International Journal of Innovations in Engineering Research and Technology [IJIERT]

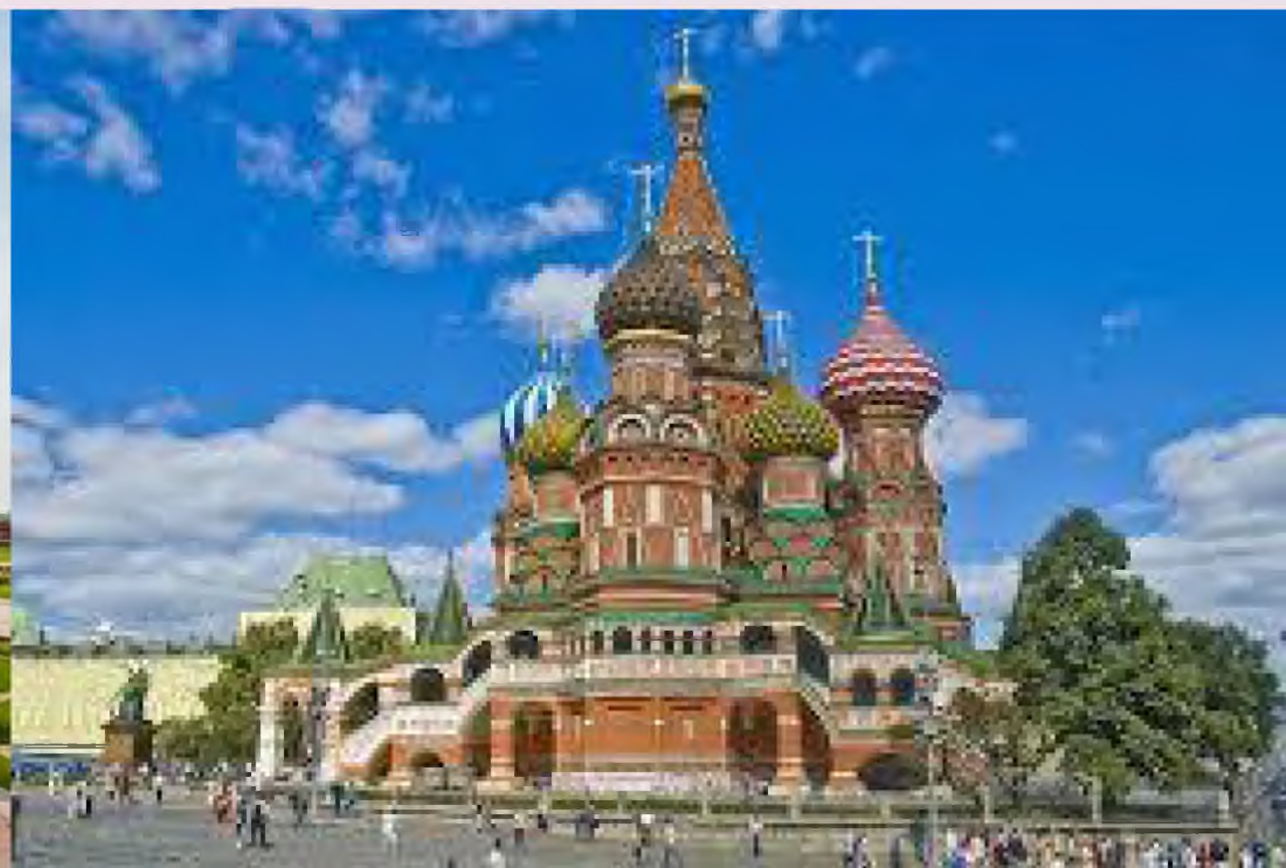
# Special Issue on

No. 7

## Basis of Applied Sciences and Its Development in the Contemporary World

**Collection of Proceedings in three Different Languages**

**English, Russian, and Indonesian**



# In Association with

"Department of Technology and Organization of Construction"
Samarkand State Architectural and Civil Engineering Institute,
Samarkand, Uzbekistan

"Department of Mechanization of Livestock"
Samarkand Institute of Veterinary Medicine, Uzbekistan

# Indexing

Google Scholar
WorldWide ScienceAlliance
OpenAIRE
zenodo
Academia.edu
CiteFactor Academic Scientific Journals
ResearchGATE scientific network
issuu
J-Gate


