II. ECOLOGICAL AND SUSTAINABLE AGRICULTURE

ECOETHIC PROBLEMS OF SALINE AND SALTY SOILS IN AZERBAIJAN

Garib Mamedov

Abstract: Salinization of plain soils in Azerbaijan Republic has a special place within the ecoethic problems. Saline soils spread widely in Azerbaijan. Approximately about 60% of the Kur-Araz lowland soils wich total area is 2.2 million hectares, became medium and strongly saline soils. In addition, saline soils are spread in Siyazan-Sumgait, Jeyranchol areas, in the Nakhchivan Autonomous Republic and other areas of Azerbaijan. In general, moderate and intensive saline soils in the territory of our Republic consist of 1.3 million hectare total area. It means that 15% of the territory of the Republic has suffered this Ecoethicproblem. As a result of carried investigations it was defined that, 565481 hectares of the 1444.9 thousand hectares or 47.6% of total irrigated suitable for agriculture soils of the country, became saline in different degrees (152898 ha or 27% of this less saline, 146235 ha or 25.9% average saline, 223838 ha or 39.6% intensive saline, 42510 ha, or 7.5% salty soils), 508.3 thousand hectares (29.0%) of the different saline degrees (385037 ha or 75.8% of the low saline, 102110 ha, or 20.1% average saline, 21123 ha or 4.1% intensive saline)

In the result of assessment of irrigated soils it was defined that 385.1 thousand hectares of soil is insufficient; in addition 103.4 thousand hectares of soil where the level of ground water near the surface, 115.1 thousand hectares of intensive saline soil, 166.6 thousand hectares are shown as the main reason for the combined effect of both factors.

The main issue of soil washing is removal of salts from soil where plant roots spread. Plant roots spread layer implies one meter upper layer of the soil. Because, most of the agricultural crops or their root systems are in whole or partially spread under one meter. This layer is called a report layer. Light and medium mechanical composition soils are easy to clean as their water-leakage ability is great.

The essence of the strip wash technology is the area defined is be washed being divided into parallel 3-5 lines depending on among-drain distance. The width of the central section 100 m, but the edges of the strips are separated into 50 meters. Washing the first begins with burial of the central zone with water, in the second stage middle strips, and in the third stage continues the burial of the edge strips. The area is prepared for washing generally in intermittent wash. Beds buried with water should be waited for absorption of the water up to depth 1.5-2.0 m. After that, the area is to be watered again. By this way washing continues up to reaching required report norm.

Key words: ecoethic problems, salt quantity, producing, ground water granulometric composition

INTRODUCTION

Although soil salinization or becoming salty are the natural processes occurring in the soil, it causes a negative impact on agricultural production, natural communities, including low-lying areas and in low-lying forest formations if not to take necessary measures in a timely manner. So, such soils are considered environmentally disadvantaged areas, and there must be taken some ecoethic measures warning their negative dynamics, prevention and restoration for use (drainage application, carrying out washing, chemical reclamation, some administrative and legal measures, etc.) [2, 3, 4, 5, 8, 9, 10]. Soils of this category are considered to be not useful and a complex measure on their melioration is required, Mamedov G. Sh. [1].

About 670 thousand hectares of irrigated soils in the country (46.4%) are situated to Kur-Araz lowland. The irrigation herein has an ancient history. In Mill plain and in the south of Mughan plain the traces of irrigation canals are found and remain even today. However in XIX century, in Azerbaijan the primitive methods of irrigation had been implemented and irrigated soils – were in the Kur-Araz lowland, in the lower part of the Shirvan and Karabakh river flows, located along the banks of the Kur and Araz rivers. Buried in the areas of flood waters of the Kur and Araz rivers, the soil surface cracks formed because of drying and after it seeds (barley and cotton) were sown, though there have not been vegetation watering the was product relatively high. In these conditions in the 60s years of the XIX century, the Tsarist government has implemented some measures for irrigation of these areas and has started the construction of irrigation canals for the production of cotton to Mugan-Salyan zone in 1900.

