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# A MELIORATIVE MEASURES FOR CROP FERTILITY INCREASE AND PREVENTION OF SOIL TRANSPORT

**Saribek B. Galstyan**
Shushi University of Technology
7 V.Vagharshyan, Stepanakert, RA
galstyan.saribek@mail.ru
ORCID iD: 0000-0001-6728-7817
Republic of Artsakh

**Zhirair M. Mirzoyan**
Shushi University of Technology
7 V.Vagharshyan, Stepanakert, RA
mirzoyan.als@gmail.com
ORCID iD: 0000-0001-9667-7582
Republic of Artsakh

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**Abstract**

Analysis was done on the efficiency of moisture accumulation and counterflow action in tiered tillage. It was discovered that post-forest silty-gravel soils in the foothill, mid-mountain, and mountain zones of Artsakh, located at an altitude of 600-1300 m above sea level, where the average annual amount of precipitation varies between 490-600 mm, are light-brown, brown, and dark-brown in color. According to the findings of the study, the tiered method of basic soil cultivation by its moisture accumulation and the anti-erosion effectiveness is superior to the anti-erosion measures applied in the traditional ploughshare tillage system. In the case of tiered method of cultivation, water from atmospheric precipitation is well absorbed in deep cracks developed in the soil, it prevents surface and subsoil flow on slopes, and during freezing in winter and thawing in spring, it provides self-loosening of the soil. High yields are produced as a result of water retention and organic matter mulch on the soil surface, which reduce ineffective moisture loss and runoff.

***Key words***: tiered, moisture accumulation, anti-flow, effective moisture, yield, soil transport, prevention.

## Introduction

The protection of the soil from a variety of harmful factors, such as washing, wind drift, agrophysical degradation, etc., has been demonstrated to be one of the key benefits of tillage. The mulch made of sorghum and other sorghum residues that is stored and accumulated on its surface protects the soil from adverse effects by absorbing the energy of raindrops, the mechanical impact of water and air currents, machines, and tools, and preventing soil erosion. Organic wastes improve soil properties by decomposing and supplying nutrients. Vegetable-derived organic material has a sponge-like ability to absorb a lot of water. Mulch's high organic content causes it to absorb water quickly, halting its flow and producing washing effects. The

top layer of soil is supported by roots and other plant remains, which prevent erosion by strengthening it [1, 2].

According to experiments carried out in Belarus, flushing is decreased by 6 times when flat felling cultivation is done in the slope's direction compared to 27 times when downward cutting is done against the slope. [3].According to studies, the stepped cultivated soil, which consists of the lower linearly compacted horizon and the upper widespread loosely compacted layer, has very good counterflow and reservoir properties. Such a profile can be created without expending a lot of energy. The bottom of the processed layer prevents the infiltration of absorbed water, and the compacted rows provide good water permeability of the deep root layers of the soil. Linear loosening contributes to the natural loosening of spaces between rows due to the infiltration of a large amount of moisture into the deep rows and good wetting of the lateral uncultivated parts, in which the soil loosens during freezing and thawing, reaching an equilibrium density [4].

**Conflict Setting**

The 44-day Nagorno-Karabakh conflict has made it necessary to develop intensive agriculture under difficult relief conditions in Nagorno-Karabakh, where 30-35% of the region's total precipitation falls, in order to ensure food self-sufficiency. With such a distribution of atmospheric precipitation, the yield of agricultural crops mainly depends on the moisture stored in the soil in the autumn-winter period. Taking into account that cultivated lands in this area are also subject to water and wind transport of soil, the problems of water safety and drought control should be solved by applying soil protection agrotechnics and special techniques for its implementation. In the lands located on the slopes of the relief, which is typical of mountainous countries, even with minimal cultivation, excess water is generated, a significant part of which can flow underground into streams and aqueducts, be lost, and cause soil erosion.

Applying new technology with a water-holding capacity, an anti-flow effect, and an anti-erosion effect while using the least amount of tillage is difficult.