# Published by
# Novateur Publication India's

**International Journal of Innovations in Engineering Research and Technology [IJIERT]**

Website: www.ijiert.org

ISSN 2394-3696

# Indexing

WorldWide ScienceAlliance

Google Scholar

J-Gate

Scientific Journal Impact Factor

TOGETHER WE REACH THE GOAL

OpenAIRE

zenodo

CiteFactor

Academic Scientific Journals

issuu

DRJI

Academia.edu

ADVANCED SCIENCE INDEX

CENTRAL EUROPEAN SCIENCE ARCHIVE AND EVALUATION

# Special Issue-2020

Special Issue on Basis of Applied Sciences and Its Development in the Contemporary World
Published in Association with
Department of Technology and Organization of Construction, Samarkand State Architectural and Civil Engineering Institute, Uzbekistan
Department of Mechanization of livestock, Samarkand Institute of Veterinary Medicine, Uzbekistan
**Novateur Publication India's International Journal of Innovations in Engineering Research and Technology [IJIERT]**
**ISSN: 2394-3696, Website: www.ijiert.org, 15th Jule, 2020**

# THE EFFECT OF THE GREEN MANURE ON SOIL AGGREGATES

Kenjaev Yu. Ch.

Doctor of sciences agriculture, associate Professor of the department of Industrial viticulture and service of Tashkent chemical-technological institute.

ykenjayev@bk.ru, (+99894) 406-83-78

**Abstract:** It was achieved to improve agro physical properties of soil by forming of 22, 41-52,92t/ha green biomass of pea, chick pea, rape and barley when sown as green manure as well as tilling it into soil in summer July 10 wheat freed areas, and autumn October 10 cotton freed areas.

With a 10-0,25 mm sized of macro aggregates portion was over 2,96-6,9 % in 0,20 cm of soil layer in summer green manure variant and it was over 2,37-6,41 % autumn green manure applied variants comparatively to control without green manure.

In 20-40cm of soil layer the portion of macro aggregates differs from the tilling layer, and makes up 69,04 %-68,72% in control variant -without green manure when applied summer and autumn green manure variants, if these indicators are between 71,31-73,53 %; 70,59-73,0 % , it provides soil grainy, serves to increase of the mass of soil and increases soil fertility as well.

In its turn, by establishing favorable condition of branching the root system of cotton-plant will be achieved to get high and quality yield

**Key words:** Short rotation system, green manure, green manure crops, soil agro physical properties, soil grainy, soil fertility, macro aggregates, micro aggregates, soil porosity.

**Introduction.** To increase systematically of soil fertility and use of its potential for further development of crop cultivation is a topical issue.

Whereas, after independence of our republic, radical reforms were carried out in the country, as a result of organization of farmers' specific peculiarities of farm management especially those related to the introduction of modern short-term varieties, the solution to this problem plays an important role in theoretical and practical aspects.

The scientists in the field of soil fertility have developed a variety of activities and methods, including land treatment, use of fertilizers and various meliorative activities, proper irrigation, erosion control, rotation system, use of green manure, enhancing soil fertility by implementing many activities, such as improved soil ecological state.

According to K.Mirzajonov[9], the mass of the soil determines its hydrometric, air and microbiological states.

Green manure (green fertilizers) optimizes its overall state.

When green manure is crushed with hard disk and tilling into soil, agro physical, agrochemical and biological properties of soil are improved and the productivity of the cotton will grow by 2,8-4,5 c depending on green manure types.

The experiments were conducted by I.Ernazarov[16], B. Khalikov[14] and other researchers, which showed that the use of intercrops radically improved physical and mechanical properties of the soil, reduced mass and soil humidity content.

According to B.Khalovs[14], when tilling intercrops in spring, they positively impact on agrochemical and agro physical properties of the soil, the soil fertility changes and the yield of the next crops increases.

The root system of green manure crops and stirred of green mass also positively impact on the physical properties of the soil.

First of all, the deep rooted system leads to a reduction the mass of soil, the water retaining increases in 75m3 in barley for 3 hours, 88m3 in rye, 124m3 in rape and accelerate of microbiological processes and restores soil fertility [4].

The rotting process of organic compounds is extremely important in the occurrence of productivity and in the process of soil aggregates formation and a number of researchers have covered this issue [4].

It is recommended that alfalfa is to be planted in salinity and pulse (mung, soya, bean, chick peas) in desalinized areas as double crops and intercrops like, rape, perko, rye, vika, peas are preferable to till into the soil as green manure in rotation system of cotton growing complex[4;11].

