MARKET NOTE ON THE FOOD PROCESSING CHAIN IN TURKMENISTAN

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INDEX

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1. Macro-economic Outlook of Turkmenistan and Growth Expectations

Turkmenistan has large reserves of various natural resources, including gas and oil, and for a long time the country developed first according to the resource model, and then the industrial-resource model. However, the dialectics of the development of the world economy and the experience of several industrialized countries have shown that in modern conditions it is not so much natural resources as innovations and education that determine the progress of any country. And a series of global economic crises in the last decade has only accelerated Turkmen government understanding that the growth rate of the modern economy and its qualitative structure are determined by the innovative and technological model of development and the digital economy. And today in Turkmenistan, science-intensive technologies and innovations are increasingly becoming the main tool for building up economic potential.

The economy of Turkmenistan is diversified with companies operating in various industries: oil and gas production and refining, power generation, chemical and petrochemical, construction materials and construction, transport and communication, textiles and food manufacturing, agriculture. The hydrocarbons sector takes the lead, as the country is the home of the fourth largest proven reserves of natural gas in the world according to the Statistical Review of World Energy, 2021.

Since gaining independence in Turkmenistan, the structure of GDP has traditionally had a high share of accumulation. Accumulation primarily implies investment in the economy, the construction of new industrial and socio-cultural complexes. This gave the country the opportunity, firstly, to diversify the economy from and transition from a resource model to an industrial-resource model, and later to an industrial-innovative model of development; and secondly, to increase the volume of GDP itself at a high rate due to new industrial facilities.

Turkmenistan, which declared its independence on October 27, 1991 with the collapse of the Union of Soviet Socialist Republics, is located in the south-west of Central Asia, in the middle of the Caspian Sea and the Amuderya. Neighboring countries within the borders of Turkmenistan, which has a surface area of 488,100 km^2 ; Iran and Afghanistan in the south, Kazakhstan and Uzbekistan in the north and east, and the Caspian Sea in the west.

Turkmenistan's economy grew by an average of 15% between 1999 and 2008, and in 2009, the growth rate decreased to 6% with the effect of the global financial crisis. The economy, which recovered by 9% in 2010, expanded by 11.6% on average in the 2011-2014 period due to the increase in oil revenues. In 2015 and the following period, the growth is around 6%. The country, which is estimated to have grown by 1.8% in 2020 with the effect of the epidemic, is expected to expand by 4-5% in the following period.

Like other post-Soviet countries, the country went through a deep economic downturn in the 1990s. However, even in such conditions, thanks to the effective economic and social reforms carried out, Turkmenistan first achieved stabilization of the economy and real incomes of the population, and then their growth. For the period 2007-2020 the average annual growth rate of real GDP was about 10%, which is a very high figure. As a result of effective structural transformations of the economy in terms of GDP per capita, according to the classification of economic systems of the World Bank, since 2001, Turkmenistan has moved from the group of countries with low incomes to the group of middle incomes, and in 2012 - to the group of countries with incomes above the middle level. Today, GDP per inhabitant is more than 8 thousand US dollars, and in terms of Purchasing Power Parity - more than 19 thousand US dollars.

Due to what factors did the economy of Turkmenistan manage to avoid a serious crisis? First of all, due to the fact that in the economy, as already noted, over the past 10-15 years, a high share of investment in the gross product has been constantly maintained. This, along with tens of thousands of new jobs, made it possible to significantly increase the volume of manufactured products. By creating new high-tech industries, the country began to process most of the raw materials (oil, gas, cotton, etc.) into final export products that are many times more expensive on the world market than the raw materials themselves.

The country has an internally coordinated system of strategic planning, which is based on the National program of social and economic development of Turkmenistan for 2011-2030. The strategic goal of this and all other national programs is to further build the foundations for the formation of a dynamic, diversified, competitive and high-tech economy, which will ensure the rational use of the existing potential and sustainable long-term economic and social development of Turkmenistan. The implementation of these programs ensures the efficiency and growth of the economy, as a result of which control over their implementation is carried out by the head of state himself.

Today, in order to increase the efficiency of the national economy, improve its competitiveness in the world market, and also taking into account the volatility of the international oil market, the government has now focused on the introduction of the digital economy, the use of innovative methods and approaches in all sectors and, as a result, the transition from the industrial raw material model economy to an industrial-innovative, digital development model.

In the economy of Turkmenistan, it is possible to conditionally distinguish between the public and private sectors. The public sector, having large financial resources and direct access to the world's leading discoveries and technologies, successfully applies many innovations. One can give an example of one successful innovative project already implemented in the country in 2019 - the largest gas chemical production - the world's first plant for the production of gasoline from natural gas on an industrial scale. This unique high-tech enterprise for the first time carries out large-scale “distillation” of natural gas into liquid fuel - gasoline. The cost of the complex is about 1.7 billion US dollars. The enterprise provides employment for 700 people. This innovative project makes it possible to annually process 1 billion 785 million cubic meters of natural gas and produce 600 thousand tons of A-92 gasoline that meets the requirements of the Euro-5 standard, which is in great demand on the world market. It also provides for the production of 12 thousand tons of diesel fuel and 115 thousand tons of liquefied gas per year.

The private sector in Turkmenistan does not yet have such financial and resource capabilities as the state, nevertheless it is more efficient, flexible and motivated to search for and implement new ideas in the market economy.

To increase the competitiveness of the country's economy in the world market and the transition to an innovative technological model of development and the digital economy, the Parliament and the Government have developed a number of legislative acts and state policy documents. These are the Concept for the Development of the Digital Educational System (September 2017); Digital Economy Development Program until 2021-2025 (November 2018); The program for transferring the sphere of science in Turkmenistan to a digital system in 2020-2025 (March 2020), the Law of Turkmenistan "On electronic document, electronic document management and digital services" (March 2020) and other important documents.

If we consider the macroeconomic indicators of Turkmenistan for 2022, it should be noted that the country's GDP growth rate reached 6.2%, and the volume of foreign trade turnover reached $20.1 billion, which is significantly better than the results of 2021 (growth by 32.9%). In 2022, as a percentage of the previous year, gas production reached 96.7%, while export deliveries increased by 61.4% in value terms. The increase in gas exports undoubtedly contributed to further acceleration of economic growth.

Without dwelling in detail on individual indicators at the end of 2022, we note that almost all sectors of the country's economy, both in the public and private sectors, demonstrated serious growth even in the context of the global economic crisis caused by the Covid19 pandemic.

At present, Turkmenistan is not only fully self-sufficient in grain, but since 2011 has become its exporter. In 2015, the Food and Agriculture Organization of the United Nations (FAO) awarded Turkmenistan with a special award for achievements in the field of ensuring food security as one of the Millennium Development Goals defined in the FAO program for the period up to 2015. If in 1991 about five hundred thousand tons of grain were produced in Turkmenistan, then in the last decade, on average, 2.5 - 3 times more annually.

Of particular note is the growth in exports of fruits and vegetables from Turkmenistan. Using its competitive advantages (climatic conditions, low domestic prices for gas, electricity), in 2021 Turkmenistan supplied to the foreign market more than 104.5 thousand tons of greenhouse tomatoes with a total value of 92.2 million US dollars, which is 24.4% more than in 2021, which is more than three times than in 2020!

Various world agencies note the successful growth of the Turkmen economy in recent years. Thus, the American rating agency Fitch confirmed the long-term rating of Turkmenistan at the level of "B +" with a "Stable" outlook. For the first time this rating was assigned to Turkmenistan country in August 2021. And public sector debt fell to 11.5% due to large repayments on foreign loans.

Turkmenistan actively develops its foreign economic relations with other countries. It has established regular trade relations with 119 countries. Turkmenistan also engages with the multilateral financial institutions such as the International Monetary Fund (IMF), the World Bank, the European Bank of Reconstruction and Development, the Asian Development Bank (ADB), the Islamic Bank of Development, OPEC International Development Fund, Abu Dhabi Development Fund and others.

The country is a member of about 50 international organisations, including the United Nations and its agencies, ECO, CIS, OSCE, Non-Aligned Movement, Islamic Organisation of Cooperation, Energy Charter, IMF, World Bank, ADB, Central Asian Regional Economic Cooperation (CAREC), World Health Organization (WHO), International Organisation for Migration, International Atomic Energy Agency, Gas Exporting Countries Forum and others. Turkmenistan has joined World Trade Organisation in 2021 as an observer member, moreover Turkmenistan has also joined over 150 international conventions, treaties and other multilateral documents since its independence. Turkmenistan recognises the priority of the generally recognised norms of the international law.

Recently, Turkmenistan received a new status of a country "joining the World Trade

Organization" (after the status of "observer country"). With the receipt of such a status of a country joining the WTO, in accordance with the rules of procedures of this international organization, a special Working Group on Turkmenistan's accession to the WTO was established, and this enhances the realization of the geopolitical and economic opportunities of Turkmenistan.

Macroeconomic indicators for 2021

TOP-5 Trade partners	Turkey, UAE, Japan, China, Russian Federation
TOP-5 Export position	Natural Gas, petroleum products, petroleum, cotton fiber, electric energy
TOP-5 Import position	Equipment, machines, non-precious metals and their products, products of stone, gypsum, glass, chemical products

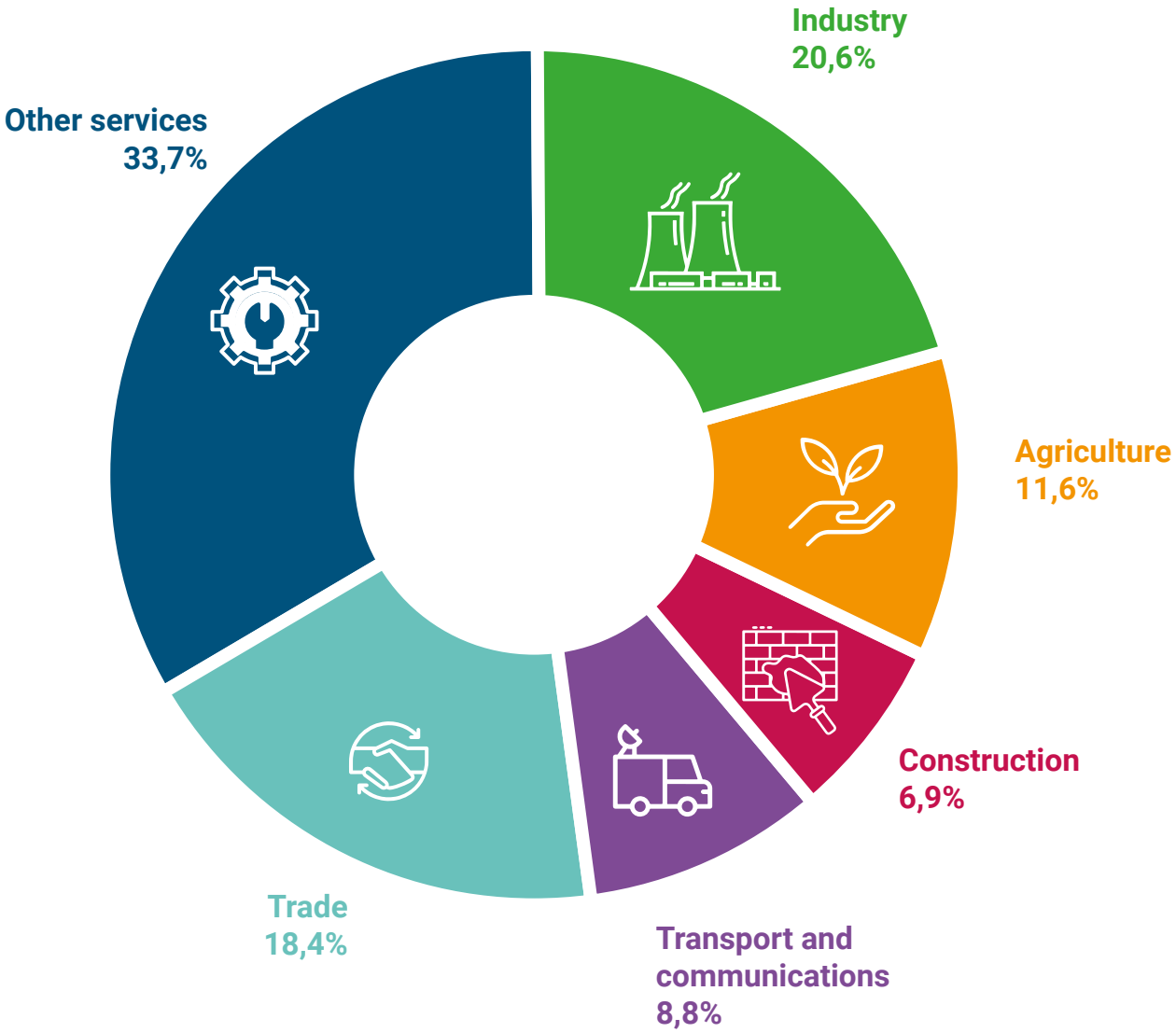
Cotton fiber, sheep, goat, camel wool, licorice root and other agricultural products of the country are in demand in foreign markets.

In general, it can be said that the Turkmen economy has been successfully developing over the years of independence and has already reached the necessary stability and maturity inherent in the developed countries of the world. And today, thanks to macroeconomic, energy independence, large reserves of natural resources, a developed transport and logistics structure, as well as the introduction of digitalization programs and new innovative, environmental approaches, closer interaction with the environment, the country's enterprises have good opportunities to enter the dynamically developing largest Asian markets, European and CIS countries.

Dynamics of the main macroeconomic indicators of Turkmenistan

INDICATORS	2016	2017	2018	2019	2020	2021	2022
GDP GROWTH (%)	6,2	6,5	6,2	6,3	5,9	6,2	6,2
FOREIGN TRADE TURNOVER (MILLION USD)	20697	17976	16974	13780	11294	15110	20081
EXPORT (MILLION USD)	7520	7788	10472	8607	6042	8860	12719
IMPORT (MILLION USD)	13177	10188	4840	5174	5251	6250	7362
CONSOLIDATED INDEX CONSUMPTION (PRICE)	106,2	110,4	107,2	106,5	108,9	121,2	103,1

Gross domestic product of Turkmenistan 2022, structure (%)


Industry
20,6%
Agriculture
11,6%
Construction
6,9%
Transport and
communications
8,8%
Trade
18,4%
Other services
33,7%

2. Social Economical Overview of Turkmenistan

Since nearly half of Turkmenistan's population lives in rural areas, most of the population is employed in agriculture. The share of those working in the agricultural sector in total employment has relatively decreased over the years, while the share of employment in agriculture was 34.3% in 2000, it decreased to 20.7% in 2019. It is observed that the rate of urbanization and employment in industry increased in parallel with industrialization in developed and developing countries, while it decreased in the agricultural sector. While 27.8% of women and 39.1% of men employed in Turkmenistan in 2000 worked in agriculture, this rate decreased to 18.7% in female employment and 22.1% in male employment in 2019.

Table. Employment in agriculture
(% of total employment) (modeled ILO estimate)

Year	Labor Force (000)	Employment in agriculture (%)	Employment in agriculture, Male (% of male employment)	Employment in agriculture, Female (% of male employment)
2000	1,539	34.3	39.1	27.8
2011	1,766	28.4	29.9	26.2
2012	1,778	27.4	28.8	25.5
2013	1,788	26.5	27.8	24.6
2014	1,800	25.5	26.7	23.8
2015	1,821	24.5	25.9	22.6
2016	1,837	23.6	25.0	21.8
2017	1,860	22.7	24.0	20.8
2018	1,888	21.7	23.1	19.7
2019	1,914	20.7	22.1	18.7

Source: The World Bank, 2022

3. Overview of Turkmen Food Production Sector in Turkmenistan

Sustaining food security is among priorities of the State Policy of Turkmenistan and Laws of Turkmenistan "On Food security", "On safety and quality of foodstuffs" define legal arrangements related to this important topic.

The share of the private sector in agro-industrial production is increasing dynamically as the result of support given to private sector involved in all steps of food value chain, including modernization of agricultural production, storage, processing and distribution infrastructures, as well as providing concessional lending.

The state policy in this field is aimed at achieving production of sufficient amount of foodstuffs inside the country and decreasing the share of imported food products.

Production of strategic crops like wheat, cotton, sugar beet, potato etc. is under strict state control and their production is subsidized by the state.

Land plots for production of these crops are allocated to farmers with obligation of production of specific amount of crop and producers are provided with fertilizers, agricultural machinery and water at lowered prices (50% discounts).

Produced amounts of strategic crops are received and stored at the enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan for further processing and delivery to consumers.

Processing enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan process and provide food to institutions funded from the State budget, like kindergartens, military divisions, schools, hospitals etc. with sufficient amount of goods at lowered prices.

In addition to these institutions, these goods are also delivered to local population through retail markets of the Ministry of Trade and Foreign Economic Relations of Turkmenistan.

The price of food products produced in the state food processing enterprises is defined by the Ministry of Finance and Economy of Turkmenistan and usually are lower than the price of imported goods.

Processing of other crops, like dairy products, meat products, fishery products etc. are performed by the representatives of the private sector.

Since the agricultural production of Turkmenistan is based on irrigated agriculture (the area of irrigated lands is about 1.8 million hectares), the activities of the two leading sectors of the country's economy – agriculture and water management - are under the great influence of global warming and are inextricably linked with each other.

The agriculture provides about 10% of the gross domestic product (GDP) in the country's economy. In addition, about 50% of the country's population lives in rural areas. Over the past decade, the share of livestock production has increased in the total value of agricultural products. One of the main reasons for this is that at present more than half of the livestock is concentrated in personal subsidiary farms.

The socio-economic development programs of the country provide for an increase in irrigated area to 2 million hectares by 2030.

This dictates the need for a set of preventive adaptation measures that will make up for the shortage of water resources expected with climate change. The quantity and quality of crops in the world increasingly depend on weather conditions. Lack of response by the agricultural sector to ongoing climate change can lead to negative consequences. The best way to reduce the dependence of agriculture on possible global climate changes is to adapt to them.

Traditional system of farming and animal husbandry, as an important part of the national culture in the territory of Turkmenistan, is highly adaptable, ecologically resilient to the peculiarities of arid, hot, sharply continental climate, soil, topography, and weather caprices. Global climate change may adversely affect the state of the country's livestock feed supply.

Natural pastures as a source of valuable gene pool for selection and introduction of new species and varieties of fodder plants, production of high-quality cheap fodder are of great importance in the development of domestic animal husbandry.

4. Agriculture sector in Turkmenistan

The agricultural sector of Turkmenistan plays important role in the national economy of the country, comprising 11.5% of the GDP in 2022. 48.2% of the labor force is used in agriculture. However, only 4% of the country's land is used for these purposes. The main types of agricultural crops are wheat, cotton, rice, sugar beet, fodder, vegetable, melon, and fruit crops.

The development of agriculture is carried out on a scientific basis. Various types of agricultural crops are optimally placed taking into account the agro-ecological characteristics of the country's regions, scientifically based crop rotation schemes are being introduced.

