

# MANUAL ON THE FEEDING CROPS



**MINISTRY OF AGRICULTURE AND ENVIRONMENTAL  
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**TURKMEN AGRICULTURAL INSTITUTE**

**AGRICULTURAL RESEARCH AND PRODUCTION CENTER**

# **MANUAL ON THE FEEDING CROPS**

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The manual describes the biological characteristics and the economic and agro-ameliorative significance of the fodder crops grown in our country (alfalfa, winter barley, corn and barley).

The manual also mentions the methods and terms of agro technical measures, methods and times of fodder-crops' cultivating in Turkmenistan.

The manual is intended for agricultural specialists, tenants, students and the general public readers.

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## INTRODUCTION

In the period of prosperity of a sovereign state, under the wise leadership of the distinguished President, large-scale work is being carried out on the scientific development of agriculture, which is one of the key sectors of our national economy. In our country, along with the rich experience of our ancestors, accumulated for centuries in agriculture, new technologies of developed countries of the world, achievements of science and technology, and best practices are widely introduced into production. In this regard, the Agricultural Research and Production Center of the Turkmen Agricultural Institute conducts breeding work on the selection of barley, corn and other fodder crops, the creation of new varieties and scientific research of their first selection.

In order to increase the productivity of animal husbandry in our country, a special role is played by the regular provision of farm animals with nutritious feed. In Turkmenistan, alfalfa, barley, corn and sorghum are mainly grown from forage crops.

Alfalfa is considered a valuable fodder and land-strengthening crop. It contains almost all the nutrients and vitamins needed for livestock, especially carotene and ascorbic acid. Used in the form of blueberries, horsetails and haulage.

Barley is also very important as a nutritious feed for livestock and poultry. Barley grains contain an average of 12 percent protein, 5.5 percent fiber, 64.6 percent nitrogen-free organic matter, 2.1 percent fat, 13 percent water, and 2.8 percent ash.

It is considered a valuable forage crop, as it can provide up to 60-70% of the required food sources for corn and sorghum. About 20 percent of the world's corn is used for food, 15-20 percent for industrial use and two-thirds for animal feed. Corn grains contain 65-70 percent starch, 9-12 percent protein, 4-8 percent fats and minerals, and vitamins.

Food for the sorghum is very important, its grain is considered a very nutritious and valuable food for cattle, green shoots (twigs, leaves, twigs) in the form of fresh greens, silage are important, the jaw is dense and the best body is prepared from it.

In connection with the above, this manual has been prepared in order to give scientific advice on the rules, methods and timing of

agro technical measures when growing forage crops in the soil and climatic conditions of our country.

When preparing this manual, advice, speeches and articles of scientists and specialists with extensive experience in growing high yields of forage crops were used. We thank them all. Published in 2009, this guide is based on the latest scientific and production data from the 2009 Feed Growing Guide.

## **I. BIOLOGICAL FEATURES OF FORAGE PLANTS**

**The requirement for warmth of fodder crops.** The heat demand of forage crops is not the same. Alfalfa seeds germinate at 1-2 degrees Celsius and the air temperature is estimated at 18-20 degrees Celsius for the plant to grow well. During germination, young plants can withstand frosts up to 6 degrees. Two- and three-year-old algae begin to grow in the spring at a temperature of 7-9 degrees. Barley is a plant that adapts to local soil and climatic conditions, its seeds can germinate even at temperatures of 1-2 degrees, and are resistant to short-term frosts. Corn seeds germinate at 8-10 degrees Celsius and seeds germinate at 10-12 degrees Celsius. At an air temperature of 22-28 degrees, corn grows well, and at 28-32 degrees - it grows well. Corn growth slows down by 36-40 degrees Celsius, and when the soil is wet, plants can tolerate 42-44 degrees Celsius.

**Demand for fodder crops.** The demand for forage crops for soil varies. High yields of alfalfa and maize can be obtained on light-textured clay soils, which are soft, rotting and have a sufficient plowing layer, while highly saline soils are unsuitable for algae. Barley is good for reclaiming new soils and is one of the most resilient crops in the world. Juvenile salt is considered one of the most resistant crops to corn and barley, and is also very effective in developing new openings.

**Water requirement for forage crops.** The demand for water for forage crops is also not the same. Among these crops, alfalfa is in high demand: in just two to three years, 6,100-6,900 cubic meters of water per hectare and 1,000-8,400 cubic meters of alfalfa per hectare are sown. Winter barley is considered a drought tolerant crop and it is recommended to water a total of 3300-3900 cubic meters per hectare during the growing season to obtain high yields. Corn is considered to be relatively drought tolerant, while straw is considered more tolerant to other forage crops. During the growing season, corn is irrigated at the rate of 4,500-7,500 cubic meters of water per hectare.