Besides that, in some parts of irrigated farm lands of our republic it is observed a breakdown of soil aggregates, erosion, breaking down of the soil aggregations, humus-freed, erosion, pollution with heavy metals, radio nuclides, pesticides and others.

To prevent these negative states, it is very important to develop natural technology systems of restoring and increasing of soil fertility.

In addition, the use of intercrops and their utilization as green manure to improve soil fertility plays a crucial role.

When the ground part of the intercrops is harvested, over 10tons of stalk, root and leaf residues are stirred per hectare when the soil tills, as a result soil fertility and its agro physical characteristics will improve [11].

As well as extensive scientific research on the effectiveness of intercrops have been done in Uzbekistan.

This activity has been continued by B.Khalikov.

It is fully important to use of natural factors that improves soil fertility during the development of measures, to keep the ecological balance of the former cotton fields and to restore soil fertility.

During the development of these measures, a great attention should be paid to green manure for the first place in Central Asian condition [Ernazarov E. 16].

Introduction of cereals intercrops and double crops into rotation system play an important role in maintaining the ecological position of the soil.

Because the root residues of these varieties spread widely into the deep soil and serve natural drainage.

And this improves the soil fertility and allows growing consistently abundant, quality and inexpensive products [2].

It helps not only to increase soil fertility but enables to grow abundant, quality and inexpensive products [2].

In particularly, the root of the cereal crops is fibrous root, they are placed in tilling part of the soil, and because of placing widely and thickly from the subterranean the water and small quantities of nutrient will vapor low as well as harmful salt comparatively to tap root plants.

In irrigated condition, more than 10-12 tons of organic matter will be collected per hectare in tilling part of the soil when rotated cereals, corn, alfalfa, cotton, pulse and other crops.

Leguminous crops collect 300-400 kg of biological nitrogen and other nutritious elements per ha and improve the soil physical and microbiological activities.

It was studied by H.M.Taylor [13].

As the authors state, how much is the residue of intercrops, monoculture, legume crops as well as stubble, the soil fertility will be much improved and the cotton, that sown after, gives much harvest.

The world scientists as well as our republican leader research institute centers' experiments confirm, it is purposeful to increase soil fertility systematically and normally apply to mineral fertilizers and supply it into the soil mapping correspondingly.

The services of the scientists on increasing soil fertility were highly appreciated by Commonwealth of Independent States [5].

Green manure crops play a great role to develop farming and the main resource and source in European and Asian countries agriculture [16].

In Central Asia, Kazakhstan- including in Uzbekistan, it is said that the organic matter positively influences on soil fertility, harvest and quality as well. [14].

CIS and foreign scientists state that intensively decreasing of humus quantity is being expected in tilling layer of the cotton fields.

The soil fertility is not to be able to restore by applied measures but this problem can be solved by using of plant residues and organic matters [4;11].

In the republican crop rotation recommendations [14], it is said that alfalfa, pulse and other legume crops should be15-20% and that is for intercrops at least 10% in the composition of the crops based on rotation system and its contribution, properly placement of crops and improving types, ratio and rationally adapting of rotation system continually restore soil fertility.

It is obviously above mentioned analysis, it is specifically emphasized to use rationally of organic and green manure, especially application of intercrops as green manure to improve meliorative state and fertility of the soil in rotation crop system.

However, the solution of the issue has not been studied sufficiently in the pasture-virgin soil condition of Samarkand region, besides that, it has also not studied the influence of green manure on soil fertility and its agro physical, agrochemical and agro biological properties in short -term rotation system.

For this point of view, it is a very important task to carry out theoretical and practical research investigations on this trend.

**Research conducting methods.** The methods by Uzbekistan plant growing institute (1986); Uzbekistan cotton-growing scientific research institute (1981, 2007) were used while conducting field experiments, planting crops, growing, harvesting and analyzing.

The field experiments were conducted for 5 variants and 4 repetitions in the formerly irrigated, cultured, average sandy as for mechanical component and the subterranean level was 3-4m deep pasture-virgin soil condition in Samarkand region.

For per seedbed surface in the experiment was 240m2 (the length was 50m, width was 4,8m) in 120m2 area and the seedbeds were placed systematically in one circle.

The samples which included in the state list "K-295"(fodder nigretum) for fodder chick pea, "Osiyo-2001" for pea, "Loris" autumn variety and "Viking-BNIIMK" for spring variety of rape, "Temur" for barley were taken and sown in different times(summer and autumn)

Methodical manual such as "Methods of agro chemical, agro physical and agro biological research in irrigated cotton areas" (1963) was used to perform agro physical analysis.