The potential of Turkmenistan's natural resources in general, and land and water resources in particular, allows for the accelerated development of the country's agricultural sector, and large-scale reforms are being carried out here to ensure sustainable growth in agricultural production and labor productivity.

State support for agricultural producers is provided in the form of granting preferential loans to peasants, paying 50% of the cost of mechanized work, sowing seeds, fertilizers, chemical plant protection products, regular increases in purchase prices for grain, cotton, sugar beets and rice, symbolic payments for land and irrigation water, are exempt from all types of taxes.

To meet the growing needs of the population of Turkmenistan in food products, much attention is paid to increasing the volume of manufactured products. As a result, in recent years, the volume of production of vegetable, melon and fruit and berry products has sharply increased, the area of perennial fruit plantations, vineyards and greenhouses has increased.

According to the National Program for the Socio-Economic Development of Turkmenistan for the period of 2022-2052, as a result of measures aimed at diversification of the sectors of the economy, the share of agriculture in the gross domestic product of the country in 2052 is will be about 6%. This transformation will be achieved through creation of an innovation system aimed at the rational use of natural resources and local raw materials, the development of agricultural, livestock and seed breeding industries of the country and consistent development in accordance with best practices.

The share of the non-governmental sector in all sectors of the national economy, including agriculture is growing at a consistent pace. In particular, in 2021, the vast majority of products and services produced in the country, including 96.6% in the agriculture system are accounted for by non-state sectors. This was possible as a result of active involvement of the private sector in large-scale projects carried out in the industrial, agricultural, trade, transport and service sectors of the country.

According to long-term commitments of the country under state and sectorial programs modern technologies and experience in the rational use of land and irrigation water will be introduced, crop yields and livestock productivity will be increased, agricultural enterprises and farmers' associations will be institutionally transformed, water-saving technologies in agriculture will be introduced and cost-effective irrigation methods will be applied, seed production activities will be improved, innovative solutions will be introduced into modern control over compliance with agrotechnical standards, special attention will be paid to the feed supply of livestock and poultry in order to increase the production of meat and meat products.

4.1. Environmental factors

Turkmenistan is located in a drought climatic zone with a very limited amount of water resources and a low rate of annual precipitation, as well as 80% of the territory comprising desert. Agricultural production requires irrigation and 90% of all water resources of the country are provided by Transboundary rivers flowing from abroad.

Turkmenistan has the harshest climate in Central Asia with the highest air temperatures and lowest levels of precipitation. In recent years, a sustained rise in air temperatures has been observed. Maximum temperatures are increasing, while minimum temperatures are decreasing. Furthermore, the variability of monthly precipitation levels has been increasing. Overall, the climate is trending towards more drought-like conditions with increasing occurrences of shock events such as flash flood runoffs, mud flows, intense rainfall events and intense heat waves.

Eighty percent of Turkmenistan's surface is comprised of the flat Karakum Desert with the remaining 20% mostly consisting of mountainous zones. Summers are long, hot, and dry, and winters are cold and dry. Annual precipitation ranges from only 80 mm in the northwest to 300 mm in the Kopet-Dag mountain range along the border with Iran. Along the Caspian coast, elevations are at or below sea level for as much as 150 kilometers inland. The northern part of the country, located in the Siberian anticyclone area, is characterized by severe and long winters with continuous snow cover and average annual temperatures fluctuating between 13°C – 16°C. The southern part of the country is characterized by mild winters with occasional snow cover and average yearly temperatures ranging between 18°C – 22°C.

Over the last 60 years, increasing temperatures have been observed and documented in the desert country of Turkmenistan as occurring at a faster pace than in many other parts of the world. The average air temperature has increased by almost 2oC between 1950 and 2010. Already extremely hot and dry, the country is projected to experience an increase in average annual air temperature by 2.21°[2] by 2040, with further warming of 5.35 °C by 2100. These increases in temperature add additional pressure on surface water availability, which

is a primary source of irrigation and drinking water.

All water basins in Turkmenistan are transboundary and originate from outside of the country. Amyderya river, the biggest water source, starts in the Pamir mountains in Tajikistan, crosses northern Afghanistan and enters Turkmenistan. This illustrates that besides the growing water deficit concern, the country has limited control over the water volumes it receives through transboundary sources. Furthermore, Dashoguz region is part of the "Aral Sea Basin Crisis Area", with highly salinized lands and poor-quality water. This subsequently affects the socio-economic development of the area, in particular, the agricultural activities and human health.

Increases in temperatures will contribute to increased evaporation rates of the Amu-Darya River, the nation's main source of water, which is already suffering from high levels of off-take from Turkmenistan and neighboring countries.

Furthermore, hydro-meteorological modeling suggests there will be a steady decline in precipitation nationwide. In the next 30 years, the amount of precipitation will slightly decrease; however, by 2050 precipitation is expected to fall dramatically, reducing by as much as 22% by 2100 from current rates. Expected precipitation decrease in the central Asia region will contribute to a reduction of the flow of the Amu-Darya River by 10-15% by 2050.

These two climate trends of reduced precipitation and increasing temperatures will be accompanied by an increase in the frequency and severity of disaster events caused by climate change (droughts, floods, and windstorms).

4.1.1. Climate conditions

Understanding the scarcity of the problem, Turkmenistan ratified all main climate change-related international multilateral agreements, including the United Nations Framework Convention on Climate Change, Paris Agreement, etc.

Paying attention to the implementation of obligations under these multilateral agreements, Turkmenistan adopted its first National Strategy on Climate Change in 2012. This document, which defines the main directions of the state policy of Turkmenistan in this field, has been revised and adopted for the second time in 2019.

The national forestry program deriving from the National Strategy of Turkmenistan on Climate change was also prepared and adopted twice in 2013 and 2020.

About 3 million of trees are planted annually in Turkmenistan under the national forestry program of Turkmenistan.

In the National Strategy of Turkmenistan on Climate Change, much attention was paid to the development of the country's water sector as the most vulnerable one to the effects of climate change. For the period under review, activities were carried out and are still in process to adapt the country's water economy to climate change, including the secondary use of collector-drainage water and provision of governmental soft loans for the introduction of modern water-saving technologies.

Climate change-related challenges require new approaches to traditional methods of irrigation and crop growing. Implementation of climate-smart technologies into agricultural production is a priority need at this stage of development.

Improvement of meteorological forecasting for the needs of agricultural production is also among the priorities. Drought-related challenges also require the implementation of best practices in pasture management.

Agroforestry is considered as an efficient method of land reclamation of agricultural lands.

In Turkmenistan, the problem of global climate change is considered as a possible serious obstacle to the implementation of planned economic development and improving the welfare of the country's population. The strategy of economic, political and cultural development of Turkmenistan for the period up to 2030 determines the national priorities of the country. Taking into account the relevance of climate change issues for sustainable development of Turkmenistan, on June 15, 2012, the National Strategy of Turkmenistan on Climate Change (The National Strategy of Turkmenistan on Climate Change) was adopted, which is the main national document in the field of climate policy.

The National Strategy of Turkmenistan on Climate Change represents the national vision of climate change issues and is the basis for the development and implementation of Turkmenistan's state policy on climate change and its consequences.

The strategy includes measures to improve energy efficiency in all major sectors of the economy, for technical modernization and for the implementation of energy systems based on renewable energy sources in remote and sparsely populated areas. It is aimed at increasing the share of renewable energy sources in the country's fuel and energy balance and at developing economic incentives for their use. Based on the strategy, a National Action Plan on Climate Change Adaptation and Mitigation is being developed, which will become part of a broader green economy development plan.

Priorities of adaptation of agriculture of Turkmenistan to climate change according to the National Strategy of Turkmenistan on climate change are as follows:

1. development and implementation of a set of measures to adapt agricultural production to climate change;

2. optimization of the distribution of agricultural production, considering the country's needs for the obligatory agricultural products and minimizing the use of water resources;
3. creation of agricultural innovation systems providing consulting services to agricultural producers;
4. adoption of a new edition of the Land Code of Turkmenistan, considering climate change and other related legislative and regulatory acts;
5. improving the legal basis of rural business communities to develop their self-organization;
6. implementation of measures to strengthen the human capacity of analytical laboratories for environmental protection, land resources and hydro-meteorological services, and their retraining in modern ways of processing analysis results;
7. comprehensive reconstruction of irrigated lands (CRIL);
8. conducting phyto-reclamation works;
9. development of programs on combating desertification, soil erosion and restoration, and further use of lands with low productivity;
10. "greening" agricultural production and obtaining high-quality and safe food and raw materials for industry;
11. breeding works on the cultivation of salt resistant and drought tolerant crops;
12. implementation of methods and practices to obtain several harvests per year;
13. development of economic and mathematical models for optimizing the distribution of agricultural production;
14. introduction and strict observance of pasture rotation, creation of pasture protection belts of fodder tree and shrub plants;
15. re-allocation of pastures between land users, taking into account forage consumption and future growth of livestock numbers;
16. introduction of documentation certifying the right to use and lease pastures;
17. design and implementation of projects with the introduction of pasture rotation;
18. further development of livestock husbandry with respect to adaptation measures;
19. significant increase in the area of irrigated pastures;
20. introduction of solar and wind installations for the power supply of outrun livestock breeding;
21. expansion of the area of halophyte crops in the zone of "Altyn Asyr" Turkmen lake for winter feeding of livestock.

4.1.2. Irrigation conditions

The entire irrigated territory of Turkmenistan is divided into five subzones, each of which has its own characteristic features, according to natural and climatic, soil and reclamation, economic and other conditions. The basis for the division of irrigated areas into separate subzones is a complex of natural and climatic conditions that determine the amount of evapotranspiration of agricultural crops, which is the sum of plant transpiration and evaporation from the soil surface.

The SOUTHWESTERN SUBZONE covers the territory of the Balkan region, including the oasis-Meshet-Misserian massif. The southern mountainous regions are characterized by favorable climatic conditions (subtropical) for growing valuable varieties of subtropical crops here. It is also possible to grow technical (cotton, sugar beet), fruits and vegetables, cereals, fodder and legumes and gourds.

The average annual air temperature is 15.9-16.0°C. Its absolute maximum reaches 46°C. The average annual amount of precipitation is 148-205 mm, and on the flat part - 154-196 mm. The sum of the air temperature above 10°^{2} during the vegetation period is 51-50°. Evaporation from the water surface on average per year is 1709mm.

KOPETDAG SUBZONE covers the territory of Akhal region from Bakharden to Kaka districts inclusive. Natural and climatic conditions are almost the same as in the Southwestern subzone. The sum of positive air temperatures is 5300-5400°C. Evaporation from the water surface is 1447mm. The total water consumption of an irrigated field with a groundwater depth of 1m is 10000-10500m3/ha, 3m and below - 8000m3/ha. Cultivated crops are cotton, cereals, fruits and vegetables, gourds, legumes, fodder.

The MURGAP-TEJEN SUBZONE covers the lands of the Mary and part of the Akhal regions, including the Khauzkhan massif. The average annual air temperature varies within 15.4-17.1°C. The sum of positive temperatures is 5000-5300°C. During the year falls from 116 to 241mm of precipitation. In some years, they increase to 254-423mm and decrease to 34-132mm. Evaporation from the water surface is 1500-1600mm. The total evaporation of the field at a depth of groundwater of 1 m is 10500-11000, at a depth of 3 m and below - 8000-8800 m3/ha. The climatic conditions allow growing here medium and fine-fiber varieties of cotton, as well as fodder, cereals, fruits and vegetables, legumes, melons, and gourds.

THE MIDDLE AMUDARYA SUBZONE covers all districts of the Lebap regions. Its climate is characterized by extremely unstable weather in the cold half of the year and relatively stable hot and dry summer. The average annual air temperature throughout the territory is positive and is 13.5-18.0°C. The sum of average daily air temperatures above 10°^{2} is 4900-5200°, reaching 5560° in the southern regions. The annual amount of precipitation is from 104 to 144 mm. In the southern regions, it reaches 185 mm, of which 48 mm falls during the warm period. Cultivated crops are cotton, cereals, rice, fruits and vegetables, gourds, legumes, fodder.

The LOWER AMUDARYA SUBZONE is located on the left bank of the lower reaches of the river. Amudarya within the boundaries of the Dashoguz region. In terms of its climatic conditions, it differs sharply from other regions.

The average annual air temperature is 11-12°C. The temperature of the coldest month (January) is below zero and is -4.7-6.0°C. Frosts last over three months. The absolute

minimum temperature is minus 33-36°C. The sum of positive temperatures is 4040-4300°C, which makes it possible to cultivate here only early-ripening medium-fiber varieties of cotton and other agricultural crops, such as cereals, fruits and vegetables, melons, legumes, rice and fodder (including sorghum). The annual rainfall is 76-90mm. Evaporation from the water surface is 1300mm.

Agricultural land is mainly irrigated by surface irrigation. A small part is irrigated using a drip irrigation system (mainly orchards) and occasionally sprinkler irrigation is used on winter wheat crops. Among the surface water resources of Turkmenistan, the most important are the Amudarya, Murgab, Tejen and Atrek rivers. The Amu Darya plays a key role in the water supply of Turkmenistan. The largest man-made water artery, the Karakum River, annually takes 10-12 km3 of water from the Amu Darya and delivers it to dry or waterless regions of Turkmenistan. The Amu Darya is the main, vital source of water, providing almost 90% of the country's water needs. Other relatively large rivers of Turkmenistan (Murgab, Tejen and Atrek) have a total average annual flow of 2.7 km3, and a flow with a 90% probability of 1.4 km3. Thus, the total water resources of the average annual river runoff of large rivers, small rivers and springs are 27.1 km3/year.

On the plains, especially in the oases, an extensive network of irrigation canals has been built. The largest of them is the Karakum Canal, with a length of more than 1100 km. Overall water consumption in Turkmenistan is increasing, partly due to population growth, but also due to the deterioration of the irrigation system and the opening up of new land for grain production.

The most significant environmental problems in Turkmenistan include soil salinization and water pollution. The problem is compounded by the lack of adequate treatment facilities. The country's water supply is threatened by siltation of existing irrigation canals and drainage networks.

Turkmenistan is in the process of building a Golden Age Lake (also called Karakum Lake) in the Karashor Depression in the Karakum Desert. The new lake will cover 2,000 square kilometers (770 sq. miles), have a maximum depth of 70 meters (230 feet), and hold over 130 cubic kilometers (4,600 billion cubic feet) of water. It is assumed that the new lake will improve the ecological situation in the country, attract migratory waterfowl, stimulate biodiversity, etc.

The design of the construction of seawater desalination plants on the Caspian coast has begun. According to this project, desalinated water should be delivered to Ashgabat through two pipelines. Along the way of these pipelines, the creation of greenhouses and gardens based on the use of desalinated water with drip irrigation has also been considered.

The geographical position makes Turkmenistan very sensitive to climate change. The

water economy does not only provide agriculture with water, but also other sectors of the country's economy. This sector also satisfies needs of the society, providing a reliable drainage system, solving environmental problems and problems to combat the harmful weather effects.

In this regard, it is necessary to improve the system of joint water resource management in the region. Increasing the efficiency of irrigation systems will save significant amounts of irrigation water, which will become a significant reserve for replenishing the water shortage in the conditions of climate change. The introduction of advanced irrigation methods has shown that the transition from the traditional method of irrigation to new ones (drip, sprinkling, laser land leveling) allows to save up to 30-40% of water. Implementation of adaptation measures will significantly compensate for the shortage of water for irrigation, which may be caused by climate change.

The National Water Code, revised and adopted in October 2016, defines the conditions for water use and water management, especially in agriculture. Notably, it contains progressive provisions for encouraging innovation and conservation – including the gradual introduction of water metering and tariffs. It also established the legal status of water user groups, a new model, that enables smallholder farmers to band together for planning and the implementation of projects. However, in order to implement the National Water Code, there is a need to develop relevant complementary policy, regulatory and implementation instruments, including laws, by-laws, national and regional regulations and irrigation technical norms. The NAP will play an important role by driving the integration of climate change adaptation into relevant policy instruments that are being developed to operationalize the National Water Code. These instruments include: Criteria and quality indicators of irrigation water – Article 104 of the National Water Code (NWC); General requirements on protection of surface and underground waters from mineral fertiliser contamination - Art.90/NWC; Classification of water facilities of Turkmenistan - Art 7/NWC; Intra-ministerial standard on the use of reclamation systems and constructions. Technical requirements on water metering equipment and technologies – Art 20 and 41/NWC; Guidance on water control, primary calculation of water use – Art 25/NWC; Construction norms and regulations – Protection of agricultural lands and nature landscapes from flooding – Art 95/NWC.

The State Committee for Water Economy of Turkmenistan (SCWE). Established in January 2019 as part of the reform of the MAEP in which the SCWE was separated out. The SCWE is responsible for water management and distribution, including development of policies on water management, planning and management of state irrigation systems as well as having a mandate over water tariffs and pricing policies. Despite now being a separate entity from the MAEP, the SCWE is considered an integral part of the agricultural complex/sector and coordination and information sharing is harmonized between the two entities. This harmonization and close working relationship is enhanced by both entities being located in the same building. The SCWE will benefit from the project through the development and

access to information on water resources and utilization and capacity building on climate change adaptation. The SCWE will be represented on the Project Board and engaged in project decision-making, planning, implementation and monitoring processes.

The National Committee for Hydrometeorology (NCH) was also merged into the new MAEP in January 2019 and is now known as the Hydrometeorological Service. It is responsible for meteorological, hydrological, and agro-meteorological monitoring, developing forecasts for hydrometeorological events, surface water flow probabilities, accurate climate data for use in planning for crop sowing and harvesting, and, providing general hydromet information to the public. The Hydrometeorological Service is also tasked with developing scientific and technological cooperation in the area of hydrometeorology with neighboring countries, systemized exchanges of hydrometeorological information, complying with common methodologies of hydrometeorological observations, and hydrometeorological data collection and dissemination.

Turkmen State Water Management Research, Production and Design Institute "Turkmensuvylymtaslama" is a key research institute in the field of water management. The main areas of research activity include following:

- organization, realization and using the production and science development projects on the main areas of activity of water economy of Turkmenistan;
- study and distribution of world science and production achievements in water economy, development and distribution of recommendations, guidelines, training aids for its rapid implementation in water economy of Turkmenistan;
- organization and operating observations of the saline level of subsoil waters on the irrigative lands and joined territories, data information, data processing and analysis of these observations;
- research of the technical condition of irrigation and collector-drainage nets;
- Calculation of volumes of water for agricultural irrigation;
- Definition of a degree of salinization of the lands on basis of salinity surveys of soils and reconnoitering investigations;
- To work on recommendations in accordance with improving melioration condition of irrigated lands, including defining their spaces according to different essential melioration measures;
- To research aqueous-saline process in main areas of irrigated lands and efficiency of melioration and agro technical measures in relation to preserving and improving their melioration condition;
- Compiling computer programs, and conducting data of melioration cadastre of irrigated lands.