**Food demand for forage crops.** If, before sowing, 10-15 tons of a rotting object, 400-600 kilograms of superphosphate, 100 kilograms of potassium chloride, 100 kilograms of urea fertilizers are added to arable land of forage crops, the soil is enriched with organic and mineral substances, as well as its agrochemical and agrophysical properties create favorable conditions for growth . It is considered

appropriate to apply scientific fertilization rules in order to obtain high crop yields.

**Nitrogen** is the most important nutrient for plant growth and harvest as it contains simple and complex proteins, amino acids and carbohydrates, chlorophyll, alkaloids, several vitamins, enzymes, and other organic compounds in the plant. Nitrogen deficiency in the food environment (in the widespread root layer), as well as its excess, negatively affect the development and productivity of plant samples.

**Phosphorus** is part of many organic plant compounds. It plays an important role in the formation (synthesis) of organic matter, in the growth, reproduction of plants and in the accumulation of a bountiful harvest. When there is a deficiency of phosphorus, the use of other nutrients by the plant slows down the synthesis of proteins and carbohydrates and reduces the plant's resistance to diseases.

Potassium - contributes to the normalization of photosynthesis in plants, the accumulation of nutrients, an increase in plant resistance to drought, and an increase in drought resistance.

The role of forage crops in crop rotation. The importance of alfalfa in the development of agricultural land is very great. It leaves up to 10-20 tons of plant waste per hectare in 2-3 years and accumulates 250-300 kg of nitrogen. Thanks to him, the composition of the soil is enriched with rot and other nutrients. It also improves the physical properties of the soil, reduces soil salinity and prevents secondary soil salinization. These crops increase the yield of sown crops after it by at least 20-30 percent in the crop rotation. It is considered inconvenient to plant alfalfa after sugar beet. Legumes, vegetables, sugar beets, cotton and ground crops are considered favorable for barley. In crop rotation, maize and beans are recommended to be planted mainly after autumn sowing of sorghum, legumes, peanuts, sugarcane, orchards and other large-scale crops.

## **II. GROWTH OF ALFALFA**

In the northern regions of the country, alfalfa is planted in March, and in the southern regions in September-October. Accordingly, preparatory work on the ground is being carried out.

**Irrigation before plowing.** Irrigation water is essential for improving the quality of basic soil cultivation. It also has a positive effect on the quality of the latter work. This water should be retained

at the rate of 600 cubic meters per hectare in old storage caches. Perennial weeds sprouting as a result of irrigation are mainly sprayed with systemic herbicides against weeds and seedlings. Pre-irrigation near groundwater is not carried out (Dashoguz region).

**Apply fertilizer before plowing.** Before grazing, it is recommended to introduce 10-15 tons of rotten object per hectare, 400-600 kilograms of superphosphate, 100 kilograms of urea and 100 kilograms of potassium chloride. When fertilizing before plowing, the soil is enriched with organic and mineral substances, improving its physical and chemical properties. It creates favorable conditions for increasing yields.

**Arable ploughing.** Correct and timely plowing is an important measure that ensures the effectiveness of all agro technical measures: soil salinization, watering, fertilizing crops, cultivation, and combating insects, diseases, and weeds. In order for alfalfa roots to penetrate into the lower soil layers, slurry should be plowed in old irrigated areas to a depth of at least 32-35 centimeters with a two-layer decrease in irrigated areas and salinization of contaminated salts in grassy areas near groundwater. Careful plowing of the slurry bottom to a depth of 30-32 centimeters simultaneously by softening the slurry bottom by 10-12 centimeters, especially in areas where heavy (dense) and harmful salts accumulate under the slurry layer, gives good results. On such lands, this work must be done every 3 years.



*Figure 1. Leveling*

**Leveling.** Good leveling of arable land is a guarantee of higher yields than alfalfa. When the fields are well leveled, it ensures the acclimatization of the wash, support and feed water, good soil cultivation and the production of high quality and healthy sprouts. After plowing, the leveling is carried out in the cross section with longitudinal levelers. If there is a higher or flatter area on the alfalfa plantation area, then these areas are leveled with bulldozers and scrapers before plowing, as well as large levelers, and then plowed (Figure 1).

**Preparing fields for flush and growth watering.** Irrigation and drainage systems should be cleaned prior to collecting flush water. Temporary irrigation canals should also be laid in flat areas and divided into ditches. Then each watering horse should be able to drink the water separately. The size of the fields should be 0.15-0.25 ha on light soils and 0.25-0.35 ha on medium to heavy soils. Caches collect water on the slopes at the foot of the mountain. Then the length of the caches should be 120-150 meters in light soils and 150-180 meters in medium to heavy soils in 60 centimeters increments. With an interval of 90 centimeters, the length of the caches increases by 1.2-1.3 times. These works are carried out after the completion of the leveling works.