Thus, in 1901-1917 the consumption of the main channels of 130 m^3/sec and 209 km in length were built four irrigation systems. Thus, 169 thousand hectares of land have been provided with irrigation water. At that time, the plain areas of Salyan irrigated directly from the Kur River water was used water-lifting irrigation devices working with animals. The main defect of irrigation systems was irrigation networks rarity and non-existence of water-throwing network. Therefore, salinization of arable lands began to be observed in the early years,

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and the population started to use a new area every year. As a result of the irrigation with landfill method 15-20 m^3 irrigation water spent per hectare, ground water level became closer to the surface of the earth, a large scale salinization process spread out. In the result of current situation population and even the service staff began to leave Mughan for other regions. During the First World War irrigation systems have been damaged, hydraulic devices were destroyed, and salinization process accelerated. As a result, the northern region of Mughan suffered from salinization 96 %, land fields of Salyan 98%. A similar process occurred in other regions, too. For example, along the left bank of the Kur River the area from Yevlakh to Hajigabul formed "Black water" swamp, the surrounding area has been exposed to salinization.

ANALYSIS AND DISCUSSIONS

Investigations show that, due to lack of experience, without taking into account the soil and hydrological conditions of the irrigation works will soon manifest itself in covered large areas of swamps and salinization. The tsarist government had to take emergency measures and since 1910 in Transcaucasia started a systematic hydrometry, the first chemical laboratory was established in 1912, and since 1913 the fundamentals of studies has been founded.

Channels since the first years of Soviet rule in 1921-1925 were cleaned of silt deposits, hydraulic devices were repaired, reconstruction of new irrigation canals were begun in the next few years, started the construction of new irrigation systems, mechanical irrigation was developed. Five water-stretching devices have been launched powered by diesel engines in 1920-1930.

Scientific-research and project research issues were paid special attention and Mughan practice meliorative station was established in 1930. However, irrigation and reclamation activities are completely stopped in 1937, but since 1945 they have been restored again, as well as the great Mingechaur complex was built.

In subsequent years, there have been built irrigation systems, collector-drainage system, water tanks and other facilities in the Republic, the soil washed up, made arable, stationary drainage stations were organized in Shirvan, Karabakh, South Mugan, organization of important measures like experimental bases in the areas of many farms in short (1-3 years) term caused achievements and successes.

In 1947-1965 years current washing measures in weak saline soils in 83969 hectares of drenaged areas in Northern Mugan, south-eastern area Salyan plains and including 32030 ha in Salyan, 35753 ha in Sabirabad district and 16166 ha in Saatli regions were reduced to 64087 hectares from 28982 ha, and very intensive saline soils reduced for 14.4 times, the average rate of salinity decreased to 0.47% from 1.08%. Thus, with an area of 8400 ha tract was almost changed to weak salinity degree from intensive.

In 1965, after the Soviet Union adopted a decision on the development of irrigation in the country, as well as large-scale irrigation and reclamation activities are carried out in Azerbaijan, as well as complex measures against soil salinization of irrigated areas, in regions were developed. In 1966-1990 years irrigated areas reached to 1094 thousand hectares from 1444 thousand hectares, water supply of 778.2 thousand hectares was improved, and melioration condition of irrigated 541.8 thousand hectares was improved by constructing drainage network.

In the result of these measures, the volume of average annual product namely in years 1986-1988 was increased relatively, 2.16 wheat, cotton 2.13, 2.55 vegetables and melons, 3.57 fruits, grape production 7.46 times.

In the early 90s of last century, with the collapse of the Soviet Union of the former Soviet Republics, including Azerbaijan get its independence. In the first years of the country's economic difficulties, especially lack of funds and financial means due to Armenian aggression, maintaining irrigation systems and reclamation measures were impossible to continue. Silting of the collector-drainage systems, their fully deterioration in some places resulted in the formation of favorable conditions for secondary salinization.

This process manifested itself especially, in Shirvan plain areas even more obvious where the collector-drainage systems and irrigation facilities are not well developed. In addition, the investigations show that, despite being in stagnation condition for some period, increase in rate of repeated salinization areas is not very high.In recent years, cleaning and other measures in Salyan, Mughan plains collector-drainage systems creates a hope on salinization or secondary salinization which is the most serious challenge to prevent the possibility of Ecoethic problem. Although there is enough experience in the struggle against salinization in the country, there is a need to develop

waters technologies and scientific-researches. It should be noted that different parts of the Kur-Araz lowland differ from each other for their natural conditions. Therefore, to apply a universal method in restoration of saline soils all over the area of the plain is impossible. Individual approach to each case is necessary.