In 2012, under the aegis of the United Nations Framework Convention on Climate,

Turkmenistan has adopted the National Strategy of Turkmenistan on climate change mainly intended for building low-emission economy with an approach to overcome climate change issues and strengthening economic growth. Among its key objectives, the strategy priorities following efforts for the water management of Turkmenistan:

1. improving efficiency of irrigation systems through modernization and technical re-equipment;
2. improving water resource management through the transition to integrated water resource management (IWRM);
3. improving the legal regulation of management, protection and use of water resources through the adoption of by-laws to the Water Code of Turkmenistan (2016);
4. improving the system of joint water resource management in the region;
5. introduction of advanced irrigation methods (drip, sprinkling and others) and improvement of existing (traditional) ones, including the use of digital technologies;
6. introduction of advanced desalination methods and the re-use of collector-drainage water in compliance with environmental standards;
7. construction of reservoirs, reconstruction of hydraulic structures and ensuring the safety of dams;
8. development and implementation of methods to stimulate rational water use;
9. implementation of measures for reclamation improvement of used lands, ensuring reduction of losses and sustainable use of water, etc.;
10. introduction of modern methods and forms in the relations between the structures of water management agencies and water users;
11. improving water metering system and optimizing conditions for paid water use by introducing smart digital systems and technologies;
12. continuation of construction of "Altyn Asyr" Turkmen lake;
13. strengthening international cooperation in the field of conservation and use of transboundary water facilities;
14. construction of mudflow facilities, water collection to create additional water resources;
15. ensuring reliable functioning of coastal protective belts and hydraulic structures;
16. enhancing public participation in resolving issues of uninterrupted and high-quality water supply, as well as in programs to improve ecological education of the society;
17. expanding research woks in the field of water management;
18. creation of unified digital information system in the water sector;
19. development of new irrigation regimes of crops, considering natural and climatic factors;
20. development of smart irrigation planning information systems;
21. improvement of technical condition of irrigation and drainage systems;
22. transfer of diesel pumping stations to electric drive and use of alternative energy sources (solar, wind).

Private sector involvement in the water sector is confined to sellers of various water distribution and water saving technologies such as sprinklers, drip irrigation systems,

furrows, and other related products and involved in the construction of irrigation networks in support of government projects.

Additionally, with regards to the involvement of the private sector in agriculture (which is the major user of water) there is an increasing number of individuals engaging in commercial farming. The growth of private (non-state) farming is a result of ongoing economic reforms and diversification, and an increasing government focus on import substitution. The Union of Entrepreneurs and Industrialists estimates that there are 20,000-30,000 private commercial farmers at this time, and that they are making capital investments in land improvement, irrigation, and greenhouses.

Barriers to further private sector growth in the agriculture sector are a lack of awareness of climate-resilient approaches (best practices and technologies) that can strengthen resilience skills and awareness of private farmers. This dynamic is compounded by a lack of consideration of climate change within existing agricultural practices, training approaches and information materials. Lastly, there is also limited access to sustainable water/land/climate information products tailored for the private sector.

The increase in water use causes very important problems. For example, underground water resources are depleted, other ecosystems are polluted, deteriorated and many environmental problems arise. Therefore, it is important to use water more effectively in agricultural irrigation.

Only 53% of the water can be used in the desired direction. In the remaining 47%, losses occur during irrigation or during the transfer of water to irrigation channels. The outdated technology used in irrigation and irrigation in the form of flood irrigation increase the losses. The lands that are used effectively and that are not in danger of salinity constitute 53% of the total agricultural lands, and 47% of the lands are in danger of salinity. In order to correct this situation, the soil should be freed from salinity, unless this problem is resolved, it is inevitable that other crops, especially cotton and wheat, will continue to experience low yields.

4.2. Agricultural Land

In Turkmenistan, according to 2019 FAO data, the total agricultural area is 33.8 million hectares, and the cultivated agricultural land is 2.0 million hectares. As a result of urbanization, the increase in residential areas, the establishment of industrial facilities and the increase in tourism investments, the total agricultural area decreased by 4% in 2019 compared to 1992. While the cultivated agricultural areas were 1.5 million hectares in 1992, it increased by 29% to 2 million hectares in 2019. Water constraint is a limiting factor in the expansion of cultivated agricultural areas. When the land use situation in Turkmenistan is

examined; 4% of the land is cultivated agricultural areas, 65% are meadow and pasture areas, 8% are forests, 4% are water surfaces, and 18% are other areas.

Table. Land use in Turkmenistan (000 ha)

Land Use	1992	1995	2000	2005	2010	2015	2019
1.Total agricultural land	35,350	35,500	35,500	34,880	34,000	33,838	33,838
a-Arable land and land under permanent crops	1,550	1,800	2,000	2,100	2,000	2,000	2,000
b-Meadows and pastures	33,800	33,700	33,500	32,780	32,000	31,838	31,838
2. Forest land	4,127	4,127	4,127	4,127	4,127	4,127	4,127
3. Inland waters	1,817	1,817	1,817	1,817	1,817	1,817	1,817
4. Other land	7,516	7,366	7,366	7,986	8,866	9,028	9,028

Source: FAO, 2022

Soil and land resources play a unique role in the issue of climate change, being both an object of influence and a source of GHG emissions leading to climate change and carbon storage. Soil and land resources quality is changing in the process of using them in agricultural production and other sectors of the economy. Currently, the process of human influence to land has intensified. Along with the global climate change and the impact of other natural factors, this leads to desertification of large areas, increase in the volume of mineralized drainage flow, salinization, erosion, pollution, soil overgrowth, etc., and, in general, land degradation.

The major types of land degradation in Turkmenistan are secondary salinization in irrigated lands, soil erosion in the rainfed areas, and loss of vegetation, desertification, or detrimental change in the vegetation composition in the rangelands. The major proximate causes include unsustainable agricultural practices, the expansion of crop production to fragile and marginal areas, inadequate maintenance of irrigation and drainage networks, and overgrazing near settlements. Water management is one of the key issues for Turkmenistan. More than 90% of its water resources go to irrigation. At present, in Turkmenistan the total land used for agricultural purposes is 40 million ha, of which land fit for irrigated agriculture is 7 million ha, out of which approximately 2 million ha is currently irrigated.

An estimated 28% of the irrigated land is under low salinization, 57% is under moderate salinization and 11% of the irrigated area is highly salinized land. Water wastage from inadequate irrigation and poor infrastructure is significant and leads to waterlogging which further increases salinization. Soil leaching uses large amounts of water, which after evaporation further contributes to an increase of soil salinity.

In addition, many times drainage water used for irrigation contains not only a high salt content but also poisonous chemicals, defoliants, chemical fertilizers, and heavy metals,

thus exacerbating salinization and contaminating underground aquifers. Waterlogging and salinization has resulted in a decline in crop yield in Turkmenistan of some 25% from 2002-2012. It has been estimated that the cost of land degradation in Turkmenistan in 2009 was 870 million US dollars, equivalent to $1,083 US dollars per capita and 4% of GDP (Mirzabaev et al, 2015).

The Economic of Land Degradation (ELD) Initiative in Turkmenistan highlighted that more than half of the desert pastures of the country is affected by land degradation, the land value under the current land governance is estimated at US$ 35 per hectare and on-going losses of pasture productivity estimated at US$ 0.6 million annually. Water losses are estimated at an average of more than 40% due to the irrigation infrastructure and inadequate irrigation methods, with losses occurring especially at farm level. In the targeted four districts (districts) of Lebap and Dashoguz regions, data from 2010 show that the amount of water losses are ranging from 30-58%. In Turkmenistan the irrigation systems is constructed in earthen beds which leads to high seepage losses from irrigation canals and to the rise of groundwater table.

Soil degradation and desertification is observed in desert rangelands, about 50% of pastures are degraded including 4.5% heavily degraded. Desert vegetation of Turkmenistan consist mostly of small semishrub and shrub psammophyte communities with a relatively homogenous species composition, with the dominant species providing most of the productivity. The rate of degradation is caused by the overgrazing around wells and settlements and other anthropogenic impacts (cutting down of saxaul and other tree-shrub plants). Climate change and changing of precipitation patterns, water scarcity and poor pasture watering infrastructure accentuates the desertification process, the productivity of pastures and grazing sites being severely affected (during dry years, a reduction of the volume of forage by 3-5 times is observed).

In 2016, some 69% (34 million ha) of Turkmenistan's land was utilized for agriculture. Of the total agricultural area, around 6.0% (2 million ha) is considered arable, 94.0% (32 million ha) is classified as permanent meadow and pasture, while 0.2% (70,000 ha) is categorized as permanent (perennial) or plantation crops. Crops produced in Turkmenistan include cereals (54% of the cropped area), followed by fiber crops and oilseeds (each 21%), horticulture (3%), and other crops (1%). Turkmenistan is highly dependent on irrigation due to its arid climate, which will exacerbate under the impacts of climate change.

After the disintegration of the Soviet Union and the independence in 1991, the Government of Turkmenistan has chosen a unique approach to land reform and farm restructuring. The collective land holdings were divided into plots that were leased to families (family leaseholds), while retaining the overall collective structure and state ownership of all agricultural land. The typical arrangement is that the use rights of state land are allocated to farm enterprises (now peasant associations), and the farm enterprises then lease land

to farmers. The Government continues to maintain the traditional system of state orders. Under this system, the lease contracts specify the crop that each leaseholder (private farmer) is required to produce (typically cotton or wheat) and set a specific quantity target for delivery to the state, often at prices below international market prices.

The Turkmen official land statistics show very little individualization since 1990, because the former collective farms still record land now held in family leaseholds as part of its asset inventory.

However, land reform resulted in a significant shift to individual or household-based farming, with more than 3/4 of the arable land leased to individual farmers. Most leaseholders consider this land to be rightfully theirs, and they expect to continue to use it in the future.

The Land Code provides that nationals of Turkmenistan may in principle be transferred up to 3 hectares of agricultural land, previously leased on the long-term basis from farmstead associations and other agricultural enterprises, into private ownership (with the right of inheritance, but restricting other transfer opportunities like selling or exchanging). Such a transfer would be done through a decree of the president and under the condition that land was used effectively and high yields were attained during last 10 years.

Turkmenistan is currently undergoing a process of establishment of a land administration system including a cadaster and land registration system. A Law on Land Cadaster was adopted on 25 November 2017 and the Ministry of Agriculture and Environmental Protection is seeking further technical assistance to develop and strengthen the land administration system.

To maintain the quality of soil and land resources in connection with climate change, as well as to strengthen their mitigation potential, the following measures are necessary:

1. In the field of strengthening the institutional capacity, inventory and monitoring of land and soil resources:
    a. updating the National Action Program to Combat Desertification;
    b. conducting comprehensive inventory of soil and land resources with detailed description of the irrigated lands and grazing lands of the country;
    c. widespread introduction and use of GIS technologies in the processing of data on land resources;
    d. updating land legislation, taking into account ongoing reforms in the country's agricultural sector and transition of agriculture to market relations;
    e. preparation of the draft Law of Turkmenistan “On Soils” in order to improve soil requirements, and, above all, for industrial facilities under construction that damage the fertile soil layer;
    f. preparation of the National Plan of Turkmenistan "On Meeting the Effects of

Drought";

g. development of the Law "On Pastures" through the preparation and adoption of by-laws on provision of pastures for use and lease;
h. creation of mechanism for regulating the use of pastures by forming commissions under local self-government bodies; tariffs for the use of pastures, etc.;
i. implementation of measures aimed at improving education and advanced training of specialists in the field of the State Land Cadaster;
j. creation of digital system of the State Land Cadaster.

2. In the field of technologies development:

a. use of new methods of tillage, ensuring accumulation of humus and activation of the soil biological processes by stabilizing its upper layer;
b. introduction and strict observance of science-based field crop rotation;
c. implementation of measures to improve conditions of used lands and to increase the level of agriculture;
d. carrying out soil protection measures in mudflow hazardous areas;
e. increase the coefficient of land use (CLU);
f. strengthening control over compliance with the technology of growing crops.
g. implementation of a set of measures to prevent soil land salinization, pasture degradation and desertification of territories;
h. continued implementation of science-based methods to improve land fertility.

The key organization responsible for the implementation of the state policy in the field of land resource sector is the Ministry of Agriculture and Environment Protection.

4.2.1. Types of agricultural land

The dominant soil type is desert sandy soil (38.7% of the territory) and sierozem, grey desert soil (25.5%). Pure sands (travelling crescent-shape sand dunes called barkhans) cover 9.1 % and are heavily subjected to deflation. Takyr and takyr-like soils cover 10% whereas saline soils (solontchaks) occur in 5.5% of the territory.

Soils of Akhal region. On the foothill plain of the Kopetdag, sierozem soils, fertile with artificial irrigation, are developed. Large expanses of desert in the north of the region are occupied by sandy desert soils and loosely fixed sands. Gray soils are formed on the lower parts of the slopes of the mountains, mountain brown soils are formed above. In the Tejen delta, irrigated and old-irrigated soils are developed, along the periphery - takyr-like soils. In the desert part of the region there are large areas of takyrs and solonchaks. In the zone of the Karakum Canal, secondary salinization of soils is observed - the result of irrational irrigation and a lack of drainage facilities.

Soils of the Balkan region. The soil cover is varied. Dark gray soils, mountain-meadow soils and gray soils are common in mountainous regions. On the plains, especially in the Kopetdag, on the piedmont plains of the Greater and Lesser Balkhans, Meshed-Misrian and the southern regions of Sarykamysh, there are takyrs, takyr-like, gray-brown, desert soils; on the Krasnovodsk and other plateaus - mostly gray-brown, desert; in the river valleys - meadow, takyr-like and light gray soils. Takyr-like serozems (an area of 400,000 ha), serozems (about 50,000 ha), meadow (about 10,000 ha) and takyrs (about 600,000 ha) form the basis of agricultural arable land. A significant area (in the Atrek basin, the Caspian lowland, the Krasnovodsk plateau, the Lower Uzboi) is occupied by solonchaks and sandy massifs.

The soil of the Dashoguz region. Depending on the nature of the surface deposits of the relief, the depth of groundwater, the soil cover of the region is diverse. Takyr-like, irrigated takyr-like, meadow, irrigated meadow, sandy desert soils, solonchaks, takyrs predominate, and gray-brown on the tertiary remnant uplands. The amount of humus in all types and varieties of soil does not exceed 0.7-1.5%. Takyr-like soils (an area of 300-350 thousand hectares) are common in the western part of the oasis and constitute the main earth fund to be developed. Soil salinity is average, chloride-sulfate. Meadow soils, widespread in the oasis, are formed under conditions of shallow occurrence (1-2 m) of low-mineralized groundwater. Irrigated meadow soils, which occupy the largest areas and are confined to the eastern part of the oasis, are developed on agro-irrigation sediments. Non-saline and slightly saline varieties predominate. Sandy desert soils are formed on overgrown oasis sands and in the Zaunguz Karakum. In places they are used for irrigation. Takyrs are common in the southwestern part of the region. Salt marshes are confined to low areas and to places where irrigation water is discharged.

Soils of the Lebap region. The main types of soils are gray soils, alluvial-meadow, irrigated-alluvial, takyr-like and solonchaks.

Soils of the Mary region. In the Murgab valley, irrigated soils are common, composed of an agro-irrigation layer. Meadow irrigated soils are common in the delta and river valley. With a decrease in the level of groundwater, they turn into takyr-like and sometimes solonchaks. In the valleys of Murgab, Kashan, Kushka, meadow-serozem irrigated soils are developed on a small area. Their composition is predominantly loamy, weakly and moderately saline varieties predominate. In the delta and floodplain of the river floodplain-meadow and meadow-marsh soils occur in patches. Soil-forming rocks are variegated alluvial deposits. Bog soils are rare in small depressions. In the northwest of the Murgab delta, residual meadow desert soils develop on light alluvial deposits. The northern anciently irrigated part of the Murgab oasis has been developed for irrigation. Takyr-like soils and takyrs of the Khauzkhan massif are used for irrigated crops. Salt marshes in the Murgab oasis are mainly represented by secondary saline soils occupying low areas with close groundwater occurrence. On the Badkhyz and Krabil uplands, light and typical gray soils are widespread. On the northern slope of Karabil and in the north of Badkhyz, desert sandy soils are developed, in the depressions of Badkhyz (Eroylanduz and others) there are solonchaks and shores. In the desert part of the Mary region, sandy soils prevail with patches of mobile sands, takyrs and solonchaks located in inter-ridge depressions and along the periphery of the Murgab delta.

The complexity of tillage is associated with soil and climatic conditions. When irrigated agriculture is carried out in conditions of high temperature and evaporation from the soil surface, they (soils of the desert zone) become very dry and become too hard. On such soils, it is difficult to carry out the main tillage to a given depth, the aggregates wear out. Therefore, in such cases it will be necessary to use deep rippers.

The tillage technology includes basic tillage (plowing at 25-32 cm, soil surface leveling), pre-sowing tillage (chiseling, harrowing, thinning), inter-row tillage (cultivation-loosening).

The land fund suitable for irrigated agriculture reaches 17 million hectares, about 2 million of which are occupied by agricultural crops.

The basis of the country's agriculture is:

- cotton growing - 42% of the sown area;
- cereals 49%;
- other crops /melon growing, horticulture, vegetable growing and viticulture/ - 4%;
- Perennial plantings (orchards and vineyards) account for -0.24%;
- area under fruit and berry - 20.6 thousand hectares, under vineyards - 28.1 thousand hectares.

As a COVID-19 pandemic response, in order to maintain food security, the Government of Turkmenistan has expanded the share of arable land for cultivation of fruit and vegetables.

Recommendations:

Unfavorable soil conditions associated with salinization require the strict implementation of the following reclamation and agrotechnical measures aimed at soil desalinization, increasing its fertility and preventing land withdrawal from agricultural use:

1. Construction and / or cleaning of drainage and carrying out operational or capital flushing against its background.
2. Deep plowing.
3. Application of organic and mineral fertilizers in the recommended volumes.
4. Sowing of master crops.
5. Sowing winter crops.
6. Timely and high-quality implementation of the adopted agrotechnical measures.
7. The use of progressive, modern water-saving methods of irrigation of agricultural crops.

4.2.2. Greenhouse production

Currently, in Turkmenistan, the area under greenhouse farms is expanding rapidly and their number is increasing every year. The country mainly uses modern large-scale greenhouse complexes, in which they mainly grow tomatoes, peppers, cucumbers according to Dutch technologies. Currently, there are 81 such greenhouses in the country equipped with modern devices and innovative technologies with a total area of more than 530 hectares. In addition, another 188 modern greenhouses are under construction with a total usable area of 1,792 hectares.

Also, small-sized greenhouses are widespread in the country, they are used mainly in private plots in private to meet personal consumption. The total occupied area of small-sized greenhouses is not significant.