**Flush and growth watering.** To save water, wastewater and side waters are combined with a standard of 2000-3000 cubic meters per hectare.

**Pre sowing cultivation.** Before sowing, in order to obtain moisture in well-irrigated areas and to obtain well-cultivated soft soil, when the lands are normal, they are cultivated with a set of tools consisting of chisels, rakes and cattle. The working depth should be 12-14 centimeters on light soils and 14-16 centimeters on medium to heavy soils. In areas where throne water is supplied from hiding places, pre-sowing treatment is carried out with a rotating rake or light rake and cattle along the row. For some reason, if not fertilizing the lower part of the herd, 10-15 tons of rotten object per hectare, 400-600 kg of superphosphate, 100 kg of urea and 100 kg of potassium chloride per hectare should be applied before pre-cultivating. -seeding processing.

**Sowing of alfalfa.** It is important that sowing is carried out in a timely manner and with high quality in order to obtain a high yield of alfalfa. Sowing is carried out at the rate of 15-17 kg of seeds per

hectare. It is also mixed with barley. Then 40-50 kg of barley seeds are consumed per hectare. Sowing should be carried out to a depth of 2-3 centimeters in medium to heavy soils and to a depth of 4-5 centimeters in light sandy soils. There are a number of additional steps you need to take to get a full and regular bruise, i.e. it is recommended to break the lid left by the oil with light, multi-pronged nails. Also, in some areas there is a moisture deficit with the norm of 800-900 cubic meters per hectare.



*Figure 2. Alfalfa seeds*

**Fertilizing alfalfa with mineral fertilizers during growth.** Timely and regular feeding of alfalfa has a positive effect on crop growth and high yields. Top dressing of two- and three-year-old alfalfa is carried out in the southern regions of the country from February 10 to 28, and in the northern regions - from February 15 to March 5 by feeding 400 kg of superphosphate and 100 kg of potassium chloride per 1 kg. ha.

**Growth watering.** The importance of efficient use of water when harvesting tall alfalfa is very important, it is recommended to bring irrigation water to a rate of 800-1000 cubic meters per hectare. Young alfalfa should contains 2 water to the first reaping of alfalfa, then later one growth water between each harvest.

**Pest control measures.** The main pests of alfalfa include phytonyms, cover, long-nosed, leaf worms. These pests are controlled with one of the suggested insecticides when the need arises.



*Figure 3. Alfalfa flowering period*

**Harvesting of alfalfa.** Regular harvesting of alfalfa has a positive effect on its yield and growth over the years. In the southern regions 4-5 annual crops are harvested, in the northern regions - 2-3 crops. In the southern regions, 5-6 harvests are carried out in 2-3 years, in the northern ones - 4-5 harvests.

### **III. CULTIVATION OF GLOSSARY BARLEY**

To obtain a good harvest from barley, it is important to breed high-yielding, high-quality, harmful and disease-resistant varieties, as well as timely agro technical measures when growing it in accordance with scientifically established rules. Barley serves as a valuable raw material for the processing industry, cereals, flour, beer, alcohol are extracted from barley and are widely used in the preparation of coffee substitutes, its straw, inscriptions on the outside of the grain, rich in nutrients for cattle.

**Irrigation before plowing.** To improve the quality of the cultivation, the field of barley is irrigated with 600 cubic meters of water per hectare. Thus, weeds germinate under the influence of water and create a favorable environment for herbicide control.

**Spraying with herbicides against perennial weeds and pre-sowing fertilizing.** Perennial weeds are mainly treated with systemic herbicides against weeds and grasses. Before plowing, it is

recommended to apply 10-15 tons of seedlings per hectare, 400-600 kilograms of superphosphate, and 100 kilograms of potassium chloride, which will improve the agrochemical and agrophysical properties of the soil and increase the yield of barley.

**Drilling and leveling.** Grazing is carried out with the aim of burying plant residues and fertilizers into the depths of the soil layer, fighting insects, diseases, and weeds. The barley should be plowed to a depth of 23-25 centimeters and then leveled with special levelers. The leveled field allows you to flush out water retention and soil salinity, as well as carry out timely planting and sowing.