In general, in order to wash up the soils from salt, in which degree is it salted, should be cleared first. The amount of salts in the soil divided to some levels and they were named. It is the classification of soils according to the degree of salinization. The basis of classification of plants and their resistance to salts are allowable limit. The basis of the classification consists of the salinization sustainability of agricultural crops and their level of division. (Table 1)

Table 1. Salinization sustainability of agricultural crops (Orohenie, Spravoçnik, 1980)

Weak Sustainable	Average Sustainable	Saline Sustainable
Three-leaf shamrock	Wheat	Sugar beet
shamrock	Sesame	Chard
esparsette	Onion	Rice
apple	Cotton	Water-melon
cherry-plum	Fig	Melon
	Pear	Pomegranate
	Mulberry	

According to amount and type classification of the soils of our country defined by G. Azizov [7] the soils were divided into saline, soda, chloride, sulphate-chloride, chloride-sulphate and sulphate types. Despite this classification differs from other classifications proposed for our Republic, (V. R. Volobuyev, [12]), but generally it reflects the real situation correctly.

Degree of salinization is characterized with poison indicators. Salines NaCl, Na_2SO_4, $MgCl_2$, $CaCl_2$, $MgSO_4$, Na_2CO_3, $Na(HCO_3)_2$ are more harmful for plants.

Therefore, based on these factors, taking into account the characteristics of the soil melioration measures, the soils in the Kur-Araz lowland are conditionally divided into three specific groups:

1. Soils with light granulometric composition, capable of high water leak, easily soluble salts (chloride, sulphate-chloride). The soils in the northern and central Mugan, Salyan plain, south-eastern zone of the Kur River in Shirvan and Shirvan plain from administrative point of view cover Sabirabad, Salyan, Netfcala and Zardab administrative districts. To prevent water loss and soil washing is very important to ensure a high yield of soil. In this regard, stripes and periodically washing technology proved its effectiveness and was confirmed.

In the result of the application of both methods, wasting of the consumption water for washing is prevented, the area is cleaned from salts in equal degree, and washing efficiency will be high.

2. Soil salinization with heavy granulometric composition, poor water leakage ability, chloride-sulphate and neutral sulphate type. These soils are mainly spread in the north-west of Karabakh (Ganja, Tartar, partially Barda), excluding the Kur River coastal zone in Shirvan plain (Aghdash, Ucar, Kurdamir, Aghsu regions) and South Mugan (Bilasuvar and Jalilabad).

The soils with weak water leakage have some typical features like poor water absorption capacity, unstructural condition, crusting over, difficulty in water and salt secretion. The existence of these features makes more difficult the melioration of soils; for preparation of soils with heavy granulometric composition for sowing, additional meliorative measures are required, unlike light soils. Heavy washings in the second group soils of which water leakage ability is weak, water passing layer is thick and its location, washing norm volume and other features, below technologies are used.

- In soils where filtration coefficient is 0,10-0,30 m / day, report washing volume rate is 10 m^3/ha the washing should be carried out in the usual way – watering the beds;
- In soils where filtration coefficient is 0,10-0,30 m/day, report washing volume rate is 10 m^3/ha the washing should be carried out in applying shallow drains;
- In soils where filtration coefficient is 0,05-0,10 m/day, depth of weak water leakage layer less than 0,6-0,7 m, report washing volume rate is 10 m^3/ha the washing should be carried out in the usual way, by applying prior loosening;

- In soils where filtration coefficient is 0,05-0,10 m/day, depth of weak water leakage layer more than 0,6-0,7 m, not depending from report washing volume rate the washing should be carried out by applying temporary shallow drains and deep loosening;

- In soils where filtration coefficient is 0,05-0,10 m/day, depth of weak water leakage layer more than 0,6-0,7 m, not depending from report washing volume rate the washing should be carried out by applying temporary shallow drains and deep loosening;

- In soils where filtration coefficient is 0,05-0,10 m/day, depth of weak water leakage layer more than 0,6-0,7 m, report washing volume rate is 10 m^3/ha the washing should be carried out by applying temporary shallow drains and deep loosening;

- In soils where filtration coefficient is less than 0,05-0,10 m/day, depth of weak water leakage layer more than 0,6-0,7 m, together with applying temporary shallow drains and deep loosening the washing should be carried out by giving chemical melirants or permament power supply;

- horizontal washing is carried out in deep loosened soils with weak mineralization and salinization level of ground water, and located in the upper layer of soil.