**In the experiment the following agrophysical analysis have been done:**

- on N.A.Kachinski for mechanical component of soil;
- by scaling , accounting and sieving of macro and microstructure of the soil (%) after green manure for per variant of 4 repetitions 0-20 and 20-40cm of layer;
- by N.I.Savvinov methods on water resistant aggregates(%) per version for 4 repetitions in 0-20 and 20-40cm layer and at the beginning and end of cotton vegetation.

**Experiment results.** The grainy is one of the most important agronomical properties that indicate crop productivity and soil fertility.

The issues like to treat soil physical properties, measures of tillage the land, water-air regime of soil and generally productiveness as well as influence on the plant productivity have been

studied sufficiently by our republican and world scientists, however, influence of green manure on grainy of soil to compare with other types have not studied which applied in summer wheat-freed and autumn cotton freed areas in rotation cotton-wheat system of pasture-virgin soil conditions in Samarkand region.

In the experimental studying, the grainy i.e 0-20 and 20-40cm of soil layer aggregate fractions of soil was taken in and analyzed by the influence of green manure on grainy according to the field experiment variants at the beginning and the end of cotton vegetation in spring.

As well as, application of chick pea, barley and rape as green manure crops positively influenced for increasing and decreasing of macro aggregates at the end of cotton vegetation.

In the analysis, after applied summer and autumn green manure at the beginning of cotton vegetation, the portion in 10-0,25 mm sized of macro aggregates which was important for agricultural point of view, was over 2,96-6,9% in control variant without green manure comparatively to other variants in 0-20cm of soil layer while autumn green manure applied variant it was over 2,37-6,41 %.

The highest difference was observed in rape and barley sown variants.

Macro aggregates portion differ from tilling layer in 20-40cm, in control- variant without green manure made up 69,04%-68,72%, and the indicators were between 71,31-73,53 %; 70,59-73,0 % in summer and autumn with green manure variants.

Their portion in 20-40 cm layer of soil, was higher in rape and barley sown variants than control- variant without green manure.

This state has been interpreted and exemplified with fibrous root plants that have cluster of root, the biomass of such plants like rape that belongs to Brassicaceae, barley belongs to Poaceae, and pea belongs to Leguminosae family, because of their root branching into the soil depends on the quantity of compost.

It was identified that the portion in 10-0,25mm sized of macro aggregates in 0-20cm and 20-40cm of soil layer rape sown as summer and autumn green manure applied versions was high(6,9-4,49 % and 6,41-4,28 % respectively), comparatively to control- version without green manure.

It was recorded relatively favorable portion of macro aggregates was in barley and pea sown versions (table 1)

Micro aggregates in <0,25mm sized of soil fertility have specificity simultaneously with macro aggregates.

Appropriate portion of soil micro aggregates provides to get high yield in virgin soils of Central Asia, micro aggregates less than 0,25 deteriorates the aerate in the soil.

These types of soil quickly become dirty in humidity and when it dries compacts and becomes arid.

In 0-20 cm soil layer the micro aggregates made up 13,72-13,82 % after summer green manure applied variants and it was 12,72-12,78 % autumn green manure applied at the beginning of cotton vegetation, it was detected that the micro aggregates less than 0,25mm were low 0,88-0,78 % and 1,52-1,42 % in the variants with green manure crops comparatively to control- without green manure variants.

It was also achieved to reduce some of micro aggregates as consequently application of chick pea, barley and rape as green manure at the end of cotton vegetation.

In this case, purely pea sown influence was inconsiderable (table1).

Generally, the portion of micro aggregates for <0,25mm sized increased in soil tilling layer water resistance formed when sown peas and chick peas as green manure purely.

The reason is forming of gel by combining of organic compost and soil particles i.e.it forms structural soil aggregates.

These structural soil aggregates does not erode under the water and it was proven by a number of research works of maintaining its state for a long time.

In general, through sowing pea, chick peas, rape and barley as green manure in short- term of cotton-wheat rotation system in summer wheat freed and autumn cotton freed area and pulverizing the grown biomass 30-40cm deep into the soil will be provided the improvement of soil structure, occurrence of water resistant aggregates, reduction of mass and soil grainy and enhancement of its fertility.