**Preparation of lands for flush and growth watering.** In our country, there are two main types of sowing barley: flat and sowing methods. Depending on this, the land is prepared for sowing. Temporary irrigation ditches are dug on the plains, which are divided into irrigation ditches. Farms should be designed so that each irrigation canal is irrigated separately. The size of the fields should be 0.15-0.25 ha on light soils and 0.25-0.35 ha on medium to heavy soils. Caches collect water on the slopes at the foot of the mountain. The length of the caches should be 120-150 meters on light soils and 150-180 meters on medium to heavy soils in 60 centimeters increments. With an interval length of 70 or 90 centimeters, the length of the caches increases by 1.2-1.3 times. These works are carried out after the completion of the leveling works.

**Flush and growth watering.** Barley is one of the salt-tolerant crops. However, in order to obtain a higher yield, it is necessary to rinse and remove the brine from the saline areas. To save water, wastewater and side waters are combined with a standard of 2000-3000 cubic meters per hectare.

**Pre sowing cultivation.** In the plains, temporary irrigation ditches and lines will be leveled, and before sowing, in order to retain moisture and obtain a small amount of soil, immediately after land is found, a leveling rake and grazing are carried out. The soil is then cultivated with a chisel, rake and livestock. The working depth should be 12-14 centimeters on light soils and 14-16 centimeters on medium to heavy soils. In areas where throne water is supplied through caches, light raking and mowing is done along the line. If, for some reason, fertilizers are not applied to the bottom of the herd, then before processing they are applied on a flat area, and on the slopes in front of a rake, then a rotten object of 10-15 tons per hectare, 400-600

kilograms of superphosphate, 100 kilograms of potassium chloride and 100 kilograms of urea. Thus, favorable conditions are created for young shoots to grow well and overwinter well.



*Figure 4. Barley seeds*

**Sowing of barley.** When growing high yields of barley, it is important to sow it in a timely manner in compliance with the rules of agricultural technology. Before sowing, the seeds are transferred to any of the prescribed pest control agents. Barley seeds are sown to a depth of 4-6 centimeters, that is, on light soils 5-6 centimeters, on medium and

heavy soils - 4-5 centimeters. Sowing is carried out at the rate of 150-160 kg of seeds per hectare (Figure 5).



*Figure 5. Sowing of barley*

**Fertilizing with mineral fertilizers during the growth.** Barley is fed with nitrogen fertilizers twice during the growing season. For the first time, it is recommended to feed 100 kg of urea per hectare during the growing season and then 250 kg of ammonium nitrate in 2

parts during the spawning and soaking period of barley. Feeding with nitrogen fertilizers and collecting water for growth has a large effect on plant growth, fertility and grain nutrition.

**Spraying the herbicides weeds.** During the growing season of barley, one- and two-year-old weeds grow among it, which absorb nutrients and water, causing great harm to its growth, nutrition and the use of sunlight. Therefore, during the development of barley, herbicides offered against single and double weeds are mixed. It is recommended to use herbicides for two periods.

**Growth watering.** Growth watering plays a special role to take high yields of barley. During the period of barley growth, it is recommended to water 4 times in the southern regions and 3 times in the northern regions. The rate of irrigation water on irrigated fields in flat areas is estimated at 1000 cubic meters per hectare, and in areas planted on the ridge, 800-900 cubic meters per hectare. The final development of the catchment area should be completed by 5 May.



*Figure 6. Ripening period of barley grains*

**Pest and disease control measures.** Harmful pests of barley include harmful lentils, leeks, grain beetles, wheat lice, common grain sorghum, sap, and grain hulls. If necessary, any of the offered insecticides should be sprayed. Recommended fungicides are used for barley rust, rashes and other diseases.



*Figure 7. Barley harvesting*

**Preparation for collecting and harvesting of barley.** It is a responsible task to harvest the harvested grain on time without losing a single grain. To do this, you need to timely inspect and repair combine harvesters and grain carriers. Temporary covers, ditches, ditches and areas around fields must be well leveled for smooth operation of combine harvesters.

#### **IV. CULTIVATION OF CORN AND SORGHUM**

Corn is an important source of feed for the development of the country's livestock sector, as it is an important grain and forage crop and is widely used in the national economy after wheat and rice with economic benefits. Corn and grain products are widely used in animal husbandry, food processing, medicine and chemical industries. Corn and ghee are ensiled during or during the mating season, with or without a subset. Since leaves and leaves contain sufficient amounts of carotene, one of the most important nutrients for livestock, the green mass of these crops is widely used as the most nutritious feed for cattle. Corn grains are used according containing starch, sugar, glucose for production vitamin E, ascorbic, glutamic acids, medicated oil and glucose. Cereals contain large amounts of B vitamins, which

are rich in proteins, carbohydrates, essential amino acids (lysine) and minerals.

