvatske. Sveučilište J. J. Strossmayera u Osijeku. Poljoprivredni fakultet Osijek.

Tešić, Ž., Todorović, M. 1988. Mikrobiologija. Poljoprivredni fakultet Beograd. Naučna knjiga. Beograd.

Vratarić, M., Sudarić, A. 2000. Soja. Poljoprivredni institut Osijek, Osijek, Hrvatska.

Vukadinović, V., Lončarić, Z. 1998. Ishrana bilja. Sveučilište J. J. Strossmayera Osijek. Poljoprivredni fakultet Osijek.

****