Table 1

**The influence of green manure on soil parameters, (relative to soil mass % on account) 2016-2018 ss**

| № | Experiment variants | Soil layer, cm | Aggregate parameter, mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | At the beginning of cotton vegetation | | | | At the end of cotton vegetation | | | |
| | | | >10 | 10-0,25 | <0,25 | Kc | >10 | 10-0,25 | <0,25 | Kc |
| | | | **Summer green manure** | | | | | | | |
| 1 | Control-without green manure | 0-20 | 18,6 | 66,8 | 14,6 | 2,01 | 22,46 | 61,14 | 16,4 | 1,57 |
| | | 20-40 | 17,76 | 69,04 | 13,2 | 2,23 | 21,42 | 62,86 | 15,72 | 1,69 |
| 2 | Pea | 0-20 | 16,42 | 69,76 | 13,82 | 2,31 | 18,28 | 67,4 | 14,32 | 2,07 |
| | | 20-40 | 16,22 | 71,31 | 12,47 | 2,49 | 17,72 | 69,09 | 13,19 | 2,24 |
| 3 | Chick pea | 0-20 | 16,46 | 69,82 | 13,72 | 2,31 | 17,64 | 67,99 | 14,37 | 2,12 |
| | | 20-40 | 16,15 | 72 | 11,85 | 2,57 | 16,61 | 69,66 | 13,73 | 2,30 |
| 4 | Rape | 0-20 | 14,77 | 73,7 | 11,53 | 2,80 | 17,37 | 70,36 | 12,27 | 2,37 |
| | | 20-40 | 16,32 | 73,53 | 10,15 | 2,78 | 16,63 | 69,92 | 13,45 | 2,32 |
| 5 | Barley | 0-20 | 14,24 | 72,94 | 12,82 | 2,70 | 16,33 | 69,09 | 14,58 | 2,24 |
| | | 20-40 | 16,3 | 72,14 | 11,56 | 2,59 | 18,14 | 68,78 | 13,08 | 2,20 |
| | | | **Autumn green manure** | | | | | | | |
| 1 | Control -without green manure | 0-20 | 19,45 | 66,31 | 14,24 | 1,97 | 23,94 | 60,12 | 15,94 | 1,51 |
| | | 20-40 | 19,16 | 68,72 | 12,12 | 2,20 | 23,41 | 62,04 | 14,55 | 1,63 |
| 2 | Pea | 0-20 | 18,54 | 68,68 | 12,78 | 2,19 | 19,82 | 64,75 | 15,43 | 1,84 |
| | | 20-40 | 18,02 | 70,59 | 11,39 | 2,40 | 18,87 | 66,92 | 14,21 | 2,02 |
| 3 | Chick pea | 0-20 | 17,64 | 69,64 | 12,72 | 2,29 | 18,76 | 66,91 | 14,33 | 2,02 |
| | | 20-40 | 17,21 | 71,57 | 11,22 | 2,52 | 17,75 | 68,48 | 13,77 | 2,17 |
| 4 | Rape | 0-20 | 15,86 | 72,72 | 11,42 | 2,67 | 17,63 | 68,45 | 13,92 | 2,17 |
| | | 20-40 | 16,77 | 73 | 10,23 | 2,70 | 16,96 | 70,6 | 12,44 | 2,40 |
| 5 | Barley | 0-20 | 16,14 | 71,41 | 12,45 | 2,50 | 17,55 | 67,73 | 14,72 | 2,10 |
| | | 20-40 | 16,61 | 72,27 | 11,12 | 2,61 | 17,2 | 69,72 | 13,08 | 2,30 |

**Conclusion and suggestions.** According to conducted analysis, after applied summer and autumn green manure, portion in 10-0,25 sized of aggregates which was important for agricultural point of view was over 2,96-6,9 % after application of summer green manure variants and that was 2,37-6,41 % in autumn with green manure on 0-20 cm layer of soil, in control variants without green manure at the beginning of cotton vegetation.

The aggregates portion in 20-40 cm layer of soil differed from tilling layer, it made up

69,04-68,72% in control-without green manure variant and this indicator was between 71,31-73,53; 70,59-73,0 % in summer and autumn applied variants and in turn it assists to decrease mass of soil and increases its fertility.