Thus, in Turkmenistan, at the state level, much attention is paid to the development of greenhouse farms, obtaining high and high-quality yields of greenhouse crops, as well as selling the resulting products in foreign markets.

Tomatoes are the most exported vegetable in Turkmenistan (81,4%). It has strong economic and value-added potential. The tomato has been produced in huge amounts in the country for many years. The produced tomato was mainly open ground tomato. At the same time, the amount of tomato produced in covered soil has increased with commissioning of huge

greenhouse facilities in recent years. Tomatoes grown in the open ground are mainly sold on the domestic market, while tomatoes grown in greenhouses are mainly exported.

Average farmer producing open ground tomatoes uses about 6-10 ha of land and gets an average harvest of 30 tons per hectare. The produced harvest is mainly being distributed via several distribution channels, including wholesale and retail marketing. Part of the produced tomatoes are being processed in the processing facilities of the Ministry of Agriculture and Environment Protection of Turkmenistan («Ruhubelent» State Vegetable Processing Factory (Ahal region) with the processing capacity of 8,000 tons/year), and some private vegetable and fruit processing enterprises (Nur Economic Society, Parahat Private Enterprise etc.).

Tomatoes produced in specialized greenhouses are not processed but sold in the local market to be consumed fresh and used in public catering facilities, while a major part of these products are being exported. Quality requirements and competition in the foreign markets force these producers to be economically efficient and keep high quality standards.

4.3. Management in agriculture production

The Ministry of Agriculture and Environment Protection of Turkmenistan is the central executive body implementing state policy in the field of agriculture, food supply, environment protection, land management and hydrometeorology.

The Headquarter office of the ministry has 150 employees, including 5 deputy ministers working in 10 departments:

- Deputy minister on environment protection and land resources;
- Deputy minister on financial and economic issues;
- Deputy minister on agricultural production;
- Deputy minister on industrial processing of agricultural products;
- Deputy minister on agricultural machinery Departments:
- Department on coordination of international environmental cooperation and projects;
- Department on environmental protection and hydrometeorology;
- Department on foreign economic relations and marketing;
- Department on economic analysis and planning;
- Department on finance and accounting;
- Department on processing agricultural products;
- Department on agricultural machinery;
- Department on agriculture and livestock;

- The Department of Information and learning of world experience of the ministry of Agriculture and Environment Protection of Turkmenistan
- Department on office management

The Ministry coordinates the activities of ministries and other government entities, organizations and enterprises, regardless of their form of ownership, in the field of agricultural development, rational use of natural and land resources, hydrometeorology and food security, studies and widely disseminates international experience, advanced technology in these areas.

The Ministry has the following subordinate organizations: agricultural production associations for grain growing, cotton growing, food, technical maintenance and animal husbandry, as well as the State Veterinary Service, the State Quarantine Service, the State Seed Production and Sort Testing Service, the Plant Protection Service, the Environment Protection Service, the Land Resource Service, and Hydrometeorology Service.

Region grain growing production associations perform activities on providing grain producers with high-quality seeds, timely receive and store harvested crop without loss and produce flour and bread products from it and market them, as well as monitor the quality of products made from grain.

Region cotton-growing production associations are engaged in providing cotton producers with high-quality cotton seeds, timely receiving, storing and processing the harvested crop without loss, monitoring the quality of raw cotton and cotton products produced from it and selling finished products.

The food enterprises of the region agricultural production associations produce food products that meet international quality standards, provide the domestic market and budget organizations of the country with high-quality food products, harvest, process and store fruits and vegetables, as well as develop specifications for new food products.

District maintenance enterprises of region agricultural production associations ensure the preservation of agricultural equipment in good condition and suitable for the activity and provide agricultural producers with services of technical maintenance of agricultural equipment.

Livestock farms of region agricultural production associations carry out activities on developing the sheep and camel breeding and increase their livestock, as well as monitor the use and protection of pasture infrastructure and the implementation of the defined rules for pasture usage by individuals and legal entities.

The State Veterinary Service monitors compliance with veterinary and sanitary rules in places of farm animals and birds. It also performs work on protection of the population from

diseases common to humans and animals and controls the production of animal products that are safe for human health.

The State Quarantine Service develops and monitors the implementation of quarantine and plant protection measures, and prevents the spread of plant diseases, pests, and weeds.

The State Seed Production and Sort Testing Service controls the implementation of work in the field of seed production of crops, animals and birds, as well as compliance with national and international standards in this area and issues the appropriate quality certificates.

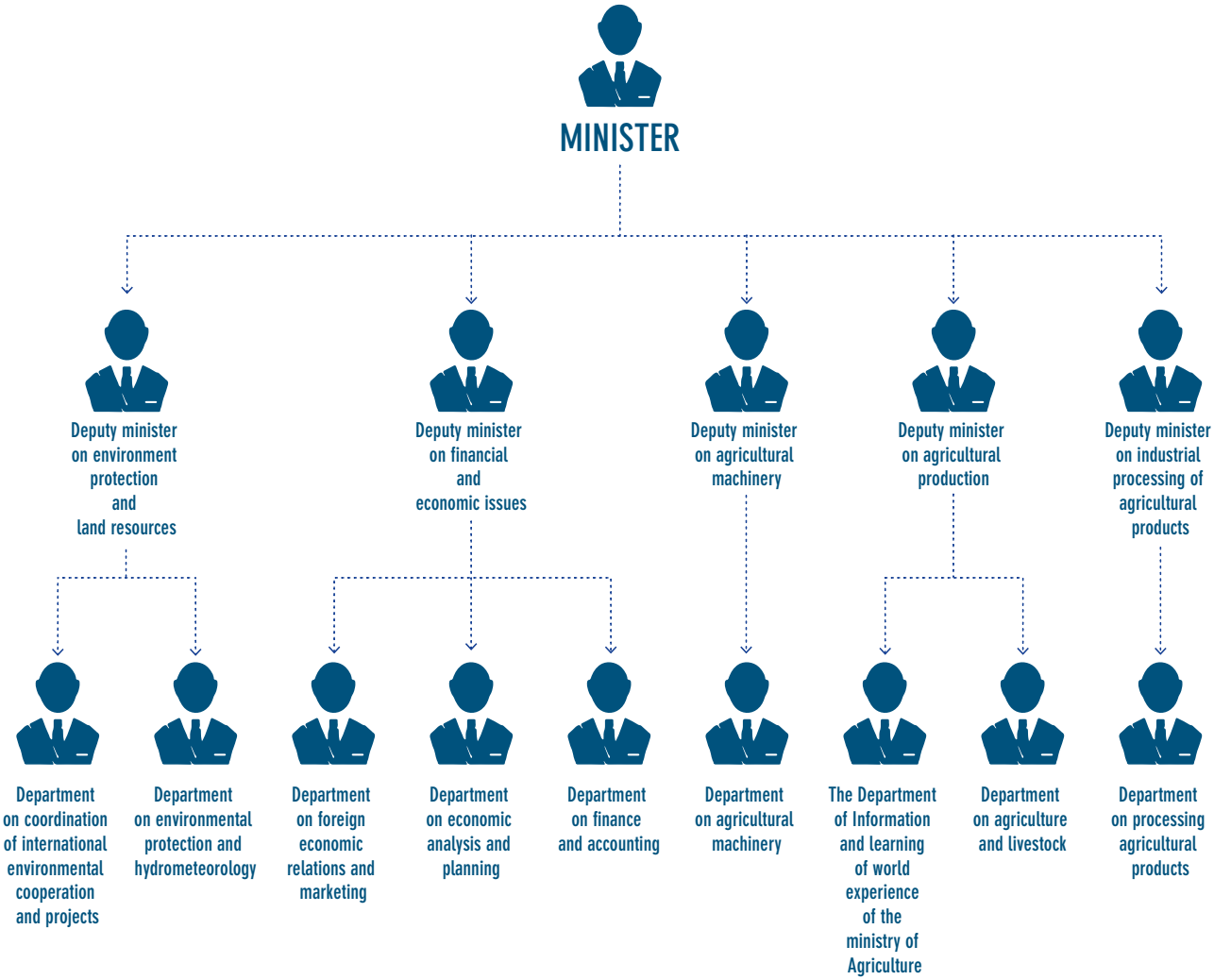
The plant protection service carries out activities aimed at protecting plants from pests, diseases and weeds. Organizes work to combat pests, diseases and weeds using biological and chemical agents.

The Environment Protection Service implements the state policy in the field of environmental protection and performs state control over environmental protection, conservation of flora and fauna, prevention of pollution of land, surface and groundwater, the Turkmen part of the marine environment of the Caspian Sea and its coastal zones, conservation and restoration of forests, as well as the rational use of natural resources.

Land Resources Service is developing proposals to improve the single state policy in the field of land resources and ensures their implementation. Carries out state control over the rational use and protection of land resources, as well as organizes the maintenance of the state land cadastre, and monitors the state of the land. Draws up in the prescribed manner the acts of granting land for the ownership, use, and lease.

The Hydrometeorology Service collects data on upcoming precipitation and expected weather. It also provides ministries and other entities, population and public associations with hydrometeorological information.

The organizational structure of the headquarter office of the ministry of Agriculture and Environment Protection of Turkmenistan



There are three types of agricultural farmers in Turkmenistan:

Small scale leaseholders: The vast majority of arable farmers are small-scale leaseholders involved in production of State order crops (mainly cotton and wheat). The main features of this type of farming include short-term land lease contracts, often for a 1-2-year period concluded between the leaseholder and the local Daykhan Birleshik (farm union) and associated crop production contracts for either of the two strategic crops. These contracts are strongly supported by State subsidies in the form of inputs and machinery services supplied effectively at half their cost. In return, the farmers are obliged to sell their entire yields of the State order crops to the State at State determined prices.

Limited number of private land owners (up to 20 ha): The number of "mulkdars", or private land owners, had increased significantly in the late 1990's. By the mid 2000's the State decided to take back mulkdar land where the land had not been used, had been neglected, or was of such poor quality that profitable farming was impossible. Some of that land has been re-allocated to other more active entrepreneurs in the expectation of profitable utilisation. Mulk - private land - is granted by a special Presidential decree and the owners of mulk land are not obliged to grow State order crops. Mulk lands are typically used for small scale livestock raising, often with own forage production, fruit production, and in rare cases vegetable production.

New long-term leaseholders (lease agreement for 39 years): These have emerged as a result of the Government's recent policy to increase the share of agricultural production by the private sector and to improve the food trade balance of the country. As a result, a new type of farmer producer has emerged. These farmer–leaseholders are usually members of the Union of Industrialists and Entrepreneurs who have been granted their land for long-term use (39 years) and who are expected to significantly contribute to the domestic production of agri-food products. Membership of the Union not only makes farmers eligible for this type of land tenure, but also provides access to soft credits, specifically targeted for increase of agricultural production in the country.

4.4. Agriculture Industries in Turkmenistan

4.4.1. Crop Processing

Although Turkmenistan does not have a lot of arable land, agricultural production is important because half of the population lives in rural areas. Plant production activities take the first place in the agricultural production of Turkmenistan. Crop production is the most important source of income for the rural population.

Cotton and wheat are the most produced crops in field crops. This is followed by sugar beet, paddy, corn and barley, respectively. The production of these products is of strategic importance for the country's economy, as it creates employment in the regions where it is produced, stimulates trade, and makes a significant contribution to the development of the economic and social structure. . The most important agricultural commercial products are cotton and wheat, while a significant part of cotton is exported abroad, wheat is consumed domestically.

Table. The main field crops produced in Turkmenistan

			Wheat	Cotton (Lint)	Barley	Paddy	Sugar Beet	Maize
1992	Cultivation Area	(000 ha)	197	567	61	28		43
	Production	(000 metric tonnes)	377	390	127	64		159
1995	Cultivation Area	(000 ha)	437	607	147	29		35
	Production	(000 metric tonnes)	695	379	207	79		121
2000	Cultivation Area	(000 ha)	700	575	45	70	16	10
	Production	(000 metric tonnes)	1.690	233	24	27	158	10
2005	Cultivation Area	(000 ha)	900	600	65	55	15	17
	Production	(000 metric tonnes)	2.834	330	65	120	169	16
2010	Cultivation Area	(000 ha)	869	550	13	18	15	3
	Production	(000 metric tonnes)	1.477	424	22	31	180	6
2015	Cultivation Area	(000 ha)	1.152	540	23	123	15	40
	Production	(000 metric tonnes)	1.406	252	30	130	190	51
2020	Cultivation Area	(000 ha)	800	535	19	137	14	48
	Production	(000 metric tonnes)	1.320	289	20	150	195	43

Source: FAO, 2022

In the study conducted by Stanchin and Lerman (2015), the last 100-year period of cotton and wheat agriculture in Turkmenistan was examined and as a result of the research, it was stated that cotton cultivation areas in Turkmenistan during the Soviet Union expanded against wheat agriculture. As stated in the study, while wheat fields constituted 90% of the country's agricultural lands in the 1920s, cotton production for industrial use increased rapidly in the following years and 60% of the agricultural lands were devoted to cotton farming in the 1960s-70s. In this process, wheat cultivation areas have decreased continuously and in the 1980s, wheat planted areas made up only 8% of the agricultural area. However, with the adoption of food self-sufficiency policy in Turkmenistan in the early 1990s, cotton cultivation areas decreased gradually, while wheat areas increased.

4.4.2. Cotton growing

Cotton growing is a significant sector of the agro-industrial complex of Turkmenistan, providing a significant contribution to the implementation of large-scale programs for the production of import-substituting products and increasing the export opportunities of the national economy. Natural cotton fiber is the most valuable raw material for the domestic textile industry, whose products are in high demand on world markets. The natural and climatic conditions of Turkmenistan are favorable for the cultivation of medium-staple and fine-staple varieties of cotton.

Cotton plant which is harvested as seed cotton from the field is besides being the raw

material of the textile and ready-to-wear industry with its fiber also it is an important industrial plant used in many sectors such as cotton seed, oil industry, and feed industry as oil cake. In recent years, oil obtained from cotton seeds has started to be used as a raw material in biodiesel production in increasing amounts in order to reduce the environmental concerns caused by foreign dependency in petroleum and petroleum-derived fuels. Thus, cotton is also a part of energy agriculture.

While the share of synthetic fibers in the global textile fiber market has increased, the share of cotton has started to decrease since the 1960s. Despite this, cotton is still the most used natural textile fiber in the world. With the added value and employment volume it provides in the textile production chain, cotton significantly increases the competitiveness of countries and can reveal potential economic factors. Due to all these features, cotton, which is a strategic product, has a great importance in international trade. In the 2019/20 season, approximately 26 million tons of cotton fiber was produced, of which 34% was subject to international trade. In the 2019/20 season around the world, approximately 29 million farmers in 77 countries produced cotton and more than 150 countries exported or imported cotton.

Cotton production on an area of 556,000 hectares in Turkmenistan, whose total cultivated agricultural area is 2.0 million hectares in 2020, is an important agricultural activity with a fiber yield of 519 kg/ha (ICAC, 2022). For this reason, the Turkmen textile and ready-to-wear industry, of which cotton is the raw material, is an important and indispensable sector for Turkmenistan with the added value it provides, the income that textile and ready-made clothing exports bring to the country's economy, the employment volume it creates and its share in the Gross Domestic Product (GDP).

In 2022, 580,000 hectares are allocated for cotton, which is 40,000 hectares less than in previous years. The vacated areas are allocated for potatoes and other vegetable and gourd crops.

In 2021, 1 million 250 thousand tons of cotton were harvested in Turkmenistan.

In general, 1,600 combines, 7,800 vehicles for transporting the harvested crop, 39 cotton gins and 158 collection points are involved in the cotton harvest throughout the country.

Today, more than 60 textile enterprises produce various types of cotton and combined yarn, fleecy and denim fabrics, finished products from them, made on the basis of design and technological solutions, handmade carpets of the highest quality, which are sold on the world market.

It is planned to produce 1250 thousand tons annually from 2020 to 2025 in the "Program of socio-economic development of the country of the President of Turkmenistan in 2019-2025".

4.4.3. Horticulture, melon growing, vegetable growing

Fruit and vegetable production also plays an important role in agricultural production in Turkmenistan. Fruit and vegetable cultivation makes significant contributions to the country's economy, and these contributions are also reflected in the growing region . According to FAO 2020 data, 678 thousand tons of vegetables were produced on 23 thousand hectares of land, and 684 thousand tons of fruit was produced on 58 thousand hectares of land. Tomatoes, cucumbers, eggplant, and cabbage are among the most important vegetables produced in Turkmenistan, while apricots, apples, plums, peaches, pears, grapes and figs are among the fruits (Table 4).

Table. Fruits and vegetables production in Turkmenistan

			Fruits	Vegetables
1992	Planted/Cultivation Area	(000 ha)	58	32
	Production	(000 metric tonnes)	354	313
1995	Planted/Cultivation Area	(000 ha)	56	34
	Production	(000 metric tonnes)	394	376
2000	Planted/Cultivation Area	(000 ha)	45	15
	Production	(000 metric tonnes)	482	347
2005	Planted/Cultivation Area	(000 ha)	52	20
	Production	(000 metric tonnes)	661	550
2010	Planted/Cultivation Area	(000 ha)	56	24
	Production	(000 metric tonnes)	663	665
2015	Planted/Cultivation Area	(000 ha)	55	22
	Production	(000 metric tonnes)	655	659
2020	Planted/Cultivation Area	(000 ha)	58	23
	Production	(000 metric tonnes)	684	678

Source: FAO, 2022

4.4.4. Livestock

Livestock play important role in agricultural value chain in terms of sustaining food security in the country providing population with meat products, dairy products etc.

The number of livestock is increasing as a result of the support of the state, including improvements of veterinary services.

According to the official statistics, number of livestock types by different ownership types between 2011 and 2022 are indicated in the table below.

Livestock in Turkmenistan by categories of farm, thousand heads (as of January 1)

	2011	2015	2016	2017	2018	2019	2020	2021	2022
All farms									
Cattle	2196,3	2289,2	2317,5	2346,3	2381,8	2393,7	2403,1	2498,6	2514,0
Sheep and goats	17042,1	17652,1	17620,1	17717,6	17858,2	17984,9	18092,5	18744,9	18863,4
Camels	123,5	125,6	126,1	126,5	127,2	128,2	129,8	140,3	140,9
Horses	24,9	24,5	24,0	23,8	23,8	24,0	24,4	27,3	27,5
Agricultural enterprises									
Cattle	110,2	61,7	62,2	60,8	60,1	58,8	58,0	57,1	41,1
Sheep and goats	2233,0	1976,0	1774,9	1772,1	1760,2	1743,5	1728,7	1584,1	1590,3
Camels	29,0	28,4	28,8	29,0	29,4	29,5	29,5	30,0	30,7
Horses	3,1	3,8	3,9	4,1	4,4	4,1	4,1	4,1	4,0
Private households									
Cattle	2086,1	2227,5	2255,3	2285,5	2321,7	2334,9	2345,1	2441,5	2472,9
Sheep and goats	14809,1	15676,1	15845,6	15945,5	16098,0	16241,4	16363,8	17160,8	17273,1
Camels	94,5	97,2	97,3	97,5	97,8	98,7	100,3	110,3	110,2
Horses	21,8	20,7	20,1	19,7	19,4	19,9	20,3	23,2	23,5

Source: Official statistical data of Turkmenistan

The productivity of livestock types, by the amount of produced products is increasing year by year. The amount of productivity of cows and sheep 2011 and 2022 is indicated in the table below.