**Research Results**

To solve the task, a new complex technology of main plowing of the soil was developed and tested- the upper 5-10cm less dense soil layer is widely loosened without ploughing up with a flat cutter of width 60 cm with three cases equipped with executive organs, the total width of which is 150cm, and the processing depth is 6-8 cm. The cases placed in the middle of connected to each other frames of the same triangular plow were equipped with 10 cm wide paws, which opened 30-35 cm deep cracks at a distance of 70 cm from each other. This difference in depth was realized by adjusting the height of the torso racks. Narrow paws that open deep furrows, moving along a wet, loose soil layer, also ensure the stability of the unit in operation (in depth). In order to determine the effectiveness of fallow cultivation and increase the yield of agricultural crops compared to traditional cultivation, field experiments and laboratory studies were carried out in different soil-climatic zones of Nagorno-Karabakh between 2018 and 2021.The field experiments were set up in two versions, with six repetitions, with a calculation area of 180 m². The "Krasnadarskaya 99" variety of autumn wheat was the object of study. The following options were explored: 1.Traditional plough – control; 2.Tiered cultivation. In all the years of the research, autumn bread crops were the predecessors. When sowing in a traditional way, the soil is prepared for sowing according to the agrotechnics used in the region. After the harvest of the previous one, the stubble harrowing of 5-7 cm depth was done with a medium

weight disc harrow. After four weeks, the field was plowed to a depth of 22-25 cm with a rotary plow. Layer-by-layer soil treatment was carried out at the same time as sowing, after the previous plowing. Pre-sowing cultivation and sowing were carried out in October-November.

Plant records, phenological observations and biometric measurements were carried out during the growing season to study field sprouting, winter hardiness, general and effective growing of bushes.

At different stages of plant development, field humidity in different soil layers was determined by weighing method, biological yield and its structural elements were calculated before harvesting by analyzing samples taken from random places in the field. , and the yield of the grain is the yield of each variant and repetition when harvesting and weighing with a combine harvester. Yield data were subjected to mathematical processing using the method of dispersion analysis [5].

The data obtained as a result of the research according to the scheme of the experiment are given in Tables 1 and 2.

**Table 1**

**Field moisture in different soil horizons depending on tillage and plant development stage in different agro-climatic zones**

| Agroclimatic zone | Version: (tillage method) | Soil horizon, cm | The stage of plant growth | | The average of stages (%) |
|---|---|---|---|---|---|
| | | | In the fall (in the bush growing stage) | In the spring (pipe-formation stage) | |
| Foothills (HASL* 400 - 610 m) | Traditional tillage | 0-20 | 15,67 | 17,14 | 16,40 |
| | | 20-40 | 16,46 | 18,25 | 17,35 |
| | Tiered cultivation | 0-20 | 17,55 | 19,49 | 18,52 |
| | | 20-40 | 20,14 | 24,17 | 22,15 |
| Middle mountain (HASL 700-1100m) | Traditional tillage | 0-20 | 21,40 | 23,31 | 22,35 |
| | | 20-40 | 20,14 | 24,41 | 22,27 |
| | Tiered cultivation | 0-20 | 22,65 | 22,56 | 22,60 |
| | | 20-40 | 26,46 | 26,64 | 26,55 |
| Mountainous (HASL 1300-180m) | Traditional tillage | 0-20 | 25,70 | 27,65 | 26,67 |
| | | 20-40 | 27,72 | 29,43 | 28,57 |
| | Tiered cultivation | 0-20 | 26,44 | 28,64 | 27,54 |
| | | 20-40 | 32,41 | 30,56 | 31,48 |

*HASL - height above sea level

In the three agro-climatic zones, in order to monitor and evaluate the balance of moisture in the soil, in the fall, in the stage of planting plants and in the spring, in the stage of piping, in the soil horizons of 0-20 cm and 20-40 cm, it was found that in all the considered zones, the field moisture data determined by the weight method , in plots on a slope, tiered plowing contributed to increasing the effective moisture reserve in the soil. Compared to the traditional variety, it was higher by 1.89-3.46 percent.