At the same time it was achieved to reduce partial of micro aggregates and to increase macro aggregates thereafter application of chick pea, barley and rape as green manure comparatively to control at the end of cotton vegetation

In general, to till and stir the biomass into the soil 35-40cm deep which have been taken by sowing of pea, chick pea, rape and barley purely as green manure provides to improve the structure of the soil, decrease of mass and to be favorable of porosity and the soil grainy as well as increases the fertility in wheat freed area in summer and cotton freed area in autumn by short-term cotton-wheat rotation.

Consequently, to get high, qualitative yield of cotton will be achieved after application of green manure.

**References:**

1. Bondarev A.G., Dimo B.N and et el. The significant peculiarities of the composition of soil as basis development of optimal physical regime// Transactions of International congress of soil scientists -T., M.: 1974. -P. 159-164.
2. Buriev A., Aripov P. Rotation and general properties of soi// Young scientists' research and agrarian problems. 2008- collection materials of scientific-practical conference devoted to "The year of youth".2008.April 9-10.-Samarkand,2008.-P.31-33.
3. Methods of conducting field experiments. -Tashkent: "ALBIT" 2007.- p. 167
4. Kenjaev Yu., AripovR. Green manure and soil fertility// Young scientists' research and agrarian problems.2008-2008- collection materials of scientific-practical conference devoted to "The year of youth".2008.April 9-10.-Samarkand,2008.-P.46-47.
5. Kuznezhov A.I. The ways of development of modern crop rotation//Rotation system in modern agriculture. -M.,-MCXA.2004.,P-308.
6. Rebut I.B. Theoretical problems of treatment soil.- L.:Hydrometeorspublish, 1969.-p7.

7. Lim Yu.R. The influence of green manure on fertility irrigated on dark-chestnut soil in dry steppe region.//Abstract.dissert.cand.agr.scien.-Saratov.,2006,P-23
8. Methods of agrochemical, agro physical and microbiological research in irrigated cotton growing regions, 1963.-440 p.,76.
9. Mirzajonov K. What is green manure?// Uzbekistan agriculture.-Tashkent,2008.- -№4-P.32
10. Muhammadjonov M.B., Zokirov A.Z. Soil density and its impact on the yield/ Cotton agro technology.-T.: Mehnat, 1988.-p 94
11. Aripov R., Sanakulov A., Islomov ., Shonazarov S. The role of intercrops for exceeding of soil fertility and crop productivity// The farmer development problems in southern of Uzbekistan.
12. Manual for conducting chemical and agrophysical analysis of soil by monitoring of land, TSRI,2004.-p260.; 77-MAWRRU, UzASPC and UzCGSRI.
13. Taylor.H.M. et al. The effects of two organic manures on soil properties and crop yields on a temperate calcareous soil under a wheat-maize cropping system //European Journal of Agronomy. - 2009. - T. 31. - №. 1. - V. 36-42.
14. Kholikov B. New cropping systems and soil fertility. Publisher "Noshirlik Yogdusi" Tashkent. 2010. p120.
15. Kholikov B., Buriev Ya., Buriev T. The influence of past crops on soil fertility, as well crop yield // The agricultural and cotton growing development problems. Collection of materials of international scientific conference. -Tashkent.2004.P-35-37.
16. Ernazarov I. The compost is a key of yield // Uzbekistan agriculture.-Tashkent,2004. -№ 4-P.3.