**Preparing the soil for sowing.** It is very important to carry out the autumn-winter events in a timely manner in order to get a high yield of corn and sorghum. Land cleared from crops must be completely cleared of plant residues and weeds, and preliminary irrigation water must be stored at the rate of 500-600 cubic meters per hectare with reserves of previously planted crops. Every 15 hectares of maize and sorghum should be sown to a depth of 28-30 centimeters, falling asleep on each hectare 10-15 tons of rotten object, 400-600 kilograms of superphosphate and 100 kilograms of potash fertilizers. Then the irrigation and drainage systems are cleaned to prepare the area for washing and preparing water for the tap (digging temporary dams, ridge, mud, ditching). To save water, wastewater and side waters are combined with a standard of 2000-3000 cubic meters per hectare. In areas where maize and maize are to be planted, seedbed treatments should be used to level temporary covers and coolers when land is found.



*Figure 8. Feedback*

Then pour 25-30 percent of the annual rate of nitrogen fertilizers and carry out processing with a set of chisels, rakes and cattle-breeding tools at a depth of 14-16 centimeters, with a row spacing of

60 centimeters on slopes and 90 centimeters on a flat one. Surfaces (fig. 8), and they should be divided into three parts. Each horse must be able to drink water separately - separately. The size of the fields should be 0.15-0.25 ha on light soils and 0.25-0.35 ha on medium to heavy soils. On the slopes of the foothills, water is captured in hiding places (Fig. 9). The length of the caches should be 120-150 meters on light soils and 150-180 meters on medium to heavy soils in 60 centimeters increments. With an interval of 90 centimeters, the length of the caches increases by 1.2-1.3 times.



*Figure 9. Growth watering*



*Figure 10. Corn seeds*

**Seed preparation for sowing.** It is very important to treat the corn and sorghum sowing seeds with chemicals before sowing against fungal diseases. In the case of fungal diseases, the fungicides and seeds offered by the industry should be processed using specialized equipment.

**Sowing corn and sorghum.** To get a high yield of corn and sorghum, it is important to carry out the sowing in a

timely manner and with high quality; sowing should be started at a daytime air temperature of 14-16 degrees. The work will be completed from March 25 till April 30 for the Akhal, Balkan, Mary and Lebap (southern districts) regions (for spring sowing), and for the northern districts of the Dashoguz and Lebap regions - from April 5 to May 10.



*Figure 11. Seeds of sorghum*

Corn and sorghum are sown with precision seed metering units at a distance of 70-90 centimeters, respectively, so that from 55 to 60 thousand hectares per hectare for grain and about 75-90 thousand hectares (number of roots) for silage, respectively. Depending on the texture of the soil, sow 5-6 centimeters into heavy soils, 7-8 centimeters into light soils and 10 centimeters into sandy soils (Fig. 12).

**Mixed sowing of corn with sorghum or soybeans.** These crops can be planted in various spring crops (winter wheat, barley, etc.) in spring and summer with green grass, silage corn, spring crops and vegetables after harvesting corn or soybeans (mixed). It is not recommended to plant these crops near alfalfa so that the same pests do not harm the crops. To carry out spring sowing, after harvesting the previous sowing, plowing is carried out here to a depth of 20-25 centimeters, 70-80 kg of phosphorus per hectare is introduced into the soil, it is leveled, and livestock is carried out. Pressed and aligned. Spring sowing is scheduled for April 1-20, summer sowing for June 15 - July 15. The seeding rate is calculated on the basis of 1000 grains: 30-35 kg/ha for corn, 8-12 kg/ha and 30-35 kg for soybeans.

When grown scientifically, these crops can yield 75-90 quintals of grain per hectare and more than 950-1200 quintals of green grass.



*Figure 12. Sowing*

Care for corn and sorghum. If it rains before the seeds germinate and the soil forms a hard cover, the hard cover should be broken and softened with a soil grinder (hoe). The soil chopping machine not only breaks the cover, but also softens the soil, kills weeds and allows less moisture to evaporate from the soil.



*Figure 13. Mating season for corn kernels*

**Loneliness.** Insulating corn and sorghum is one of the major concerns. Delays in this work lead to a reduction in most of the harvest, plant disease. Isolation should be completed within 15-20 days of the formation of 4-5 leaves on the plants. The distance between plants should be 10-12 centimeters for silage and 20-25 centimeters for grain.



*Fig 14. Period of sorghum harvesting*

Inter row processing, feeding and growth watering. The main goal of these works is to preserve the softness of the soil, destroy weeds, provide favorable water, air and food conditions, as well as creates the conditions necessary for good plant growth and high yields. During the development of corn and chickpeas, you need to go through 3 periodic treatments. To achieve full germination in the fields, the soil cover should be softened after oil, and the water should be retained with a lack of moisture.