As the data in the same table shows, the effectiveness of layered cultivation in terms of moisture accumulation is more pronounced in the arid conditions of the foothills. In order to find out the effect of the additional stored moisture reserve on the yield elements and biological yield of winter wheat, during the three years of the experiment, in the observed agro-climatic zones, the average height of the plants, the number of total and effective sprouting ability of

plants per one square meter, the length of one spike, the number and mass of grains, 1000-grain mass, grain and straw yield per hectare were calculated for the studied options (Table 2).

**Table 2**

**Winter wheat crop structure and yield depending on the method of soil cultivation in different agro-climatic zones**

| Agroclimatic zone | Options (tollage method) | Plant height, cm | In one square meter | | | Growing in bushes | | Of one spike | | | The mass of thousand grains, g | Biological crop, c/ha | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number of plants | Number of sprouts | | | | | | | | Sum total | of which | |
| | | | | Total | Efficient | Total | Efficient | Length, cm | Number of grains in a spike | The mass of grains, g | | | Grain | Straw |
| Foothill | 1 | 115 | 318 | 429,3 | 318 | 1,35 | 1 | 6,3 | 21,2 | 0,8 | 38,1 | 51,3 | 25,4 | 25,9 |
| | 2 | 118 | 341 | 473,9 | 392,1 | 1,39 | 1,15 | 7,1 | 21,6 | 0,82 | 38,4 | 64,9 | 32,1 | 32,8 |
| Medium mountain | 1 | 119 | 325 | 464,7 | 390 | 1,43 | 1,2 | 6,8 | 23,8 | 0,93 | 39,3 | 73,2 | 36,2 | 37 |
| | 2 | 123 | 332 | 491,3 | 421,6 | 1,48 | 1,27 | 8,1 | 24,2 | 0,96 | 39,8 | 82 | 40,4 | 41,6 |
| Mountain | 1 | 123 | 348 | 515 | 445,4 | 1,48 | 1,28 | 7 | 24,1 | 0,96 | 40,1 | 86,6 | 42,7 | 43,9 |
| | 2 | 128 | 369 | 557,1 | 498,1 | 1,51 | 1,35 | 8,4 | 24 | 0,96 | 40,4 | 96,8 | 47,8 | 49 |

In different agro-climatic zones, in areas located on relief slopes, layered soil cultivation, compared to traditional tillage, contributed to the prevention of both surface and subsoil water flows, accumulated more moisture in the soil, and stopped soil erosion.

In the case of layered cultivation of the soil, the grain yield of winter wheat compared to traditional one increased by 13.6, 8.8 and 5.1 c/ha, respectively,.

**Conclusion**

In the case of multi-layer cultivation, water from atmospheric precipitation is well absorbed in the deep cracks of the soil, it prevents the surface and subsoil flow on the slopes, and during freezing in winter and thawing in spring, it provides self-compaction of the soil. Stopping water flow and creating a mulch of organic residues on the soil surface minimizes inefficient moisture loss and runoff, ensuring high crop yields.

To increase crop yields and prevent soil erosion, it is necessary to:

1. Create a covering layer of organic residues on the surface of the soil, as it happens under natural conditions.
2. To provide a combination of the work of flat-cutting pawls and splitters, which will give an opportunity to increase the stability of the working process of the tool with tax treatment of the soil.

3. In order to increase the efficiency of cutting the root nodules of weeds and to keep the brush residues on the surface of the soil, reduce the depth of loosening of the upper floor.