Depending on the specific values of parameters used in the above-mentioned measures, dimensions (distance between the shallow drains, strip depth, length, in which depth the soil loosened, etc.) are defined.

Proposed main substantial washing technologies makes the soils useful for agriculture during one or two washing seasons. However, it would be better to continue it with rice planting.

3. Saline and salty soils with heavy granulometric composition, weak water leakage ability, salt which includes soda within composition. Usual washing methods are not rational in soils located in Karabakh and Mil (Barda, Agjabedi, and Imishli regions). Therefore, on these soils the 2nd group of washing is recommended and in addition to washing technology, there also must be considered the application of chemical meliorants.

Salinization is one of the factors influencing productivity of agricultural plants in irrigated agricultural areas of the Republic. As salinization plays an active role in the ecology soils in our Republic, it was partially taken as an ecoethic problem by us. Negative effects of salty soils on agricultural plant growth and productivity are associated with existence of sodium in soil composition and sodium within absorbent complex and magnesium captions. V. Kovda [13] has described the effect of absorbed sodium on plants in below ways:

a. When exchange sodium capacity is up to 3-5% of absorption volume, it has not any impact on the development of agricultural crops and vice versa, sometimes it has a positive effect;

b. When exchange sodium capacity is up to 5-10% of absorption volume, the physical properties of the soil is degraded. To avoid this, the cultivation of the soil with high agricultural policy, the proper application of rotational sowing is essential;

c. When exchange sodium capacity is up to 10-20% of absorption volume, a high salinity emerges, agrophysical features of the soil changes completely. Plant productivity decreases. A chemical melioration is necessary for struggle against it.

d. When exchange sodium capacity is up to 20-40% of absorption volume, salinity degree of soil reaches its high level, its fertility decreases severely, and it is natural that on Waterch soils we cannot think about agricultural plant sowing.

Organic substances emerged in salinization process in easy soluble forms can be washed from the upper strata of the soil to lower layer the solidification occurs in under-plant layer of soil, water and air properties such as soil structure is deteriorating and gradually breaks down. This type of soil is sticky when wet, dries very and forms cracks there is needed a great labor for cultivating or loosening it. Waterch soils are usually spread as spots, in dry and warm climate areas, steppe, semi-desert and desert soils.

V. Volobuyev [12] has shown four ways of salinization in the Kur-Araz lowland:

1. Soil formation and soil erosion processes occurring as a result of the alluvial soil salinization enrichment with sodium ions;

2. Salinization emerged in the result of weakly mineralized soil surface water drainage, and with dealluvial way;

3. Salinization before becoming salty as a result of the groundwater capillary impact;

4. Salinization emerged in the result of becoming unsalty of soils.

Saline soils are spread in Mugan and Salyan [12] plains, in the west of Shirvan plain, the Kura coastal zone, southern and northern parts of the Mill plain of the Kur-Araz lowland. As for Antipov-Karatayev saline soils characterized as follows, depending on the amount of sodium absorbed.

It should be noted that the saline soil of the area

in its turn are divided into two groups of the neutral and alkaline (soda). All saline soils with sodium are of more or less degree saline. Saline soils with sodium are mainly distributed in Garadagh plain. Such soils are found in the form of spots in Mughan and Mill plains. At the same time, existence of the magnesium origin soils in our Republic is well known. These soils have their own features.

When the amount of magnesium in the soil absorbing complex is less than 20% of the total absorbed bases, such soils are magnesium non-saline, weak magnesium saline if 20-30%, average magnesium saline if 30-40%, magnesium saline intensive case if 40-50% and > 50%. Productivity of plants also varies depending on the saltiness. As seen from the table, wheat productivity in weak saline soil is about 30%, in average saline is 50%, in intensive saline is 75%, in salty soil it is less than 90%. These soils are found in Araz coastal zone, Karabakh plain, Mugan plain of the Kur-Araz lowland zone.

It should be noted that there are some specific differences the morphological structure of sodium and magnesium. In this respect, the most characteristic feature of sodium saline soils is distribution of powderlike colloidal particles in a thin layer throughout the entire profile (dispersed) due to the movement of soft and hardened pillar structure.

Nevertheless, magnesium saline's have a differentiated (divided into layers) monolith density profile. Cation complex absorbing excess amounts of magnesium in the soil differed with high water resistance, leaving the water very weak and hardly, cause a solid monolith mass which makes the cultivation hard. These symptoms should be taken into consideration, while preparing reclamation measures of soils.