# APPENDICES

## 1- appendices

## The influence of green manure on soil parameters,

## (relative to soil mass % on account) 2016 s.

| № | Experiment variants | Soil layer, cm | Aggregate parameter, mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | At the beginning of cotton vegetation | | | | At the end of cotton vegetation | | | |
| | | | >10 | 10--0,25 | <0,25 | Kc | >10 | 10--0,25 | <0,25 | Kc |
| **Summer green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 16,7 | 60,1 | 13,1 | 1,8 | 20,2 | 55 | 14,8 | 1,4 |
| | | 20-40 | 16 | 62,1 | 11,9 | 2 | 19,3 | 56,6 | 14,1 | 1,5 |
| 2 | Pea | 0-20 | 14,8 | 62,8 | 12,4 | 2,1 | 16,5 | 60,7 | 12,9 | 1,9 |
| | | 20-40 | 14,6 | 64,2 | 11,2 | 2,2 | 15,9 | 62,2 | 11,9 | 2 |
| 3 | Chick pea | 0-20 | 14,8 | 62,8 | 12,3 | 2,1 | 15,9 | 61,2 | 12,9 | 1,9 |
| | | 20-40 | 14,5 | 64,8 | 10,7 | 2,3 | 14,9 | 62,7 | 12,4 | 2,1 |
| 4 | Rape | 0-20 | 13,3 | 61,8 | 14,9 | 2 | 15,6 | 61,5 | 12,8 | 1,9 |
| | | 20-40 | 12 | 63,5 | 14,5 | 2,2 | 15 | 62,9 | 12,1 | 2,1 |
| 5 | Barley | 0-20 | 14,6 | 62 | 13,3 | 2 | 14,7 | 61,3 | 14 | 1,9 |
| | | 20-40 | 13,8 | 62,2 | 14 | 2 | 15,4 | 61,9 | 12,7 | 2 |
| **Autumn green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 17,5 | 59,7 | 12,8 | 1,8 | 21,5 | 54,1 | 14,3 | 1,4 |
| | | 20-40 | 17,2 | 61,8 | 10,9 | 2 | 21,1 | 55,8 | 13,1 | 1,5 |
| 2 | Pea | 0-20 | 16,7 | 61,8 | 11,5 | 2 | 17,8 | 58,3 | 13,9 | 1,7 |
| | | 20-40 | 16,2 | 63,5 | 10,3 | 2,2 | 17 | 60,2 | 12,8 | 1,8 |
| 3 | Chick pea | 0-20 | 15,9 | 62,7 | 11,4 | 2,1 | 16,9 | 60,2 | 12,9 | 1,8 |
| | | 20-40 | 15,5 | 64,4 | 10,1 | 2,3 | 16 | 61,6 | 12,4 | 2 |
| 4 | Rape | 0-20 | 14,3 | 60,9 | 14,8 | 1,9 | 15,9 | 60,7 | 13,4 | 1,9 |
| | | 20-40 | 13,3 | 62,1 | 14,6 | 2 | 15,3 | 61,7 | 13 | 2 |
| 5 | Barley | 0-20 | 14,5 | 61,6 | 13,9 | 2 | 15,8 | 61 | 13,2 | 1,9 |
| | | 20-40 | 14 | 62,3 | 13,6 | 2 | 15,5 | 61,8 | 12,7 | 2 |

2- appendices

## The influence of green manure on soil parameters, (relative to soil mass % on account)

## 2017 s.

| № | Experiment variants | Soil layer, cm | Aggregate parameter, mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | At the beginning of cotton vegetation | | | | At the end of cotton vegetation | | | |
| | | | >10 | 10--0,25 | <0,25 | Кс | >10 | 10--0,25 | <0,25 | Кс |
| **Summer green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 17,7 | 63,5 | 13,9 | 1,9 | 21,3 | 58,1 | 15,6 | 1,5 |
| | | 20-40 | 16,9 | 65,6 | 12,5 | 2,1 | 20,3 | 59,7 | 14,9 | 1,6 |
| 2 | Pea | 0-20 | 15,6 | 66,3 | 13,1 | 2,2 | 17,4 | 64 | 13,6 | 2 |
| | | 20-40 | 15,4 | 67,7 | 11,8 | 2,4 | 16,8 | 65,6 | 12,5 | 2,1 |
| 3 | Chick pea | 0-20 | 15,6 | 66,3 | 13 | 2,2 | 16,8 | 64,6 | 13,7 | 2 |
| | | 20-40 | 15,3 | 68,4 | 11,3 | 2,4 | 15,8 | 66,2 | 13 | 2,2 |
| 4 | Rape | 0-20 | 14 | 65,3 | 15,7 | 2,1 | 16,5 | 64,9 | 13,6 | 2,1 |
| | | 20-40 | 12,7 | 67 | 15,3 | 2,3 | 15,8 | 66,4 | 12,8 | 2,2 |
| 5 | Barley | 0-20 | 15,4 | 65,5 | 14,1 | 2,1 | 15,5 | 64,7 | 14,8 | 2 |
| | | 20-40 | 14,5 | 65,7 | 14,8 | 2,1 | 16,3 | 65,3 | 13,4 | 2,1 |
| **Autumn green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 18,5 | 63 | 13,5 | 1,9 | 22,7 | 57,1 | 15,1 | 1,4 |
| | | 20-40 | 18,2 | 65,3 | 11,5 | 2,1 | 22,2 | 58,9 | 13,8 | 1,5 |
| 2 | Pea | 0-20 | 17,6 | 65,2 | 12,1 | 2,1 | 18,8 | 61,5 | 14,7 | 1,7 |
| | | 20-40 | 17,1 | 67,1 | 10,8 | 2,3 | 17,9 | 63,6 | 13,5 | 1,9 |
| 3 | Chick pea | 0-20 | 16,8 | 66,2 | 12,1 | 2,2 | 17,8 | 63,6 | 13,6 | 1,9 |
| | | 20-40 | 16,3 | 68 | 10,7 | 2,4 | 16,9 | 65,1 | 13,1 | 2,1 |
| 4 | Rape | 0-20 | 15,1 | 64,3 | 15,6 | 2 | 16,7 | 64,1 | 14,2 | 2 |
| | | 20-40 | 14 | 65,6 | 15,4 | 2,1 | 16,1 | 65,2 | 13,7 | 2,1 |
| 5 | Barley | 0-20 | 15,3 | 65 | 14,7 | 2,1 | 16,7 | 64,3 | 14 | 2 |
| | | 20-40 | 14,8 | 65,8 | 14,4 | 2,1 | 16,3 | 65,3 | 13,4 | 2,1 |