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# ՄՇԱԿԱԲՈՒՅՍԵՐԻ ԲԵՐՔԱՏՎՈՒԹՅԱՆ ԲԱՐՁՐԱՑՄԱՆ ԵՎ ՀՈՂԱՏԱՐՄԱՆ ԿԱՍԵՑՄԱՆ ԿԱՆԽԱՐԳԵԼՄԱՆ ՄԵԼԻՈՐԱՏԻՎ ՄԻՋՈՑԱՌՈՒՄՆԵՐ

**Գալստյան Ս.Բ., Միրզոյան Ժ.Մ.**
*Շուշիի տեխնոլոգիական համալսարան*

Վերլուծվել է հողի հարկաշերտավոր մշակման խոնավակուտակ և հակահոսքային ազդեցության արդյունավետությունը: Բացահայտվել է, որ Արցախի նախալեռնային, միջին լեռնային և լեռնային գոտիների թեքությունների վրա տեղակայված հետանտառային գլաքարա-խճաքարային բաց շագանակագույն, շագանակագույն և մուգ շագանակագույն հողերում, որոնք գտնվում են ծովի մակերևույթից 600-1300մ բարձրության վրա, որտեղ տեղումների տարեկան միջին քանակը տատանվում են 490-600մմ սահմաններում, Հետազոտության արդյուների համաձայն, հողի հիմնական մշակման հարկաշերտավոր եղանակն իր խոնավակուտակ և հակաէրոզիոն արդյունավետությամբ գերազանցում է ավանդական առի շրջմամբ վարի համակարգում կիրառվող հակաէրոզիոն միջոցառումներին: Հարկաշերտավոր մշակման դեպքում, հողում խորը բացված ճեղքերում մթնոլորտային տեղումների ջուրը լավ է ներծծվում, թեքություններում կանխում է մակերեսային և ներհողային հոսքը, ձմռանը սառչելու և գարնանը հալվելու ընթացքում ապահովում է գրունտի ինքնաքփխրեցում: Ջրհոսքի կասեցումն ու հողի մակերեսին օրգանական մնացորդներից կազմված ծածկաշերտը նվազագույնի են հասցնում խոնավության անարդյունավետ կորուստն ու հողատարումը, ապահովելով մշակաբույսերի բարձր բերք:

***Բանալի բառեր.*** հարկաշերտավոր, խոնավակուտակ, հակահոսքային, արդյունավետ խոնավություն, բերքատվություն, հողատարում, կանխարգելում:

# МЕЛИОРАТИВНЫЕ МЕРОПРИЯТИЯ ПО ПОВЫШЕНИЮ УРОЖАЙНОСТИ КУЛЬТУР И ПРЕДОТВРАЩЕНИЮ ЭРОЗИИ ПОЧВ

**Галстян С.Б., Мирзоян Ж.М.**
*Шушинский технологический университет*

Проанализирована эффективность влагонакопительного и противопоточного действия ступенчато-ярусной обработки почвы. Выявлено, что в залесных глыбово-щебнистых светло-каштановых, каштановых и темно-каштановых почвах, расположенных на склонах предгорной, среднегорной и горной зон Арцаха, расположенных на высоте 600-1300м над уровнем моря, где среднегодовое количество осадков колеблется в пределах 490-600мм, ступенчато-ярусный способ основной обработки почвы по влагоемкости и противоэрозионной эффективности превосходит противоэрозионные мероприятия, применяемые при традиционной системе обработки почвы с оборачиванием верхней части пахотного слоя. При ступенчато-ярусной обработке вода атмосферных осадков хорошо впитывается в глубокие трещины почвы, препятствует поверхностному и внутрипочвенному стоку на склонах, а при промерзании

зимой и оттаивании весной обеспечивает саморазрыхление почвы. Удержание воды и слой покрытия, состоящий из органических остатков на поверхности почвы, сводят к минимуму неэффективные потери влаги и эрозию, обеспечивая высокий урожай культур.

***Ключевые слова:*** ступенчато-ярусный, влагонакопитель, противопоточный, эффективное увлажнение, урожайность, эрозия, профилактика.

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