During salinization of soil cracks (cracks) are formed on it, and separate pillar structural components are formed, as well. Pillar layers are located at different depths depending on the degree of ongoing process and are influenced by a variety of plants grown there. Abduyev [11] defined the following three types of saline soils, for the location depth of the structural pillar layer: crusted saline soils; average pillar saline soils; deep pillar saline soils. In his reclamation Abduyev also has cleared the essence of the deep ploughing, biological, tightening and other methods and showed their parameters.

Taking into account the formation conditions and characteristics of saline soils to improve and increase their fertility, briefly, the following methods are used to solve their ecoethic problems.

1. Chemical melioration method. In this case, the chemical meliorants are given equivalent to their amount of sodium ions in the soil and the alkalinity of soil absorbing complex;

2. Agro-biological method. In this case, agronomic and biological measures complex (through deep plugging and trenching the layers of gypsum and calcium carbonate are used, their solution is provided) is to be applied.

Melioration of saline soils with chemical method is carried out in two stages, phases:

- In the chemical phase of melioration chemical meliorants of equal amount is given for removal of alkality of soil solution and replacing sodium ion with calcium ion in soil. After that, the favorable soil structure is formed, a water-physical property of the soil improves significantly, and fertility begins to grow gradually as intensive soil microbial processes continue.

- In the physical phase of melioration – tin the result of exchange between given calcium salt and sodium cation compressed from absorbent complex, the excessive amount of harmful salts (mainly Na_2SO_4) for agricultural plants within soil solution washed out through water.

For the purpose of studying the effects of different meliorants, experiments carried out by K. H. Teymurov and H. H. Huseynov show that although reaching some success in some gypsum applied experiments, when increasing gypsum amount for 3 times (from 12 t/ha to 36 t/ha) for the purpose of removing completely the harmful part of sodium cation from the absorbing complex of soil, the amount of excreted sodium increases only for 1,53 times. More than 50% of given gypsum stays within the soil and manifests no meliorative effect. The authors came to such conclusion that the norm of rated of gypsum will be effective to give several times in at 10-12 t/ha amount. The completion of the meliorative effect of each unit requires a break for 2-3 years. Thus, gypsum measure prolongs melioration works for 7-10 years. There exist other disadvantages of this method. Weak and hard solution of gypsum in water slightly reduces and delays its effectiveness; raw gypsum is to be grinded and sifted before given to soil; weak solution of gypsum increases the dose in soil, and it is less effective economically. By applying a series of meliorants a numerous variants of experience was carried out by Mikayilov [14] in saline or salty soils of Shirvan and Karabakh plains. Gypsum dose in

versions was 10, 20, 30, 40 t/ha, sulphate acid dose was 10, 20, 30 t/ha, if applicable with manure gypsum dose was 10, 15, 20 t/ha, manure dose was 5, 10, 15, 20, 30, 40 t/ha, dose of chemical plants' waste was 10, 20 and 30 t/ha.

Analysis of investigation results shows that, respectively manure gypsum in 15 and 40, t/ha together, sulphate acid in 10 t/ha dose and chemical wastes in 10-20 t/ha is recommended to be applied. Currently, a number of guidelines have been developed on use of active meliorants. As an example of this acid solutions, the new complex compounds, $CaCl_2$, Ca $(NO_3)_2$, scale and acid together can be shown. The main objective on application of agro-biological complex in melioration of saline soils is of attracting calcium salts to planting layer of soil and loosening hardened edges of the saline layer. In this case, the gaps increased in all soil profile, arises in good conditions increasing the depth of precipitation and irrigation water absorption, increases moisture reserves in soil, physical and chemical processes are accelerated and melioration of hazardous substances from soil with washing process easier.

It means, agro-biological method itself consists of joint complex meliorative mechanical, chemical and biological measures. Meliorative cultivation system is applied in this case (deep tillage, conventional tillage and deep loosening) through which the structure of saline layer is destroyed, carbonate salts and gypsum in the soil are included into chemicals melioration, mastering crops are grown, their root systems and organic remains of biological effects as well as manure to the soil, carbon dioxide (CO_2) is increased in the soil and sustainable structure is created. Taking into account the diversity of types of saline soils, thickness of the layer on saline layer, the depth of calcium salts, the amount and quality of easily soluble salts in water, optimal plowing depth should be applied in the soil.