Livestock productivity on all the farms

	2007	2015	2016	2017	2018	2019	2020	2021
Average milk yield from a cow, kg	2412	2577	2601	2614	2725	2829	2848	2852
Average wool clip from one sheep, kg	2.5	2.8	2.8	2.8	2.9	2.9	3.1	3.2

Source: Official statistical data of Turkmenistan

4.4.5. Livestock industries

Livestock industry is also improving. The official statistical data on types and amounts of produced livestock products is shown in the table below.

	2011	2015	2016	2017	2018	2019	2020	2021
All farms								
Meat (slaughter weight), thsd.tons	293,6	328,8	333,4	338,4	340,0	346,6	354,5	355,7
Milk, thsd.tons	2068,5	2386,8	2396,3	2400,7	2413,8	2423,6	2463,8	2485,1
Wool (physical weight), thsd.tons	40,9	41,6	41,7	42,2	42,3	42,8	47,5	48,3
Honey, tons	889,3	815,3	815,5	839,0	850,2	853,0	864,4	873,1
Agricultural enterprises								
Meat (slaughter weight), thsd.tons	22,5	10,1	11,3	11,8	11,9	11,6	9,9	10,1
Milk, thsd.tons	60,6	31,6	32,9	30,6	29,5	27,2	26,3	25,5

	2011	2015	2016	2017	2018	2019	2020	2021
Wool (physical weight), thsd.tons	6,2	4,4	4,5	4,6	4,6	4,6	4,6	4,6
Honey, tons	21,4	8,6	5,4	9,2	5,6	3,9	6,3	4,1
Private households								
Meat (slaughter weight), thsd.tons	271,1	318,7	322,1	326,4	328,1	335,0	344,6	345,8
Milk, thsd.tons	2007,9	2355,2	2363,4	2370,1	2384,3	2396,4	2437,5	2459,6
Wool (physical weight), thsd.tons	34,7	37,2	37,2	37,6	37,7	38,2	42,9	43,7
Honey, tons	867,9	806,7	810,1	829,8	844,6	849,1	858,1	869,0

Source: Official statistical data of Turkmenistan

4.4.6. Fishery and fish farming

Fish and fish products are among the most traded food commodities worldwide. Trade plays an important role in the fisheries industry as a source of employment, a supplier of food, a source of income, a contribution to the economy, growth and development, and food security and nutrition. For many countries, fish exports are critical to the economy. The fish trade has grown significantly in recent decades, and the fisheries industry is operating in an increasingly globalized environment.

Sustained demand, trade liberalization policies, globalization of food systems, technological and innovation, and changes in distribution and marketing have greatly changed how fish products are prepared, processed, marketed, and delivered to consumers.

Despite the growing role of aquaculture in the total fish supply, the fishing sector remains the main sector for a range of species and is vital to national food security.

In accordance with the economic strategy of Turkmenistan, the ongoing systematic and gradual transition to a market economy in the country is accompanied by the solution of tasks for the expanded production of import-substituting products, saturation of the domestic market with high-quality domestic goods that can successfully compete with imported counterparts.

The fishery complex is one of the dynamically developing sectors of the economy of Turkmenistan. The key drivers of the industry are the growth of domestic consumption and, most importantly, the growth of exports of products from aquatic biological resources. The new program of socio-economic development of Turkmenistan has set tasks for all sectors of the economy, spheres of life of our society for three decades to come. In the fishing industry, in accordance with this document, activities will continue on the artificial reproduction of fish stocks, the production of fish feed, as well as the focus on import substitution and export-oriented production.

Aquaculture is one of the drivers of consumption growth. In general, fish production is

growing at a rate of 3% (www.hazarbalyk.com).

As the demand for fish increases, the consumer basket becomes more stable. With the deterioration of the epizootic situation in animal husbandry, it is possible to partially switch from meat to fish and maintain the level of consumption of animal protein. Such a switch is possible subject to the improvement of the production equipment of the fisheries and the development of the logistics infrastructure for transportation within the country. New refrigeration and processing capacities are needed, as well as an increase in the number of refrigerated containers available.

The development of the fishing industry, in which large investments are directed, contributes to the expansion of export opportunities and the strengthening of the food segment of the national economy. In recent years, thanks to the qualitative renovation and equipping of sectoral economic entities, the creation of new large industrial enterprises based on innovative technologies, there has been a systematic increase in the volume of fish catch, and the effectiveness of measures aimed at artificial cultivation and breeding of commercial fish in ponds, high-quality processing and production a wide range of fish products.

Thus, a significant event was the commissioning in September 2015 in the administrative center of the Turkmenbashi district of a complex for breeding sturgeon fish, producing black caviar and fish products of the Khazar Balyk Open Joint Stock Company of the Union of Industrialists and Entrepreneurs of the country.

For the purpose of industrial fish farming in Ahal, Mary and Lebap regions, investment projects are being implemented to build artificial reservoirs and create fish incubators. In all regions, the existing fish processing facilities were modernized and new capacities were put into operation in this industry. In the Turkmen lake "Altyn asyr" fish catch is established, which averages 1.5-2 tons per week. Fish enterprises created 450 jobs.

In total, 1901.7 tons of fish were caught by fisheries enterprises in 2019. The production plan for the industry was fulfilled by 100.1 percent, the growth rate in comparison with the previous year was 168.5 percent. Accordingly, processing and canning of fish products - 135.7 percent (www.turkmenportal.com).

As a result of this activity, 744.6 tons of fish products were produced in January-April 2019, which is significantly more than in the same period last year.

Specialized stores and retail outlets have been opened in the regions and the capital, where they sell fresh and frozen fish, as well as various types of salted, smoked and canned fish products, the demand for which is growing.

In this regard, in the Baherden district of the Ahal region, the construction of a trout farm with a capacity of 30 tons per year continues, in the Kaahka district - reservoirs with

waterproofing from geotextiles and geomembrane, in the Kerki.

4.5. Agriculture Production by Regions

Agricultural production is common in all regions of the country, taking into account soil and climatic conditions.

All regions of the country are producing cotton and wheat.

For instance, cotton cultivation in Turkmenistan is carried out in the regions of Mary, Ahal, Dashoguz and Lebap, and it is generally dominated by alternating rotations with wheat. Although it varies from year to year, cotton cultivation is carried out on an area of approximately 500-600 thousand hectares throughout the country.

Cotton cultivation areas in Turkmenistan in 2019 (ICAC, 2020)

	Area 000 Ha	Production 000 Tones
1. Mary Velavats	167	84
2. Lebap	152	81
3. Dashoguz	120	62
4. Ahal	106	56
National	**545**	**283**

5. Food and beverage processing technologies

Involvement of the private sector in agricultural production brings to the country innovative approaches to technologies of food and beverage processing. Private producers in order to export their food products abroad, they try to meet veterinary, sanitary, labor and quality requirements of food processing. In this regard, number of private processing enterprises getting international standard certificates is increasing; new technologies of food processing is spreading in the country.

The National Strategy for Socio-Economic Development of Turkmenistan 2011–2030, specifies the country's medium-term development targets, and aims to strengthen the base for the formation of a growing, diversified, highly competitive, and technologically strong economy. With Agriculture being a key sector in the economy, strong and sustainable economic growth in the sector has been the aim of major reforms which commenced in 2007. The 2011-2030 Plan for Agriculture aims to follow through on the transfer of responsibility for national agricultural production from the relatively small number of state-controlled enterprises to a much larger number of private farm enterprises (individual farmers, farming families and farmers' associations).

The policy envisages increasing the involvement of private sector enterprise into the important input supply and processing functions. This means that state monopolies in farm inputs and processing will be reduced and ultimately phased out, thereby allowing private operators to operate in a fair and equitable way across the Agricultural Food Value Chain. It is crucial that this be done in a way that does not disrupt the existing supply of inputs to farmers. Equally, it is important that privately owned enterprises are presented with a "level playing field" as they engage in the supply of needed farm inputs, as well as the procurement of primary products, processing them, and selling them in domestic and export markets.

The Government of Turkmenistan has chosen a strategy of diversifying and increasing agriculture and food production and recognised the important role of the private sector in achieving these aims. The Government's target is to privatise 70% of the relevant productive capacity and associated services. It has tasked the Union of Industrialists and Entrepreneurs of Turkmenistan to drive and facilitate this private sector development.

The result of these initiatives is a slowly growing viable private sector in agriculture and food processing. Unlike the commercially and technically limited household plot enterprises and the closely regulated state crop producers, these private farms and food processors have recognised potential to adapt to real market conditions and contribute significantly

to the desired growth in GDP, to substitution of imported produce, and to the expansion of agricultural and food exports.

In May 2015, the Government adopted two specific programmes designed to guide economic diversification:

- State Programme on Increasing Export Volumes of Turkmen Products;
- State Programme on the Production of Import-Substituting Products in Turkmenistan.

In addition to mapping out the diversification strategy and activities, these programmes also identify specific types of products, including agricultural and food products that have 'high potential' for exports.

Generally, post-harvest operations in fruit and vegetable production of the farmers in the study are very simple, with little use of specialised technological equipment or application of proven scientific approaches. Invariably, some sorting is done prior to delivery to market, or collection by middle-man. The sorting of produce is predominantly by hand. Packing is simple manual packing into plastic or cardboard crates, where the different colours of the crates define different end destinations, either within Turkmenistan or in the different export countries.

5.1. Food processing

In Turkmenistan, the development of the food processing industry industry is strategically prioritized, both in terms of food security and the development of agriculture.

The food industry of Turkmenistan is assigned in the implementation of the policy of import substitution and export promotion, ensuring the food independence of the country.

The main branches of the food industry are represented by meat, dairy, fish, flour and cereals, baking, pasta, production of beverages, and other industries.

In the meantime, the food processing became one of the the main non-governmental sectors of the national economy with very high rates of expansion od its share.

5.2. Meat-packing industry

Meat produced in the country is subject to raw consumption or processing in the country, because the export of raw meat products is restricted in order to sustain food security in the country.

In this regard, meat-packing industry is new to the country and has a potential for development in the future upon improvement of meat storage facilities in the country.

According to official statistics of Turkmenistan, amount of produced meat products are as follows.

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Meat including byproducts, thsd.t	29.2	41.6	40.1	34.4	32.7	34.8	33.1	39.4
Including:								
Beef and veal	10.5	14.1	11.6	6.8	6.8	6.2	8.3	14.9
Mutton	12.5	15.5	13.3	11.9	12.7	13.9	9.3	10.7
Other kind of meat and byproducts	4.2	3.3	3.8	3.5	3.1	3.3	3.0	2.9
Sausages, thsd.t	4.8	11.3	13.1	15.3	11.4	13.0	12.5	13.7

Source: Official statistical data of Turkmenistan

As can be seen on the above table, amount of poultry products produced in the country is drastically increasing as a result of state support to poultry producers.

5.3. Dairy production

Livestock production is improving in the country; consequently, production of dairy products is also improving both in private and state ownership.

Number of producers of dairy producers exporting their goods abroad is also increasing.

According to official statistics of Turkmenistan, amount of produced dairy products are as follows.

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Dairy butter, thsd.t	2.7	4.0	4.1	3.7	3.3	4.2	4.5	4.9
Whole-milk products (in terms of milk), thsd.t	104.8	159.1	179.6	183.0	186.4	182.0	182.2	204.1
Cheese and cottage cheese, thsd.t	2.5	2.6	2.5	2.8	2.8	3.9	3.7	4.0
Cultured milk foods, thsd.t	26.9	63.5	71.3	82.5	92.2	86.2	90.0	99.2

Source: Official statistical data of Turkmenistan

5.4. Poultry and egg production

Until now, by members of the Union of Industrialists and Entrepreneurs of Turkmenistan 63 mln pcs of poultry-oriented chicken producing incubators have been imported to the country.

Annually 10.8 kg of poultry products is required per person according to the norms approved

by the Ministry of Health and Medicinal Industry of Turkmenistan. Consequently, total annual demand of the country² s population will be approximately 70,2 thousand tons.

Nowadays, members of the the Union of Industrialists and Entrepreneurs of Turkmenistan have facilities with capacity for keeping 47,5 million birds. If we assume average weight of each bird as 1,6 kg, the existing facilities of entrepreneurs will be sufficient for producing 76 thousand tons poultry products per year.

Cost for chicken produced by local entrepreneurs is equal to 0,22 USD, while the cost for 1 (one) imported poultry-oriented chicken is equal to 1,00 USD. Consequently, cost of produced poultry related chicken is 4,5 times lower than imported same chicken.

According to official statistics of Turkmenistan, amount of produced meat products are as follows.

Food products	2015	2016	2017	2018	2019	2020	2022	2022
Poultry, thousand heads	16396.5	17168.3	17993.3	18039.7	18789.8	20375.8	20606.2	20674.2
Poultry meat, thsd. t	8.7	11.4	12.2	10.1	11.4	12.5	10.9	-
Eggs, million units	29.2	41.6	40.1	34.4	32.7	34.8	1502.3	1502.6

Source: Official statistical data of Turkmenistan

As can be seen on the above table, number of poultry products produced in the country is drastically increasing because of state support to poultry producers.

In 2019, the member of the Union of Industrialists and Entrepreneurs of Turkmenistan "Hosh zaman" private enterprise launched incubator facility for egg-oriented chicken production in Turkmenistan. This facility provided local egg producers with 1,8 million egg-oriented chicken, which is equal to about 44% of local demand (in addition about 1,8 million rooster chicken were produced for one year).

Cost for chicken produced by local entrepreneurs is equal to 0,36 USD, while the cost for 1 (one) imported egg-oriented chicken is equal to 1,50 USD. Consequently, cost of produced poultry related chicken is 4,5 times lower than imported same chicken.

50 members of the Union of Industrialists and Entrepreneurs of Turkmenistan possess egg-oriented farms with total capacity of 4,063 million hen.

To promote local poultry and egg producers of the country, the Union of Industrialists and Entrepreneurs of Turkmenistan is working on establishment of "Turkmen gush konsorsiumy" (Turkmen Poultry Consortium). Following activities are planned by the consortium:

- construction of special cold storage facilities with capacity of 5000 tons of poultry products.

- construction of veterinary research laboratory in order to control the quality of poultry products, control and prevent bird diseases.
- develop capacity of feed supply system.

5.5. Industrial fishing

The fisheries industry in Turkmenistan is important to many rural communities living along the Caspian coast or inland waters.

Turkmenistan has very little production in the aquaculture sector, but with scope for scaling up. Despite the fact that the volume of production is relatively small, aquaculture has a significant impact on the lives of the rural population in Turkmenistan (World Bank, 2017). This is because almost all farms are located in rural areas and the industry provides the only employment opportunity in some rural areas.

The potential for aquaculture can be considered significant and can contribute to the conservation of endangered species and economic development through the production of high-value commodities such as caviar (World Bank, 2005). In 2015, the share of aquaculture in total fisheries production in Turkmenistan was approximately 0.2 percent of total fish production. In 2015, Turkmenistan produced 30 tons of fish using aquaculture (World Bank, 2017). At the same time, at present, a fish farm operates at the Khazar Balyk enterprise with a possible production capacity of 100 tons of fish per year, 2 tons of black caviar, 170 tons of smoked products and 10 million cans of canned food from various types of marketable fish.

The development of aquaculture to conserve sturgeon stocks in the Caspian could reduce the attractiveness of illegal fishing, saturating the market and lowering prices. Turkmenistan completely banned sturgeon fishing and the use of drift nets (Strukova et al., 2016). The problems of sturgeon aquaculture for Turkmenistan are long breeding times and high capital requirements caused by high start-up and production costs, in addition to high energy consumption (Apostle, 2017).

Fishing in Turkmenistan contributes to the development of the economy as a whole, providing employment and food for the local population. It is one of the most important activities in the agricultural sector, being a source of food for people and raw materials for the food industry, providing employment opportunities and creating high potential for export.

The fishery industry of Turkmenistan is very small. However, due to a significant reduction in the fishing fleet between 2000 and 2008, the number of people employed in this industry has decreased (State of the Environment Report of the Caspian Sea, 2012).

Fish processing generates numerous side streams and waste (eg skins, heads, entrails) that

are used for secondary production. Thus, the waste of the Khazar Balyk enterprise is used for the production of feed for aquaculture and for pets.

Thus, the fish industry plays an important role for the national economy, being a supplier not only of fish and fish products for humans, but also providing feed to other animal industries.

In all regions of the country, the existing fish processing facilities have been modernized and new capacities have been commissioned in this industry. In Turkmenistan, the main companies in the fish sector, such as Khazar Balyk, Ak Durna, Kenar, Elin Balyk and others, are engaged in fish processing. These companies process both marine and freshwater fish. As a result of sector privatization, the amount of information on production volumes is limited. Larger companies have new and modern fish storage and processing equipment (Figure 7). For example, JSC "Khazar Balyk" for the first time in Turkmenistan uses a new technology for the production of canned products. The productivity of the cannery is 10 million cans per year. The priority raw material for production is the Caspian sprat. Currently, the main types of products manufactured by Khazar Balyk OJSC are: canned food, cold and hot smoked fish, dried, salted and spicy-marinated fish. In order to increase the range of products, in addition to sprat, which is customary for buyers, products from inland waters were produced. These are bream, vobla, cold-smoked crucian carp and dried, packaged in bags and special cold-smoked cuts in bags.

Large companies in the fish sector of Turkmenistan are striving to obtain international standards. Thus, in order to increase the competitiveness of the enterprise and provide consumers with high-quality and safe food products, Khazar Balyk OJSC is developing and implementing the Food Safety Management System (FSSC 22000) step by step. JSC "Khazar Balyk" has international quality certificates, such as: ISO 9001:2015, ISO 22000:2005, HACCP.

The fishing sector has great potential for development. The dynamic growth of the fishing industry within the framework of the integrated development of the processing industries and the production of high-quality food products are called upon to serve new refrigerated warehouses for the storage of these products.

The distribution of fish and fish products is carried out in two main ways - sales by fishermen directly in local markets and resale of fish bought from fishermen by fish processing companies. In Turkmenistan, the main share of fish and fish products is distributed to budgetary organizations. In 2012, 555 tons of fresh-frozen fish and 361 tons of canned fish products were allocated. In 2013, 512 and 223 tons, respectively. The demand of the local population for partial fish is low. Specialized stores and retail outlets have been opened in the regions and the capital, where they sell fresh and frozen fish, as well as various types of salted, smoked and canned fish products, the demand for which is growing.