For the first time since the formation of 1-2 true leaves in plants, they must undergo the first treatment by introducing 150 kg of urea per hectare. The second treatment should be carried out when 4-5 leaves are formed, and then feed 250 kg of ammonium nitrate per hectare along with a cough. When 8-10 leaves are formed on the plants, you should pull out the cache to retain water after inter-row processing. Water for cultivation should be treated with cash vodka at the rate of 900-1500 cubic meters per hectare each time.



*Figure 15. Corn grains*

**Harvesting.** The most important task is to harvest the harvested corn and sorghum in a timely manner and without losses. Therefore, combines and tractor trailers must be repaired in a timely manner. The reception areas of corn and sorghum fields should be prepared for the season, and for the smooth operation of agricultural machinery, prepare a headland at the edge of the fields with a width of at least 10 meters. It is more profitable to use roads and temporary overlaps to ensure there are sufficient reversal zones. Corn should be harvested with a grain content of no more than 40 percent. The grain is harvested when the grain is fully ripe and the silage is harvested for the breeding season and for green grass. Corn and sorghum are harvested using combines. Harvesting should be organized as soon as possible.

Table 1

## Agro technical measures for the cultivation of fresh alfalfa

№	Measures to be taken	Rules	The timing	
			In Akhal, Balkan, Mary regions and in the southern districts of Lebap region	In the Dashoguz region and in the northern districts of the Lebap region
1	2	3	4	5
1	Watering before travel (if necessary)	600 m <sup>3</sup> / ha	20.07-20.08	-
2	Fertilization before plowing	Rotten manure - 10-15 t/ha; superphosphate-400-600 kg/ha; urea-100 kg/ha; potassium chlorine-100 kg / ha.	01-30.08	25.10-01.12
3	Keeping a cultivation of caterpillars	32-35 cm	10.08-05.09	01.11-05.12
4	Deep softening (25-30% heavy soils)	Under ploughing in 10-12 sm depth 1 time in 3 years	10.08-05.09	01.11-05.12
5	Align	Transverse section	15.08-10.09	15.11-15.12
6	Preparation of land for ablution and growth watering (excavation of temporary dams, crest)	Between: 60 cm: 18-20 cm deep; 90 cm: 23-25 cm deep; 0.15-0.25 ha on light soils; on medium, heavy soils 0.25-0.35 ha.	08.20-15.09	20.11-20.12
7	Combination of ablution and growth watering	2000-3000 m <sup>3</sup> / ha	20.08-20.09	10.01-25.02

*Continue of table 1*

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
8	Presowing arable: -Temporary closures, straightening, chisel, rake-cattle with a set; - softening the ridge on sloping areas	12-14 cm in light soil; 14-16 cm in medium soil; 16-18 cm in heavy soil; 6-8 cm.	15-30.09	05.03-25.03
9	Sowing	15-17 kg/ha	15.09-15.10	10-30.03
10	Growth watering	800-1000 m <sup>3</sup> /ha	15.09-20.10	15.03-05.04
11	1st growth watering	800-1000 m <sup>3</sup> /ha	01-30.11	04.25-15.05
12	Carrying out pest control measures	Recommended insecticides	During the development period (if necessary)	
13	2nd growth watering	900-1000 m <sup>3</sup> /ha	20.03-10.04	05.25-10.06
14	3rd growth watering	900-1000 m <sup>3</sup> /ha	20.04-10.05	20.06-10.07
15	1st place		20.05-10.06	01-20.07
16	4th Growth Watering	900-1000 m <sup>3</sup> /ha	01-20.06	10-30.07
17	Conducting round 2		20.06-10.07	05-25.08
18	5th growth watering	900-1000 m <sup>3</sup> /ha	01-20.07	15-30.08
19	Conducting the 3rd round		10-30.08	25.08-10.09
20	6th growth watering	900 m <sup>3</sup> /ha	10-30.09	-
21	Conducting 4 rounds		01-20.10	-