In the territory of the Republic, especially in the Kur-Araz lowland accounting on salty and saline soils were carried out and drawn maps for certain periods. According to writings of V.R. Volobuyev by indicating of main degree of salinization, the first map of Kur-Araz lowland was drawn in 1934 by V.R. Volobuyev and N.A .Dimo. Endeavour in compiling a separate map of Azerbaijan was observed in 1939. The work was completed in 1943, partly made precise in 1946 and 1948. Finally, in 1959, was drawn the new map of the Kur-Araz lowland. This map drawn on the basis of Shirvan plain in 1952 by A.S. Preobradzensky, Mill plain compiled in the same year by D.M. Sekirin, Karabakh plain compiled by A.G. Zeynalov and D.M. Sekirin in 1949 and in 1952, Mughan-Salyan plain compiled in 1947 by V.R. Volobuyev and south-eastern Shirvan plain map.

Within the specified time the salinization map of the Kur-Araz lowland have been prepared by V.R. Volobuyev under the leadership of G.Z. Azizov at the Institute of Soil Science and Agrochemistry of NASA.

Currently, some soil investigations are carried out at the State Land and Cartography Committee on preparation of 1: 100,000 scale map of the Kur-Araz lowland. On the basis of these investigations, electronic soil cartography, including saline and saltiness maps were drawn.

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ЕКОЕТИЧНИ ПРОБЛЕМИ СВЪРЗАНИ СЪС ЗАСОЛЕНИ И СОЛНИ ПОЧВИ В АЗЕРБАЙДЖАН

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Резюме: Засоляването на обикновени почви в Азербайджанската република заема специално място в екоетичните проблеми. Солните почви са разпространени широко в Азербайджан. Приблизително 60% от общата площ на почвите на долината Kur-Araz, която е 2,2 милиона хектара, е средно и силно засолена**.** Освен това солените почви се разпространяват в районите на Сиязан-Семгайт, в района на Джейранхол, в автономната република Накчиван и в други части на Азербайджан. Като цяло умерените и интензивно солените почви на територията на нашата република се състоят от 1,3 милиона хектара обща площ. Това означава, че 15% от територията на републиката страда от този екологичен проблем. В резултат на проведените изследвания е установено, че 565481 хектара от 1444,9 хил. хектара или 47,6% от общо напояваните, подходящи за земеделие почви в страната са станали засолени в различни степени (152898 хектара или 27% от тях са малко засолени, 146235 ха или 25,9% средно засолени, 223838 ха или 39,6% силно засолени, 42510 ха или 7,5% солени почви), 508,3 хиляди хектара (29,0%) с различна степен на соленост (385037 ха или 75,8% от слабо засолените, 102110 ха, или 20,1% средно засолени, 21123 ха или 4,1% силно засолени). В резултат на оценката на напояваните почви беше установено, че 385,1 хил. хектара са недостатъчни; в допълнение 103,4 хил. хектара са почвите, където нивото на подпочвените води е в близост до повърхността, 115,1 хиляди хектара са силно солена почва, 166,6 хиляди хектара са показани като основна причина за комбинирания ефект на двата фактора. Основният проблем при промиването на почвата е отстраняването на соли от нея, в участъка където се разпространяват растителните корени. Коренът на растението се разпростира един метър под горния слой почва. Тъй като повечето селскостопански култури или кореновите им системи са изцяло или частично разпределени под един метър, този слой се нарича продуктивен. Леките и средно-механично съставни почви са лесни за очистване, тъй като тяхната способност за изтичане на вода е висока.

Същността на технологията за измиване на ленти е зоната, определена за промиване, която е разделена на успоредни 3-5 линии, в зависимост от разстоянието между зоните на изтичане. Ширината на централната секция е 100 м, а краищата на лентите са разделени на 50 метра.

Първото промиване започва със заливане на централната зона с вода, във втория етап - средните ивици, а в третия етап - заливането на крайните ивици продължава. Районът е подготвен за измиване обикновено при периодично измиване. Леглата, заровени с вода, трябва да се изчакат за поглъщане на вода до дълбочина от 1,5-2,0 м. След това районът трябва да се напоява отново. По този начин промиването продължава до достигане на необходимата изискуема норма.

Ключови думи: екоетични проблеми**,** количество на солта, производство, гранулометричен състав на подпочвените води

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