Retail trade in fish and fish products is carried out in Ashgabat - in the shops of the trading house "Turkmenbalyk": "Al balyk", "Altyn balyk", "Balyk", "Altyn luv", "Turkmenbalyk" and cafe "Altyn balyk". In Mary region - in the Umman store. In Lebap region - in the Balyk store. In Dashoguz region - in the store "Shabalyk". In the Balkan region - in the stores "Khazar nygmatlary", "Balkanabat", "Serdar" and "Bereket".

Products of "Dashoguzbalyk" are systematically sent to shops and retail outlets in the city of Dashoguz, Boldumsaz and Gubadag districts, and are also supplied to educational institutions and shops in the Turkmen capital. The fish is transported by heavy trucks with refrigerators of modern brands.

Processed fish products are sold on the domestic market. The supply of fish to markets is seasonal. Processing companies are private and therefore it is difficult to obtain production data.

JSC "Khazar Balyk" as a whole conducts trade in four directions:

- Export
- Distribution in regions
- Own distribution in Ashgabat
- Trade house "Khazar Balyk"

The company acquired the Trade House "Turkmen Balyk" as a result of privatization. Now he works under the brand "Khazar Balyk". And includes the implementation of several functions:

- retail branded specialized outlets,
- commercial real estate management,
- ensuring supplies to public consumers,
- fishing in inland fresh waters,
- provision of cargo transportation by road,
- ensuring the implementation of marketing and redirection activities.

The most important achievement of the Trading House can be recognized as an increase in sales of products of Khazar Balyk OJSC to such a level that we can state a change in direction depending on: if earlier production depended on how much it was possible to sell products, now those responsible for sales are forced to depend on what and in what quantities they can provide production.

In the regions of Turkmenistan, sales at retail outlets are carried out by distribution partners.

In 2019, Ashgabat formed its own Khazar Balyk product distribution group, which supplied canned fish, preserves and other fish products to retail outlets.

In Turkmenistan there are specialized markets for the sale of fish or fish products. However, in public markets and supermarkets, sections for selling fish are kept.

In Turkmenistan there are specialized markets for the sale of fish or fish products. However, in public markets and supermarkets, sections for selling fish are kept.

5.6. Processing of fruits and vegetables

Potatoes are among the main agricultural products in the country, both in terms of food security and its share in production. The balance of abundance of potatoes in the market is gained by local production and the import. Government is promoting the increase of internal production and decrease of imports. Potatoes are produced in all regions of the country.

Average farmer producing apple fruits uses about 1-5 ha of land and gets an average harvest of 7-10 tons per hectare. The produced harvest is mainly being distributed via several distribution channels, including wholesale and retail marketing. Part of the produced apples are being cold stored, redistributed and processed throughout the year in the cold storage and processing facilities of the Ministry of Agriculture and Environment Protection of Turkmenistan («Jeyhun» State Vegetable-Fruit Processing Enterprise (Lebap region) with the processing capacity of 350 tons/year), and some private vegetable and fruit processing enterprises.

The table grape is mostly being produced in the Ahal and Mary regions and is an important product in terms of economic efficiency and storage potential. The network of cold storage facilities located in the regions of the country supply the population with high quality table grapes during all the year. Sunny climatic conditions of the Ahal and Mary regions are very suitable for production of different varieties of grapes in the country.

Average farmer producing open ground table grapes uses about 2-7 ha of land and gets an average harvest of 7-10 tons per hectare. The produced harvest is mainly being distributed via several distribution channels, including wholesale and retail marketing. Part of the produced table grapes are being processed in the processing facilities of the Ministry of Agriculture and Environment Protection of Turkmenistan (State Wine Factories).

5.7. Dried fruits

Nowadays, dried fruit production in the country is not developed enough to address demands of the local market. Consumed dried fruits are being imported mainly from Islamic Republic of Iran, Turkiye, Uzbekistan and Tajikistan.

A support given to private sector for promoting production of fruits have a potential for improving production of dried fruits sector in the country, because large amounts of produced fruits will require either exporting or processing.

Data on amounts of produced dried fruits in the country is not available in open sources.

5.8. Other fruit and vegetable preservation techniques

Normally fruits and vegetables are conserved in households conditions. Industrial conservation techniques of fruits and vegetables are improving both in private sector and state owned enterprises.

Products of conserved fruits and vegetables are mainly distributed in the local market.

There is a great potential to export conserved fruits and vegetables to other countries, but it require some works towards meeting international standards. The private sector should be supported in this regard, to increase their exporting potential.

According to official statistics of Turkmenistan, amount of produced canned fruits and vegetables are as follows.

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Canned Fruit and vegetables, mln. conventional cans	215.3	314.3	333.6	371.6	371.1	361.6	347.2	360.3

Source: Official statistical data of Turkmenistan

5.9. Bakery and pasta production

Wheat processing is mainly done by the state owned strategic enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan, including production of pasta products. According to official statistics of Turkmenistan, amount of produced bakery products, including confectionery and pasta products are as follows:

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Bread and bakery products, thsd.t	959.9	885.8	881.7	851.4	846.8	852.6	799.5	849.0
Confectionery, thsd.t	28.3	50.5	54.5	46.4	38.8	39.2	49.0	51.9
Pasta, thsd.t	8.2	14.4	14.3	14.8	15.1	16.2	15.6	16.3

Source: Official statistical data of Turkmenistan

5.10. Oil and fat industry

Fat processing is not developed in the country, because it is consumed by consumers and usually cost same price as meat.

Vegetable oil is mainly produced from cotton seed and mainly done by the state owned strategic enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan. According to official statistics of Turkmenistan, amount of produced vegetable oil is as follows:

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Non refined vegetable oil, thsd.t	71.2	107.4	91.4	77.9	78.2	56.3	40.3	49.4

Source: Official statistical data of Turkmenistan

6. Beverage Production

Beverage production is done both by private producers and enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan. Variety of beverages increase as a result of support given to beverage producers under the state policy for decreasing amount of imported goods.

To promote local production of beverages high-rate excise duty is applied to imported alcoholic and non-alcoholic beverages, making local products dominant in the market.

The data on total amount of beverages produced in the country is not available in open sources.

6.1. Non-Alcoholic Beverages

According to official statistics of Turkmenistan, amount of produced non-alcoholic beverages is as follows.

Food products	2007	2015	2016	2017	2018	2019	2020	2021
Mineral water and alcohol-free beverages, mln.dal	11.1	383	42.9	38.2	36.1	34.4	36.9	42.3

Source: Official statistical data of Turkmenistan

6.2. Carbonated soft drinks

Production of carbonated soft drinks is done both by private producers and enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan. Variety of beverages increase as a result of support given to producers under the state policy for decreasing amount of imported goods.

To promote local production of carbonated soft drinks high-rate excise duty is applied to imported carbonated soft drinks, making local products dominant in the market.

The data on total amount of carbonated soft drinks produced in the country is not available in open sources.

6.3. Juice and juice drinks

Production of juice and juice drinks is done both by private producers and enterprises of

the Ministry of Agriculture and Environment Protection of Turkmenistan. Variety of juice and juice drinks increase as a result of support given to producers under the state policy for decreasing amount of imported goods.

To promote local production of juice and juice drinks high-rate excise duty is applied to imported juice and juice drinks, making local products dominant in the market.

The data on total amount of juice and juice drinks produced in the country is not available in open sources.

6.4. Tea and coffee

Mainly, tea and coffee are imported from abroad. In addition to imports of end-user products, certain number of entities offers products produced locally. Such coffee products (both instant and roasted beans) and tea are prepared on the basis of imported raw material which is finally processed in the country. Final processing includes drying, roasting and packaging of the product.

Processing tea and coffee is commonly organized within the cooperation with foreign suppliers of packaging machinery and food technologists.

In terms of roasting and packaging of coffee beans, local Bazzetti and Markow brands actively introduce their cooperation with Italian machinery suppliers and food technologists.

In terms of the consumption, the market is dominant by green tea and instant coffee.

The data on total amount of tea and coffee imported to the country is not available in open sources.

6.5. Alcoholic Beverages

Production of alcoholic beverages is done both by private producers and enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan. Variety of alcoholic beverages increase as a result of support given to producers under the state policy for decreasing amount of imported goods.

To promote local production of alcoholic beverages high-rate excise duty is applied to imported alcoholic beverages, making local products dominant in the market.

The data on total amount of alcoholic beverages produced in the country is not available in open sources.

6.6. Wine and Spirits Production

Production of wine and spirits production is done by enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan.

Newly created large scale wineries actively develop partnership with Italian technologists, agronomists and suppliers of machinery.

To promote local production of wine and spirits production high-rate excise duty is applied to imported wine and spirits production, making local products dominant in the market.

The data on total amount of wine and spirits produced in the country is not available in open sources.

6.7. Brewing Industry

Production of brewing industry is done both by private producers and enterprises of the Ministry of Agriculture and Environment Protection of Turkmenistan.

To promote local brewing industry high-rate excise duty is applied to imported brewing production, making local products dominant in the market.

The data on total amount of brewing industry in the country is not available in open sources.

7. Storage and Distribution process

Subordinate bodies of the Ministry of Agriculture and Environment Protection of Turkmenistan responsible for agricultural production and sustaining food security purchase harvested fruits and vegetables and store in their cold storage facilities and sustain local markets with fresh products throughout the year.

Distribution of food products is done through private and state owned trade enterprises in local bazars.

Ministry of Trade and Foreign Economic Relations sustain required amount of food products state funded organizations and population.

As previously noted, the generally small size of producers in the sector as a whole allows little in terms of post-harvest processing, sorting and storage by producers, this is mainly limited to manual sorting and with little use of specialized equipment.

Processors need to purchase material from a few or many small producers, which means that processors have little control over quality and continuity of supply. This affects consumers in terms of availability, quality, stable pricing, etc. Long-term storage on the farm hardly exists, so any processor who wants to have a constant supply throughout the year must have his own storage facility to store crops purchased from growers.

Fruit and vegetable canning is the main activity of the Turkmen canning industry (canned meat and fish almost disappeared, falling to 2 million cans in 2008, equivalent to less than 1,000 tons). The reported strong growth in canned fruits and vegetables since 1996 has stabilized at 50-60,000 tons of processed fruits and vegetables (compared to 15,000 tons in 1996). The volume of local horticultural production of the canning industry has remained stable at 5-10% since 2000 with a total of 29-24% of local horticultural products being disposed of by the processing sector (source - FAOSTAT). Recently, fruit juice processed under the Serdar brand, founded in 2000, has found its way into the market with imported juice from Turkey and Ukraine. In the last 4-5 years, many other local fruit juice producers have emerged, including Bereketli, Ruhubelent, Jos, 8 Yap, Saaba, Ecil, Nazli, Yedigen and etc., and these stamps covered most of the local market, supported by a state-imposed duty on imported Russian, Turkish and Ukrainian stamps. However, due to the lack of local fruit products, all local fruit juice producers import raw materials (fruit pulp, additives) and packaging from abroad, which makes their production unsustainable and subject to potential challenges associated with cross-border trade.

7.1. Consumption in domestic market

Turkmenistan has not developed its own National Consumer Basket. With this regard, based on the system for the calculation of consumer basket common for CIS countries and report of the National Statistics Institution of Turkmenistan, it becomes possible to estimate the content of the food basket for the working-age group of the population of Turkmenistan. According to the report published in 2020, the main food basket of working-age population of Turkmenistan consisted of milk and dairy products, eggs, bread, pasta products, cereals and legumes.

Product	Consumption kg/year	Consumption kg/month
Milk and dairy products	290	24,17
Eggs (pcs)	210	17,50
Bread, pasta products, cereals and legumes	126,5	10,54
Vegetables and gourds	114,6	9,55
Potatoes	100,4	8,37
Fresh fruits	60	5,00
Meat	58,6	4,88
Sugar and confectionery products	23,8	1,98
Fish	18,5	1,54
Vegetable oil, margarine and other fats	11	0,92
Salt, tea and spices	4,9	0,41

Source: Official statistical data of Turkmenistan

Among these products specified in the table above, high import values for raw sugar, margarine poultry, seed oils, frozen bovine meat are noticeable on yearly basis. According to the 2021 statistics of Turkmenstat, imports of raw sugar amounted to USD 45,7 million which was followed by margarine (USD 38,5 mln) and poultry meat (USD 30,8 mln)

7.2. Export and Import regulations

The State Commodity and Raw Materials Exchange (https://tmex.gov.tm) of Turkmenistan was established by the Decree of the President of Turkmenistan dated July 29, 1994 and is the most important economic institution of the country. The Exchange performs the function of the main body of state regulation of export-import operations.

Before importing or exporting goods, it is imperative to pay attention to:

- GOODS SUBJECT TO MANDATORY CERTIFICATION - "Procedure for certification of

products" approved by order of the Head of the Main State Service "Turkmenstandartlary" for No161 dated May 17, 2021

- SANITARY AND EPIDEMIOLOGICAL CONTROL - "Procedure for certification of food products" approved by order of the Minister of Health and Medical Industry of Turkmenistan No. 48 dated February 13, 2015
- "Sanitary and hygienic rules for products made from waste" approved by order of the Minister of Health and Medical Industry of Turkmenistan No. 243 dated September 10, 2019
- PHYTOSANITARY CONTROL - "Rules for external plant quarantine in Turkmenistan and the list of quarantine objects" approved by order of the Minister of Agriculture and Environmental Protection "for 78-Ö dated February 21, 2022
- VETERINARY CONTROL - "The procedure for state registration of veterinary medicinal products and state control over their quality" approved by order of the Minister of Agriculture of Turkmenistan dated October 15, 2012 No 173-Ö

7.2.1. Restrictions on the export and quoting.

In accordance with the list of goods for which customs duties are not paid and are not limited in quantity approved by the President of Turkmenistan of June 27, 2008 No. 9925, the goods of private entrepreneurs and individuals (food products) Exports from Turkmenistan are allowed:

1. Alcoholic beverages
2. Mineral water
3. Non-alcoholic beverages
4. Vegetables and melons, fruits
5. Pasta products
6. Bee honey
7. Food salt
8. Tomato paste
9. Ice cream and other types of edible ice with or without cocoa
10. Mineral treatment waters
11. Packaged vegetables and fruits
12. Sweets
13. Canned fish
14. Cotton butter

7.3. Customs duties

In accordance with the Resolution of the President of Turkmenistan dated June 9, 2017 No. 252 "On Improving the Operation of the State Commodity and Raw Materials Exchange of Turkmenistan", the sale of goods and products produced in Turkmenistan to foreign trade houses created with the participation of government agencies and non-governmental the goods and products produced by legal entities and private entrepreneurs, as well as from non-state-owned legal entities and private entrepreneurs, purchased from the population, valued at US $ 200,000 (two hundred thousand) (or equivalent national currency, or contracts for the export of goods (raw materials) not exceeding the other foreign currency) may be concluded without participation in exchange trades.

7.3.1. State customs service of Turkmenistan

The State Customs Service of Turkmenistan is a state management body that implements the state policy in the field of regulation of the activities of the customs system of Turkmenistan, ensuring compliance with Turkmenistan's international obligations on customs issues, as well as carrying out the fight against smuggling and other crimes, administrative offenses in the sphere of its activities. Formed on November 4, 1991, the State Customs Service of Turkmenistan, at present, taking into account national practice and proceeding from generally established principles and basic provisions of international law, improves the customs legislation, works on updating the structures of customs bodies, strengthening their material and technical base and using modern satellite communication system carries out activities to implement electronic customs business in the 'online' format. The State Customs Service of Turkmenistan includes its central office, the Training Center under the State Customs Service, the Directorate of Economic Management under the State Customs Service, customs in regions and cities with the rights of the region, their customs posts on the territory of Turkmenistan and checkpoints on the State Border of Turkmenistan. In total, there are currently 6 customs administrations and 51 customs posts. Depending on the features of the function performed at the location of customs posts, customs control and customs clearance of goods passing through the customs border of Turkmenistan is carried out by the Ashgabat city and Akhal, Balkan, Lebap, Dashoguz and Mary region departments.

Turkmenistan, is a member of the World Customs Organization

Actual information on customs duties is available at https://customs.gov.tm/en/customs-info/customs-fees/duties

8. Support for the food production sector in Turkmenistan

One of the priorities of the state policy is rapid development of the agro-industrial complex, which is directly related to ensuring food abundance in the country. Large-scale reforms are successfully carried out in this area, aimed at increasing its efficiency and expand the production of various types of agricultural output.

The adoption of the Program "Revival of the New Epoch of the Powerful State: the National Program for Socio-Economic Development of Turkmenistan in 2022-2052" marked the beginning of a new stage of large-scale transformations aimed at achieving lofty goals.

Comprehensive measures are undertaken to further improve the management and restructuring of agriculture, the establishment of new economic relations in the rural areas, the rational use of land and water resources, raising soil fertility and crop yields, introducing advanced technologies and the latest scientific and technological developments.

It is noteworthy that Turkmenistan is consistently implementing a strategy to address the challenges related to water issues of global importance, contributing to the efforts being made by the international community.

Having the richest experience of prudent water use, accumulated over millennia, Turkmenistan is already developing it for the future based on the most modern approaches, and taking into account global trends, as well as puts forward international environmental initiatives. One of them is the establishment of the Regional Center for Climate Change Technologies in Ashgabat under the UN auspices.

In the water industry, modern, more environmentally advanced land reclamation technologies are introduced, and measures are taken to improve the efficiency of control over the rational use of water resources.

The provision of strategic water reserves is one of the goals specified in the unprecedented project being carried out in the country, which is the construction of the "Altyn asyr" Turkmen Lake in the Karakum Desert, which already has a beneficial effect on the environment, including the increase in biodiversity. Various species of fish settled in its collectors, and reed beds and tamarisk woods along the watercourse banks became a habitat for birds. The water system of the lake will also have a beneficial effect on mitigating the harsh desert climate.

The construction of new modern villages on the shores of a unique hydraulic facility in the

center of the endless Karakum Desert will give impetus to the development of desert lands, and will allow for development of the livestock sector, agriculture and fish farming. This is the aim of the "Concept for the Development of the "Altyn asyr" Lake region for 2019-2025", the phased implementation of which is of exceptional importance from both economic and environmental point of view.

One of the most important objectives for the construction of the Turkmen Lake is to prevent pollution of the Amudarya River. This project, unprecedented in its scale, is of great importance for the whole Central Asia. Its successful completion will not only open up qualitatively new opportunities and possibilities for development of agriculture and water management in our country, but it will also have a beneficial effect on the ecology of the entire region.

According to assessments by domestic and foreign experts, the high profitability of the "Altyn asyr" Turkmen Lake project is beyond doubt. Moreover, its economic return will only grow over time, since the operation of this hydro-technical facility will be associated with a reduction in currently high costs for organizing an optimal water consumption schedule in agriculture, saving and preserving natural resources.