**Note:** depending on weather conditions, the recommended agro technical norms and terms may differ.

Table 2

**Agro technical measures for the cultivation of alfalfa for two to three years**

№	Measures to be taken	Rules	The timing	
			In Akhal, Balkan, Mary regions and in the southern districts of Lebap region	In the Dashoguz region and in the northern districts of the Lebap region
1	Fertilize	Superphosphate 400 kg / ha; Potassium chloride - 100 kg / ha.	10-28.02	15.02-05.03
2	Climb	5-6 sm	15.02-05.03	20.02-10.03
3	1st growth watering	1000-1200 m <sup>3</sup> / ha	20.03-10.04	10-25.04
4	Carrying out pest control measures	Recommended insecticides	During the development period (if necessary)	
5	2nd growth watering	1000-1200 m <sup>3</sup> / ha	04.25-15.05	15-30.05
6	1st place		15-30.05	05.25-15.06
7	3rd growth watering	1000-1200 m <sup>3</sup> / ha	05.25-15.06	10-30.06
8	Conducting round 2		10-25.06	06.25-10.07
9	4th growth watering	1000-1200 m <sup>3</sup> / ha	06.20-15.07	05-25.07
10	Conducting the 3rd round		05-20.07	20.07-10.08
11	Fifth growth watering	1000-1200 m <sup>3</sup> / ha	15-30.07	01-20.08
12	Conducting 4 rounds		01-20.08	20.08-10.09
13	6th growth watering	1000-1200 m <sup>3</sup> / ha	15.08-05.09	01-15.09

*Continue of table 2*

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
14	Conducting round 5		25.08-20.09	20.09-10.10
15	7th growth watering	1000-1200 m <sup>3</sup> / ha	05-20.09	-
16	6th reaping		09.25-10.10	-

**Note:** depending on weather conditions, the recommended agrotechnical norms and terms may differ.

Table 3

## Agrotechnical measures for growing winter barley

№	Measures to be taken	Rules	The timing	
			In Akhal, Balkan, Mary regions and in the southern districts of Lebap region	In the Dashoguz region and in the northern districts of the Lebap region
1	2	3	4	5
1	Pre-sowing watering	600 m <sup>3</sup> / ha	10.06-15.08	-
2	Spraying the herbicides against weeds	Recommended herbicides	15.06-25.08	10.06-20.08
3	Pre-sowing fertilizing	Rotting course - 10-15 t / ha or 30-40 t / ha 1 time in 3 years; superphosphate - 400-600 kg / ha; potassium chloride - 100 kg / ha	15.06-25.08	10.06-20.08
4	Ploughing	23-25 cm deep	01.07-10.09	20.06-25.08
5	Align	Transverse section	05.07-15.09	20.06-30.08
6	Preparation of lands for flush and growth watering (temporary closings, pull lines, rake, jaw, break into parts)	Average: 60 cm: depth 18-20 cm 90 cm: depth 25-30 cm 0.15-0.25 ha on light soils; on medium, heavy soils 0.25-0.35 ha.	10.07-25.09	01.07-05.09

*Continue of table 3*

1	2	3	4	5
7	Seed treatment	Recommended fungicides	01-15.09	20-30.08
8	Combination of flush and growth watering	2000-3000 m <sup>3</sup> / ha	10.07-10.10	05.07-25.09
9	Soil tillage before sowing	12-14 cm in light soil; 14-16 cm on medium to heavy soils.	15.09-20.10	30.08-05.10
10	Fertilize before or after sowing	Karbamid - 100 kg / ha	15.09-25.10	30.08-10.10
11	Sowing	150-160 kg / ha	09.25-30.10	15.09-15.10
12	Growth watering (if growth water is not provided)	1200-1400 m <sup>3</sup> / ha	25.09-31.10	-
13	Fertilizing with nitrogen fertilizers for the first time	Karbamid - 100 kg / ha	10.11-10.12; in areas where autumn is not foreseen 15.02-15.03	10.10-10.11; in areas where autumn is not foreseen 15.02-20.03
14	1st growth watering	900 m <sup>3</sup> / ha	15.11-15.12	01-25.03
15	Spraying with herbicides against weeds	Suggested herbicides	if necessary	
16	2nd feeding with nitrogen fertilizer	Ammiak selitrasy - 150 kg / ha	10.03-15.04	10.03-25.04
17	2nd growth watering	800-1000 m <sup>3</sup> / ha	20.01-25.03	01.04-10.05
18	3rd growth watering	800-1000 m <sup>3</sup> / ha	10.03-15.04	10.05-10.06
19	4th growth watering	800-1000 m <sup>3</sup> / ha	05.04-05.05	-

*Continue of table 3*

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
20	Carrying out control measures of pests and diseases	Recommended insecticides and fungicides	During development (if necessary)	
21	Preparing to harvest barley	Line up temporary aviaries, chile and surrounding areas	15-30.05	20.05-05.06
22	Barley harvesting	Creation of national teams	20.05-05.06	05.25-10.06