3- appendices

## The influence of green manure on soil parameters, (relative to soil mass % on account)

## 2018 s.

| № | Experiment variants | Soil layer, cm | Aggregate parameter, mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | At the beginning of cotton vegetation | | | | At the end of cotton vegetation | | | |
| | | | >10 | 10--0,25 | <0,25 | Кс | >10 | 10--0,25 | <0,25 | Кс |
| **Summer green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 21,4 | 76,8 | 16,8 | 2,3 | 25,8 | 70,3 | 18,9 | 1,8 |
| | | 20-40 | 20,4 | 79,4 | 15,2 | 2,6 | 24,6 | 72,3 | 18,1 | 1,9 |
| 2 | Pea | 0-20 | 18,9 | 80,2 | 15,9 | 2,7 | 21 | 77,5 | 16,5 | 2,4 |
| | | 20-40 | 18,7 | 82 | 14,3 | 2,9 | 20,4 | 79,5 | 15,2 | 2,6 |
| 3 | Chick pea | 0-20 | 18,9 | 80,3 | 15,8 | 2,7 | 20,3 | 78,2 | 16,5 | 2,4 |
| | | 20-40 | 18,6 | 82,8 | 13,6 | 3 | 19,1 | 80,1 | 15,8 | 2,6 |
| 4 | Rape | 0-20 | 17 | 79 | 19 | 2,5 | 20 | 78,6 | 16,4 | 2,5 |
| | | 20-40 | 15,3 | 81,1 | 18,6 | 2,7 | 19,1 | 80,4 | 15,5 | 2,7 |
| 5 | Barley | 0-20 | 18,7 | 79,3 | 17 | 2,6 | 18,8 | 78,3 | 17,9 | 2,4 |
| | | 20-40 | 17,6 | 79,5 | 17,9 | 2,6 | 19,7 | 79,1 | 16,2 | 2,5 |
| **Autumn green manure** | | | | | | | | | | |
| 1 | Control-without green manure | 0-20 | 22,4 | 76,3 | 16,4 | 2,3 | 27,5 | 69,1 | 18,3 | 1,7 |
| | | 20-40 | 22 | 79 | 13,9 | 2,5 | 26,9 | 71,3 | 16,7 | 1,9 |
| 2 | Pea | 0-20 | 21,3 | 79 | 14,7 | 2,5 | 22,8 | 74,5 | 17,7 | 2,1 |
| | | 20-40 | 20,7 | 81,2 | 13,1 | 2,8 | 21,7 | 77 | 16,3 | 2,3 |
| 3 | Chick pea | 0-20 | 20,3 | 80,1 | 14,6 | 2,6 | 21,6 | 76,9 | 16,5 | 2,3 |
| | | 20-40 | 19,8 | 82,3 | 12,9 | 2,9 | 20,4 | 78,8 | 15,8 | 2,5 |
| 4 | Rape | 0-20 | 18,2 | 77,9 | 18,9 | 2,4 | 20,3 | 77,6 | 17,2 | 2,4 |
| | | 20-40 | 17 | 79,4 | 18,7 | 2,6 | 19,5 | 78,9 | 16,6 | 2,5 |
| 5 | Barley | 0-20 | 18,6 | 78,7 | 17,8 | 2,5 | 20,2 | 77,9 | 16,9 | 2,4 |
| | | 20-40 | 18 | 79,7 | 17,4 | 2,6 | 19,8 | 79 | 16,2 | 2,5 |