As part of the large-scale reforms being carried out in the agrarian sector, an integral system of state support for the agro-industrial complex has been formed in Turkmenistan. One of its basic elements is investments made in upgrading the infrastructure, technical re-equipment of agriculture and service industries, including the construction of agro-processing enterprises and mineral fertilizers production factories. Significant financial resources are allocated for irrigation and land reclamation, and development of science, breeding and seeding.

Thus, effective measures are taken to diversify agricultural production. Rice is grown in the regions, where soil and climate conditions are most suitable, such as Dashoguz and Lebap regions, whereas sugar beet is grown in Mary and Balkan regions.

Large areas of virgin land are developed in all regions of the country today. Areas are allocated for the cultivation of potatoes, other vegetable, grain and melon crops, new fruit gardens and vineyards are laid. All this requires a constant increase in the level of technical equipment of agriculture, predetermines the demand for modern machinery, mechanized and automated systems for certain technological processes.

A great contribution to development of the agro-industrial complex is made by Turkmen agricultural scientists, employees of research centers at higher agricultural institutions, whose objectives include breeding and seeding work, improvement of agricultural technology for the cultivation of various crops, including the testing of innovative technologies in soil-conservation practices, and analysis of the effectiveness of ongoing activities.

Domestic breeders have dozens of high-yield varieties of different crops introduced into production in the fields of the country, including soft wheats “Türkmenbaşy”, “Bitarap”, “Lebap-1”, “Ýolöten-1”, “Ýolöten -3”, “Miras”, “Garaşsyzlyk”, “Berkarar”, “Bagtyýarlyk” and “Döwletli”, and durum wheats “Türkmenbaşy-1”, “Akbaş”, as well as “Bereket” rice, “Sona” barley, “Paýtagt” and “Laçyn” corn, and “Bereketli” mung bean.

High mechanization and automation of labor is a key aspect of improving the efficiency of agricultural production. Target-focused steps in this area have made it possible to raise the prestige of working professions in the rural areas, attract young personnel and improve employment. A significant help for farmers is new modern machinery from leading world manufacturers, which is operated in the fields during the grain and cotton harvest, and sowing season, such as combines, ploughing and universal tractors, as well as plows, grain seeders, etc.

It should be emphasized that today the problems of technical and technological modernization of the industry are addressed on an innovative basis, taking into account the Concept for Development of the Digital Economy in Turkmenistan. In particular, high-performance special machinery of the John Deere (USA) and Claas (Germany) brands, purchased by our country, is gradually switched to a telematic digital control system.

Animal husbandry, poultry farming, vegetable growing, gardening, viticulture, melons, watermelons and gourds cultivation, beekeeping and other types of agricultural business are actively developing.

Representatives of the private sector of the economy, who are successfully carrying out large investment projects in the above-mentioned industries, take an active participation in this large-scale work. Among the promising areas is the development of greenhouse farms, the number of which is systematically increasing in the regions.

As part of the implementation of the State Programs for Import Substitution and Increasing Exports, agro-industrial clusters are established in all regions that include livestock and poultry complexes, agricultural raw materials processing enterprises and greenhouse complexes, where advanced experience is taken as a basis, and modern technologies are introduced. Enterprises producing meat, dairy and bakery products and other foodstuffs are regularly put into operation.

In general, the effectiveness of the measures being taken to implement the State Program for Import Substitution reflects the growing output of flour, bread and bakery products, meat, milk, eggs, vegetables, watermelons and melons in the country.

The share of the private sector in development of the agro-industrial complex is increasing every year, which is indicated by a significant reduction in the import of foodstuffs, mainly fruits and vegetables, and an increase in their exports.

The stepping up of agribusiness is largely facilitated by preferential bank loans provided to farmers' associations and farms, agricultural joint-stock companies and research institutes, tenants, private entrepreneurs and other agricultural producers.

8.1. Law of Turkmenistan on Food Security

According to the Law of Turkmenistan on Food Security, state regulation of the food market is carried out by the Cabinet of Ministers of Turkmenistan and its authorized state bodies based on the balance of the required and actual level of food production in Turkmenistan.

State regulation of the food market includes:

- accounting for food production, its supply and inventory, as well as monitoring the state of the food market;
- control of the movement of bulk food consignments from its production or import to delivery to consumers;
- certification of food safety and quality for compliance with the requirements of normative legal acts of Turkmenistan.

The Cabinet of Ministers of Turkmenistan, if necessary, has the right to establish state fixed prices in the food market in accordance with the legislation of Turkmenistan.

8.2. Import Substitution and Export Promotion Strategy of Turkmenistan

The authorities of Turkmenistan pay great attention to the development of trade relations with other countries, in connection with which the main focus is on increasing the export of Turkmen products abroad.

Since 2015, Turkmenistan has been implementing a state program to increase export volumes and a state program for the production of import-substituting products.

The purpose of the import substitution program is the development of national industry and the production of products that are competitive in foreign markets. In 2020, the import of food products decreased by 24% compared to 2019 due to the local production of similar products by Turkmen enterprises.

Due to the increase in domestic production, the country's foreign trade turnover has been declining in recent years for objective reasons. But here, too, the policy of diversification in the economy, the creation of new industries and a significant increase in the processing of

raw materials within the country and the supply of finished products to the foreign market, the cost of which is many times higher than the raw materials themselves, is already yielding results.

In general, it can be noted that the policy pursued in the country in the field of import substitution and increase in export volumes allows, even in difficult conditions for the world economy, to increase production, and for individual goods to achieve a noticeable increase in export volumes.

8.3. Investment projects with preferences from the state

Construction of an enterprise for the production of bread and bakery products

- Construction of an enterprise for the production of bread and bakery products.
- Annual capacity - 12 thousand tons.
- investment amount - 3,428,571 US dollars.
- The implementation period is 3 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: "Kämil toplumy" Economical society
- Project Address: Ashgabat city
- Region: Ashgabat

Construction of a plant for the production of drinking water

- Construction of a plant for the production of drinking water.
- annual capacity, 1.25 million decalitres.
- The amount of the investment is 4,857,143.00 US dollars.
- The implementation period is 3 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: Entrepreneur A. Garajaev
- Project Address: Ashgabat city
- Region: Ashgabat

Construction of a plant for the production of tin packaging for food and packaging of food products with a trading store

- Construction of a plant for the production of tin packaging for food and packaging of food products with a trading store.
- Annual capacity:
  - tin packaging - 35 million pieces;
  - dairy products - 2000 tons;
  - canned meat products - 1 million pieces;
  - meat products - 1000 tons;
  - confectionery - 1000 tons
- The amount of the investment is 800,000 US dollars.
- The implementation period is 5 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: Entrepreneur A. Begjanova
- Project Address: Ashgabat city Bagtyyarlyk district
- Region: Ashgabat

Construction of the enterprise for the production of confectionery "Oguzkhan"

- Construction of the enterprise for the production of confectionery "Oguzkhan"
- Annual capacity is 5000 tons.
- The amount of investment is 857,143.00 US dollars
- The implementation period is 2 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: Entrepreneur B. Ishanov
- Project Address: Ashgabat city, Berkararlyk district
- Region: Ashgabat

Construction of a plant for packaging mineral and drinking water from the Berzenga spring into bottles of their polyethylene terephthalate (PET) and glass bottles

- Construction of a plant for packaging mineral and drinking water from the Berzenga spring into bottles of their polyethylene terephthalate (PET) and glass bottles.
- Capacity per year, 450 thousand decalitres.
- The amount of the investment is 407,143 US dollars.
- The implementation period is 6 years.

- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: "Gozly" Economical society
- Project Address: Ashgabat city Bagtyyarlyk district
- Region: Ashgabat

Reconstruction of the «Ýakymly suw» plant and construction of a coal-fired power plant nearby

- Reconstruction of the Fresh Water plant and the construction of a carbon dioxide plant in the surrounding area.
- Capacity per year, 480 thousand decalitres of purified drinking water, 480 tons of carbon dioxide.
- The amount of investment is 651,429.00 US dollars.
- The implementation period is 6 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: "Gozly" Economical society
- Project Address: Ashgabat city Bagtyyarlyk district
- Region: Ashgabat

Construction of a plant for the production of canned vegetables

- Construction of a plant for the production of canned vegetables.
- Capacity per year, only 1 million pieces of cans
- The amount of investment is 685,714.00 US dollars manat.
- The implementation period is 6 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: Entrepreneur P. Nazarova
- Project Address: Ashgabat city Bagtyyarlyk district
- Region: Ashgabat

Construction of a plant for the production of wine and alcohol, 5 ha.

- Construction of a plant for the production of wine and alcohol, 5 ha.

- annual productivity, wine 17.5 million liters, alcohol 1,200,000 liters
- The amount of the investment is 18,000,000.00 US dollars manat.
- The implementation period is 4 years.
- The purpose of the investment is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: "Nurly gadam" Economical society
- Project Address: Ashgabat city
- Region: Ashgabat

Construction of an enterprise for the production of purified drinking water

- Construction of an enterprise for the production of purified drinking water.
- Capacity per year, 1.25 million dal
- The amount of investments is 4,857,142 US dollars. The implementation period is - 6 years. The purpose of the investment - is the creation of a new production. Form of investment - Own and borrowed funds.
- Project Initiator: "Gül zaman" Economical society
- Project Address: Akhal region Gokdepe district
- Region: Akhal
- Construction of a milk processing plant
- Construction of a milk processing plant
- Capacity per year, 1000 tons of dairy products
- The amount of investments is 100,000 US dollars.
- The implementation period is - 6 years.
- The purpose of the investment - is to create a new production. Form of investment - Own and borrowed funds.
- Project Initiator: Entrepreneur T. Nepesov
- Project Address: Akhal region Ak bugday district
- Region: Akhal

Construction of a plant for the production of alcohol.

- Construction of a plant for the production of alcohol.
- Capacity per year, food ethyl alcohol 1.2 million dal,

  - medical alcohol - 0.1 million decalitres,
  - alcoholic beverages - 1.8 million dal
- The amount of investments is 9,257,143.00 US dollars.
- The implementation period is - 6 years.
- The purpose of the investment - is the creation of a new production.
- Form of investment - Own and borrowed funds.
- Project Initiator: "Altyn aýlak" Economical society
- Project Address: Akhal region Ak bugday district
- Region: Akhal

Information on other investment projects https://invest.gov.tm/project/index

8.4. Projects of international organizations intended to support agriculture production

Cooperation Framework 2021-2025: Turkmenistan and FAO signed a Cooperation Framework. Under the agreement, FAO will assist Turkmenistan, which is committed to reforming and strengthening the agricultural sector to meet national needs and meet global challenges. As a result, the Organization will support Turkmenistan in three areas, such as the collection and analysis of data related, in particular, to the Sustainable Development Goals (SDGs); promoting a more productive, efficient and digital agricultural sector with enhanced export potential; assistance in disaster prevention and response, and in the sustainable management of natural resources. The project is being implemented in 2021-2025.

9. New food processing enterprises of Turkmenistan

No.	Type of activity	Product type	Productivity per month	Name of the company	Contacts of the company
1	Production of soft drinks	Josh fruit juice, 1 liter	500,000 liters	IE «Parahat»	Turkmenistan, Ashgabat, Buzmeyin etrap, Yalkim housing complex, Turkmenistan street Phone 24-66-00, fax 24-68-38 E-mail: info@parahat.com.tm
1.1	Production of soft drinks	Non-alcoholic carbonated drink	500,000 liters		
1.2	Production of baby food	Children's puree Yeserge, 90g	10,000 kg		
1.3	Production of soft drinks	Iced tea, Han tea 0.5 liters	100,000 liters		
2	Production of soft drinks	Fruit juice Nyazli, 1 liter	500,000 liters	ES "Yupekchi"	Turkmenistan, Mary region, Sakarchag etrap, Akyap Phone: +(99312) 46 84 64: +(993566) 5 03 65 Mail: Nazli.juice@mail.ru Web address: http://yupekchi.com
2.1		Non-alcogolic carbonated drink	500,000 liters		
2.2		Carbonated drink, 0.5 liter	500,000 liters		
2.3		Buzz iced tea, 0.5 liter	500,000 liters		
3	Production of soft drinks	Carbonated drink, 0.5 liter	500,000 liters	ES “Archalyk suv”	Ashgabat, Bezmein etrap, Abadan highway, building 265-A charyar@archalyk.com (99312) 453031, 453930, 457200, 450320
3.1	Production of drinking water	Pitjeva water, 0.5 liters, 0.33 liters, 1.5 liters	100,000 liters		

No.	Type of activity	Product type	Productivity per month	Name of the company	Contacts of the company
4	Production of vegetable oil	Sesame oil	10,000 liters	Factory for the production of sesame oil "Nurber"	Turkmenistan, Lebap region, Turkmenabad city, 1st industrial zone export@turkmenexporters.com info@turkmenexporters.com
5	Confectionery production	Chocolate wafers	200,000 pcs	ES «Duygy»	Ak bugdaiysky district, village of Tyaze durmush, Akhal /Turkmenistan duygy.tm@gmail.com www.duygy.com.tm
5.1		Chocolates	200,000 pcs		
5.2		Chocolate chip cookies with marshmallows	200,000 pcs		
6.	Production of cornflakes, pistachios, seeds, etc.	Cornflakes, Glazed Cornflakes	35 000t	ES «Asuda»	Turkmenistan, Mary city, Magtymguly street +993 61 09-51-65
6.1		Pistachios Asuda	500,000 pcs		
6.2		Pumpkin seeds	500 000 pcs		
6.3		Sweet puffed rice Asuda, 40g	2 000 000 pcs		
6.4	Confectionery production	Marmalade, waffles, cookies, caramel, sweets, pistachios	---	ES «Hasar»	Turkmenistan, Ashgabat, Shor railway station, Altyn Suv street, 11 info@hasar.tm +99312 74 36 16 , 74 36 22 Fax: +99312 74 32 37 @hasar.official

9.1. Perspectives of the development of agriculture market in Turkmenistan

It is expected that continuous reforms of agriculture of Turkmenistan will lead to changes in the agricultural market of the country. Increasing role of the private sector in all steps of agricultural value chains, including production, storage, processing and distribution is integrating local agricultural markets to the international markets.

Integration of agricultural markets to foreign economic relations will bring the innovative and new approaches to the agriculture.

State policy in promoting production of imported goods and materials in the domestic market, will raise competition capacity of local producers and open new opportunities for them to export agricultural products.

Urbanization processes will probably be a challenge and the demand for rural workers will increase, and consequently conditions of workers of agricultural sector will require improvements to be attractive for young generation.

Trends of digitalization of the sectors of the economy will also be observed in agriculture, and consequently mechanization of agriculture will lower the cost of produced agricultural products contributing to sustaining food security in the country.

Reforms carried out in agriculture will increase demand to high profile specialists in different specialties related to agriculture and to address this demand, higher educational institutions related to agriculture will need modernization as a request of time.

Producers of agricultural products, representing private sector will need continuous real time expert support and consultations. To address this challenge, the network of extension services represented by private sector will be established and improved. Favorable conditions to promote agricultural production will attract both national and foreign investments to the national economy of Turkmenistan.

According to the agricultural department of the Union of Industrialists and Entrepreneurs of Turkmenistan, the tomato crop grown in the country exceeded the needs of the domestic market by several times.

Turkmen tomatoes compete quite actively in foreign markets. The products of Turkmen exporters are successfully sold in the Russian Federation, Kazakhstan, Kyrgyzstan, and Afghanistan. Last year, a batch of tomatoes grown on Turkmen soil was sent to Dubai (UAE) for the first time.

East Fruit experts believe that if earlier Turkmenistan was a relatively small supplier and did not create significant competition for other participants, now Turkmen tomatoes compete quite actively in foreign markets. According to East Fruit analysts, against the backdrop of the ongoing decline in imports of greenhouse tomatoes to the Russian Federation in 2021, the promotion of Turkmenistan in this market has become a real sensation of the year. At the same time, Turkmenistan almost caught up with Uzbekistan in terms of supplies, which also increased exports over the year, but not so significantly. Turkmen vegetables are highly valued in the CIS market due to their excellent taste and low cost of production.

9.2. International standardization in food industry

Standardization of food products allows the food industry of Turkmenistan to:

- improve the process and quality of manufactured goods intended for human consumption;
- customer satisfaction with the quality of products, which in turn ensures competitiveness in the food industry market.

In the food industry, at the moment, there are such types of standardization:

- ISO 9001;
- ISO 22000;
- FSSC 22000;
- HALAL;
- Global G.A.P.

One of the areas of food safety is the international food standard ISO 22000. All areas of the food industry are subject to it. This standard is a kind of food safety management system. And since 2018 in Turkmenistan, it is widely distributed by the introduction in local enterprises engaged in the production of food products. To date, ISO standards have been implemented in hundreds of enterprises. The FSSC 22000 standard has been implemented in 4 companies (2 production companies for PET preforms, one confectionery production, and the production of soft drinks). The Halal standard has been implemented in only 2 companies, and one of them was implemented thanks to the consulting company Standart Hyzmat.

Turkmenistan became a member of the Codex Alimentarius Commission in 2012, and in 2019 the country was selected to implement the Codex Trust Fund (CTF) project. Compliance with this code contributes to the expansion of cooperation in the food field between national producers.

The Codex Alimentarius is the internationally accepted standards, norms and rules for food production. Within the framework of the code, new international standards are also being developed that regulate the safety and quality of food products supplied to the world market.

The main state service "Turkmenstandart" (Turkmenstandartlary) is a state body that manages in the field of standardization and metrology, certification of products (works, services), accreditation of laboratories, geological control over the use and protection of subsoil, mining supervision and labor protection in Turkmenistan. https://tds.gov.tm/en

10. Conclusions

The share of the non-state sector in all sectors of the national economy, including agriculture, is steadily growing. In particular, in 2021, the vast majority of goods and services produced in the country, including 96.6% in the agricultural system, are in the non-state sectors. This became possible as a result of the active involvement of the private sector in large-scale projects implemented in the industrial, agricultural, trade, transport and service sectors of the country.

The number of livestock is increasing as a result of state support, including the improvement of the veterinary service.

Turkmenistan, preserving and increasing the historical traditions of cultivation of the most important crop of domestic agriculture, is one of the world's leading producers of high-quality cotton. Today, more than 60 textile enterprises produce various types of cotton and combined yarn, fleecy and denim fabrics, finished products from them, made on the basis of design and technological solutions, handmade carpets of the highest quality, which are sold on the world market.

Turkmenistan is located in an arid climate zone with very limited water resources and low annual rainfall, as well as 80% of the territory constituting a desert. Agricultural production requires irrigation and 90% of the country's water resources are provided by transboundary rivers flowing from abroad.

All water basins in Turkmenistan are transboundary and originate from outside the country. The Amuderya River, the largest source of water, originates in the Pamir Mountains in Tajikistan, crosses northern Afghanistan, and flows into Turkmenistan. This suggests that, in addition to growing concerns about water scarcity, the country has limited control over the amount of water it receives through transboundary sources. In addition, the Dashoguz region is part of the "Aral Sea Basin Crisis Zone" with highly saline lands and poor-quality water. This subsequently affects the socio-economic development of the region, in particular, agricultural activities and people's health.