**Note:** depending on weather conditions, the recommended agrotechnical norms and terms may differ.

Table 4

### Agro technical measures for the cultivation of corn and sorghum

№	Measures to be taken	Rules	Term			
			In spring		In summer (after wheat)	
			In Akhal, Balkan, Mary regions and in the southern districts of Lebap region	In the Dashoguz region and in the northern districts of the Lebap region	In Akhal, Balkan, Mary regions and in the southern districts of Lebap region	In the Dashoguz region and in the northern districts of the Lebap region
1	Pre-sowing watering (if necessary)	500-600 m <sup>3</sup> / ha	20.10-20.11	-	05.06-20.06	
2	Pre-sowing fertilizing	Rotten manure 10-15 t / ga; superphosphate 400-600 kg / ha; Potassium chloride 100 kg / ha.	25.10-10.12	25.10-01.12	10.06-25.06	15.06-25.06
3	Ploughing	28-30 cm	01.11-15.12	01.11-05.12	10.06-01.07	06.16-26.06
4	Leveling	Transverse section	15.12-25.02	15.11-25.02	13.06-28.06	06.17-29.06
5	Preparation of land for growth watering (drawing irrigation cages, ditching, sludge spill, digging temporary dams)	0.15-0.25 ha on light soils, on medium, heavy soils 0.25-0.35 ha, cache depth 18-25 cm	20.12-01.03	20.11-05.03	14.06-29.06	18.06-30.06
6	Combination of flush and growth water	2000-3000 m <sup>3</sup> / ha	20.12-15.04	20.11-20.04	-	-
7	Growth watering	1800-2200 m <sup>3</sup> / ha	-	-	-	18.06-02.07

*Continue of table 4*

1	2	3	4	5	6	7
8	Presowing processing (smoothing, combing, raking) and fertilizing with mineral fertilizers, processing with a chisel + rake + a set of cattle, soften the comb	12-14 cm in light soil, 14-16 cm on medium, heavy soils, urea 100 kg / ha, 6-8 cm deep	20.03-30.04	03/20/05/05	15.06-30.06	06.24-08.07
9	Sowing	Corn: For fetus 20-25 kg / ha, For silage 30-35 kg / ha, sorghum: For fetus 8-10 kg / ha, For silage 20-25 kg / ha	03.25-30.04	05.04-10.05	10.06-01.07	25.06-05.07
10	Take extra measures to remove germination (break the cover, wet watering).	900-1600 m <sup>3</sup> / ha	30.03-15.05	10.04-20.05	16.06-02.07	-
11	1st inter row processing	6-8 cm deep, protection zone 10-12 cm	15.04-20.05	25.04-25.05	04.07-15.07	05.07-20.07
12	Using herbicides against weeds	Recommended herbicides	04.25-30.05	05.05-10.06	10.07-25.07	15.07-30.07
13	By caching 1st feeding	Urea - 150 kg / ha	20.05-10.06	01.06-20.06	20.07-30.07	25.07-05.08
14	1st growth watering	900-1500 m <sup>3</sup> / ha	20.05-15.06	01.06-25.06	20.07-31.07	25.07-06.08
15	To pests and diseases Control measures	Recommended insecticides	15.04-10.08	04.25-15.08	06.25-25.08	30.06-30.08

*Continue of table 4*

1	2	3	4	5	6	7
16	2nd inter row processing	10-12 cm deep, protection zone 10-12 cm	25.05-20.06	05.06-30.06	25.07-05.08	30.07-10.08
17	By caching 2nd feeding	Ammonium nitrate 250 kg / ha	10.06-05.07	20.06-10.07	05.08-15.08	10.08-20.08
18	2nd growth watering	900-1500 m <sup>3</sup> / ha	10.06-10.07	06.20-15.07	05.08-16.08	11.08-21.08
19	3rd inter row processing	10-12 sm deep, Protected zone 10-12 sm	15.06-15.07	06.25-20.07	10.08-20.08	08.16-26.08
20	Caching	18-25 sm deep	25.06-25.07	10.07-15.08	08.20-30.08	26.08-31.08
21	3rd growth watering	900-1500 m <sup>3</sup> / ha	30.06-30.07	15.07-10.08	21.08-31.08	28.08-05.09
22	4th growth watering	900-1500 m <sup>3</sup> / ha	15.07-15.08	05.08-30.08	10.08-20.08	20.09-30.09
23	Fifth growth watering	900-1500 m <sup>3</sup> / ha	01.08-30.08	-	01.10-10.10	-
24	Preparing fields for harvest	Temporary overlaps, elevations and leveling of plots, turning zones 8-10 meters wide	01.08-15.09	10.08-25.09	15.09-15.10	09.25-15.10
25	Harvesting	Standing still (for silage) When the grain is fully ripe (for grain)	01.08-25.08 15.08-20.09	10.08-01.09 25.08-30.09	20.09-05.10 15.10-25.10	01.10-20.10 -

**Note:** Early maturing corn and sorghum varieties and hybrids should be planted in summer. Recommended agro technical rules and terms may vary depending on weather conditions.

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**MANUAL ON THE FEEDING CROPS**