An urgent problem is the assessment of possible changes in river flow. The reliability of such an assessment is determined by the accuracy of climate change forecasts and the dependence of the characteristics of the water regime on climatic conditions. It should be noted that the management of water resources by the states of the region has a significant impact on the regime of the Amudarya River.

Barriers to further private sector growth in the agricultural sector are the lack of awareness of climate resilient approaches (best practices and technologies) that can strengthen the

resilience skills and awareness of private farmers. This dynamic is exacerbated by the fact that climate change is not mainstreamed into existing agricultural practices, educational approaches and information materials. Finally, there is also limited access to sustainable water/land/climate information products for the private sector.

It is necessary to improve the system of joint water resources management in the region. Increasing the efficiency of irrigation systems will save significant amounts of irrigation water, which will become a significant reserve for replenishing water shortages in the face of climate change. The introduction of advanced irrigation methods has shown that the transition from the traditional method of irrigation to new ones (drip, sprinkling, laser land leveling) saves up to 30-40% of water. The implementation of adaptation measures will make it possible to significantly compensate for the lack of water for irrigation, which may be caused by climate change.

The development of agriculture, in which large investments are directed, contributes to the expansion of export opportunities and the strengthening of the food segment of the national economy. In recent years, thanks to the qualitative renovation and equipment of sectoral economic entities, the creation of new large industrial enterprises based on innovative technologies, a systematic increase in crop volumes has been observed.

Hydrometeorological modeling suggests that rainfall across the country will steadily decrease. Rainfall will decrease slightly over the next 30 years; By 2050, however, precipitation is expected to drop sharply, falling by as much as 22% by 2100 from current rates. The expected decrease in precipitation in the Central Asian region will help reduce the flow of the Amudarya River by 10-15% by 2050.

These two climate trends of decreasing precipitation and increasing temperatures will be accompanied by an increase in the frequency and severity of climate change-induced disasters (droughts, floods and hurricanes).

It should be remembered that vegetables and fruits, including potatoes and melons, were traditional crops grown on household plots during Soviet times. The production of vegetables and fruits, with the exception of greenhouse production, is carried out mainly on smaller plots. This, of course, limits the possible sorting, packaging and primary processing on site. This also presents a problem in ensuring a uniform sequence or supply. In addition, long-term storage is likely to be either unaffordable or difficult, and it is this that guarantees year-round supplies for processors and the consumer market. The lack of in-house expertise is evident in the fact that most relatively new greenhouse producers tend to rely initially on hired qualified experts and production workers, often from abroad, to supply greenhouses, equipment and capital goods.

The following observations can be made:

- In 1980, vegetable production accounted for 4.4% of the total crop in Turkmenistan, and increased to its peak of 6.4% in 1991, and then slowly declined to as low as 1.9% in 2001, rising to 2.9% in 2008 and stopped at this level (source - FAOSTAT)
- Compared to other Central Asian republics, this is a low level: in Uzbekistan - 6.2%, Tajikistan - 7.9%, Kyrgyzstan - 10.7%. Only Kazakhstan has a lower rate of 1.7%, which is not surprising given the population density and vast areas (source - FAOSTAT)
- The share of vegetables produced by the private sector has increased from less than 20% in 1990 to almost 95% today (source - FAOSTAT)
- Importantly, the share of crop yields achieved by private farmers compared to farmers' associations in 1997-2008. increased by more than 2 times for melons and 2.5 times for grapes (source - FAOSTAT)
- The total production in 2016 (for 10 months) of vegetables was 738,200 tons, melons and watermelons - 366,000 tons, fruits and berries - 168,900 tons, and grapes - 294,700 tons, with Akhal region being the most productive, which quite expected due to its proximity to Ashgabat markets.
- Recently there has been a significant decline in imports of onions (-31.1%), tomatoes (-38.2) and cucumbers (-29.6%); this no doubt reflects a significant increase in the aforementioned greenhouse potential. Potato imports also fell significantly (-11.6%)
- The same cannot be said for fruits and nuts, whose imports increased from less than 1% to 11%

Many of the crops grown are obsolete varieties and varieties that are still being used, inevitably leading to lower yields and quality.

Insufficient transport and storage infrastructure serving the fruit and vegetable value chain is not only an obstacle for fruit and vegetable suppliers, but also for industry processors, because they experience serious difficulties in moving products properly to consumers. The emergence from the Turkmen business climate of an efficient transport and storage infrastructure, including efficient long-term cold storage and transit from the producer through the processor to the consumer, is essential to help meet consumer demands for quality, quantity and safety.

For intermediaries exporting fruits and vegetables to neighboring countries, the problem of collecting material of the same type, quality and continuity is difficult, and is currently carried out on a random basis.

It is clear that new large farms and greenhouses offer the best opportunities for increased production and import substitution for fruits and vegetables. Stronger links are required between the elements that make up the value chain: between producers, processors and retailers, as well as other market operators. For example, organizing contracts throughout

the year with guaranteed prices would be beneficial to all parties.

For the production of vegetables, the following issues should be noted:

- Long-term post-harvest storage of vegetables in hot climates is a major concern for all vegetables. Temperature and humidity must be controlled at least to maintain quality and reduce weight loss due to moisture loss in storage
- Potatoes: if import substitution occurs, then new varieties of potatoes should be considered. There is no such thing as a universal variety. Both french fries and chips require varieties with a high dry matter content (DM), egg-shaped for fries, and round-shaped for chips. Standard (or old/popular) table varieties are not suitable
- Consideration should be given to importing seed potatoes from world-famous companies suitable for French fries or chips varieties, which will allow Turkmenistan to produce frozen french fries and chips.
- Onion: The dry climate of Turkmenistan is ideal for growing onion on a field scale with sprinkler irrigation. Seeds can be planted in March with a harvest in August. It is necessary to import seeds of red, yellow and white varieties, which are capable of producing a yield of 60 tons / ha in Turkmen conditions
- The dry climate means that, as in the Middle East, curing of the bulbs can take place in the field before harvest. This means huge energy savings compared to curing onions in storage at northern climate temperatures
- It is also possible to grow carrots on a field scale with sprinkler irrigation
- Tomatoes: it is obvious how diverse tomato varieties can be, with unsuitable plum tomatoes being offered as table varieties while they are only suitable for canning or tomato juice
- Again, as with other vegetables, it is a matter of paying attention to the specific varieties in order to meet consumer expectations and ensure year-round supply of products grown in the country
- Better arable land should be allocated for vegetable production. The poorest quality land that many of the newly emerging private farmers are gaining is hardly suitable for growing some forage crops such as corn or barley.
- Irrigation infrastructure and methodology needs significant improvement. The government is offering a special soft credit scheme for the purchase and installation of modern irrigation equipment. The reason for the low utilization of government loans offered for irrigation improvement may well be a lack of understanding among farmers and producers of the economic benefits of modern irrigation, such as fewer machines and soil leveling work (usually in the case of flood irrigation), higher yields, caused by the timely and equal application of irrigation water to all parts of crops, the application of fertilizers and some chemicals along with irrigation water.

As for fruits, the following should be noted:

- In hot climates, ensuring the quality of fruits during long-term storage is a real challenge
- Turkmenistan is rightfully famous for its melons and they could possibly become a potential product if the logistical problems of storage and transportation are overcome and/or dried melons become a salable product
- The main goal of producers should be to ensure a year-round supply of fruits from the main types of fruit that the consumer wants to buy, grown and presented in such a quality as to match and compete with imports from surrounding countries
- To improve and increase current fruit production, better land should be allocated to new orchards using improved drip irrigation facilities supported by subsidized government schemes.

Processors and retailers

To enable growers and retailers to succeed in growing fruits and vegetables by increasing quantity and quality. It is clear that closer cooperation and coordination among all actors in the horticultural value chain is a precondition for a good development of the sector. In particular, if the range of domestically produced horticultural products is to expand, such as chips produced in the country, and the variety and quantity of domestically produced juices are to increase and meet the requirements of the domestic market, then closer cooperation of all sector players is critical in order to import substitution has been successful.

The following measures may be considered:

- Long-term controlled ecological storage is necessary for most fruits and vegetables to achieve high quality and availability throughout the year, both for processors and consumers to compete with imports into the country.
- It will also have the effect of pumping over supply during times of peak production, thus reducing the risk of subsequent market price crashes that could affect overall crop profitability
- Provision of suitable enclosed environmentally controlled transport (road or rail) and handling systems to transport fruits and vegetables around the country with minimal damage
- A review of the varieties of fruits and vegetables grown in Turkmenistan should be done, together with the participation of the private sector, to find out which varieties are suitable for specific purposes and where there are gaps, for example. potato varieties with a high dry matter content for French fries and chips
- This should be done in conjunction with the possibility of exploring the creation of new processing plants to fill gaps that are currently being filled by imports when they could be filled by local products. For example, potato chips.

- Establish a research and development structure to explore import substitution and export opportunities for Turkmen fruit and vegetable products, in terms of new diversified fruit and vegetable products, as well as identifying the right varieties of fruits and vegetables suitable for local climate and soil conditions. Ideally, funding for such a structure could be provided through direct producer/processor fees, government subventions, or a combination of both. However, at this early stage of an emerging and underdeveloped private sector producer, special government funding for R&D is recommended to support local research. To improve the effect, research activities should be carried out jointly with the participation of relevant international institutions (FAO, ICARDA, WB, etc.) and their scientists.

11. Useful Links

Turkmenistan Trade Information Portal https://infotrade.gov.tm/?l=en

Ministry of Foreign Affairs of Turkmenistan https://www.mfa.gov.tm/ru

Ministry of Finance and Economy of Turkmenistan https://fineconomic.gov.tm/

Ministry of Agriculture and Environmental Protection of Turkmenistan http://www.minagri.gov.tm/

State Committee on Statistics of Turkmenistan http://www.stat.gov.tm/

Ministry of Textile Industry of Turkmenistan http://turkmentextile.gov.tm/index.php

Ministry of Trade and Foreign Economic Relations of Turkmenistan http://mintradefer.gov.tm/index.php/tk/

Union of Industrialists and Entrepreneurs of Turkmenistan https://www.tstb.gov.tm/

«Turkmendemiryollary» Agency http://www.railway.gov.tm/

State Customs Service of Turkmenistan http://www.customs.gov.tm/

Ministry of Justice of Turkmenistan http://minjust.gov.tm/tm/php/home.php

State Migration Service of Turkmenistan http://www.migration.gov.tm/

Ministry of Labour of Turkmenistan http://mlsp.gov.tm/

Central Bank of Turkmenistan http://www.cbt.tm/index.html

State Bank for Foreign Economic Affairs of Turkmenistan http://www.tfeb.gov.tm/

Chamber of Commerce and Industry of Turkmenistan http://www.cci.gov.tm/index.php/ru/

National Center of Trade Unions of Turkmenistan http://www.tradeunions-kardesh.gov.tm/

State News Agency of Turkmenistan http://tdh.gov.tm/

«Turkmenistan: golden age» News Agency http://www.turkmenistan.gov.tm/

Business Turkmenistan (BT) is a business news and information service https://business.com.tm/

12. Industry Fairs

The calendar of fairs in Turkmenistan for 2023 (the calendar is approved by the Government of Turkmenistan at the end of previous year)

https://cci.gov.tm/turkmen² exhibition

https://business.com.tm/info/exhibitions/exhibitions-in-turkmenistan

March

Exhibition on anniversary of the formation of the Union of Industrialists and Entrepreneurs of Turkmenistan and a meeting of members of the Union of Industrialists and Entrepreneurs of Turkmenistan (17-23.03.2023)

April

Exhibition of the trade complex of Turkmenistan (04-06.04.2023)

September

Exhibition of Economic Achievements of Turkmenistan dedicated to the 32nd anniversary of the independence of Turkmenistan (20.09.2023-21.09.2023)

November

International exhibition of modern technologies for food production "Agro-Pack Turkmenistan-2023" (28.11.2023 - 30.11.2023)

13. Associations

Union of Industrialists and Entrepreneurs of Turkmenistan

https://www.tstb.gov.tm/

Address: 174, A.Nyyazow avenue, Ashgabat city
Phones: (+99312) 21 23 44, (+99312) 21 23 45
E-mail: info@tstb.gov.tm

The Union of Industrialists and Entrepreneurs of Turkmenistan (TUIE) is a public organization, which activity is directed at support of a small-scale and medium-scale business in Turkmenistan, assistance in the development of a private sector of the national economy, the formation of a modern enterprise infrastructure.

The Law of Turkmenistan "About the Union of Industrialists and Entrepreneurs of Turkmenistan (as amended)", adopted in October 2019, provides the legal, organizational and economic basis for the activities of the TUIE.

TUIE plays a significant role in modernization and diversification of Turkmen economy branches, in implementation of modern technologies and advanced world practices into production, in the expansion of production and the range of high-quality products, in the creation of import-substituting and export-oriented industries, ensuring food abundance in Turkmenistan, creating new jobs, and improving the living standards of the population.

The Members of the Union actively participate in the development of various branches, the creation of innovative productions on the output of the goods possessing high competitiveness in the internal and foreign market. They are involved in the spheres of trade, public catering, agriculture, food-processing industry branches, building materials, textile, sewing, furniture, shoe manufacturers, etc. The representatives of a private sector conduct major work in the area of education, tourism, physical culture and sports, render advertising and publishing services.

Developing the agricultural sector on the depend of market relations and increasing the share of the private sector is an important aspect of state policy, and the private sector is given great support.

On the arable lands allotted to the members of the Union, modern farming technologies, water saving systems, achievements of science and best practices is being implemented, ecologically and high-quality vegetables and fruits are grown. The Union members are also carrying out relevant work to increase the capacity of animal husbandry, poultry farming

and the food industry. New productions of members of the union allowed Turkmenistan significantly reduce imports of milk and dairy products, confectionery, sausages and other meat products, packaged and dried vegetables and soft drinks.

A great deal of experience is been gained in growing tomatoes, which takes a major part in the export of food products of Turkmenistan. Domestic market is equipped with ecologically fresh tomatoes grown in the greenhouses belonging to the members of the union, and most of them are exported abroad.

Joint-Stock Commercial Bank "Rysgal", established with the participation of members of the TUIE, provides modern banking services. The number of customers using Internet banking payment services and the "QR-code" (instant verification code) system, which is the main e-commerce tool launched by this bank, is increasing.

The Union of Industrialists and Entrepreneurs of Turkmenistan operates a business school and the country's first private newspaper, Rysgal.

Representing the interests of business circles both in Turkmenistan and at the international level, the Union has opened its trade missions in China, the United Arab Emirates, and Austria. Its representatives take part in international exhibitions held abroad and other business events.

Chamber of Commerce and Industry of Turkmenistan http://www.cci.gov.tm

Address: 143, Chandybil avenue, Ashgabat city, Turkmenistan
Phone: (+99312) 39 89 81
E-mail: 3@cci.gov.tm

The Chamber of Commerce and Industry of Turkmenistan was established to promote the development of the economy of Turkmenistan, its integration into the world economic system, the formation of a modern industrial, financial and trade infrastructure, the creation of favorable conditions for entrepreneurial activity, assistance in establishing trade, economic, scientific, and technical ties with foreign partners.

Promoting the development of exports of domestic goods and services to foreign markets is a priority task of the Chamber of Commerce and Industry of Turkmenistan. We provide practical support to manufacturers and exporters of goods and services in their activities in foreign markets. First of all, this is the provision of quality services not only to domestic, but also to foreign entrepreneurs, including such services as:

- issuance of Certificates of examination and certificates of origin of goods ST-1.
- organoleptic examination.

- execution of customs declarations.
- issuance of a consultation certificate to confirm the degree of depreciation of material assets.
- issuance of conclusions confirming the circumstances of force majeure.
- translation services from foreign languages and certification of translations with the seal of the Chamber of Commerce and Industry of Turkmenistan.
- organization and holding of business events of any format (seminars, conferences, etc.).

The Chamber of Commerce and Industry of Turkmenistan assists in opening representative offices, private companies, joint ventures, in advising on the registration and liquidation of business entities of any organizational and legal form, provides marketing research services, examines contracts, agreements and contracts.

The international cooperation:

On the basis of agreements and memorandums of cooperation, the Chamber of Commerce and Industry of Turkmenistan maintains bilateral relations with many foreign chambers of commerce and industry and associations.

Main areas of work:

- Assistance in the integration of Turkmen business into the system of world economic relations.
- Support for the export of Turkmen producers of goods and services.
- Development of multilateral and bilateral cooperation.
- Organization of business missions.
- Attracting foreign business to Turkmenistan

This is largely facilitated by regular international exhibitions, fairs, and conferences.

Exhibition, fair and congress activities of the Chamber of Commerce and Industry of Turkmenistan:

The development of exhibition, fair and congress activities is one of the incentives for further economic development, a tool for business communication between partners (counterparties), suppliers, manufacturers of goods, works and services, exchange of experience, formation of a positive and favorable business image of Turkmenistan, which has a high industrial and intellectual potential.

The Chamber of Commerce and Industry of Turkmenistan is the coordinator of international congress and exhibition events in Turkmenistan and abroad. To conduct them at a high international level, the Chamber of Commerce and Industry of Turkmenistan has all the necessary infrastructure that meets international standards.

14. List of the main importers in the machinery sectors (agricultural and livestock machinery and equipment, food processing machinery, and Packaging machinery).

N.°	Equipment name	Designation	Production	The owner of the equipment
1	Technological equipment	To adjust the size of leather products, fabrics through a computer system	Italian equipment "ATOM", Company “Gramos”	Entrepreneur Rejepova Aykhan, products under the brand "Gerchek"
2	Production equipment	For the production of textiles (towels)	Turkish equipment	Bursali Company
3	Production equipment	For the processing of cotton seed oil -For the production of rapeseed oil	Turkish equipment	Economic Society "Ovadan Ulke"
4	Production equipment	For the production of meat and sausages	Seydelmann (Germany), PSS Svidnik (Slovakia), Reich Thermoprozesstechnik GmbH (Germany)	Economic Society "Bereketli"
5	Production equipment	For the production of confectionery products	BEMAK DIŞ TIÇARET PAZARLAMA LIMITED ŞIRKETI, EMIR TEKSTIL, Turkey	ES «Hojaly»
6	Production Equipment Vacuum Loader of Polymer Materials	For the production of plastic pipes	«MERCURY DIS TIJARET LOGISTIK», Turkey	IE «Altyn Bürgüt»
7	Production equipment	For the production of polypropylene yarns, bags and bag fabrics	OOO «HERMES TRADE AND TRANS», Uzbekistan	
8	Production equipment	For growing vegetables in greenhouse conditions	«MERCURY DIS TIJARET LOGISTIK», Energy-saving/ sun-shading thermal film Clima+55, Turkey	

N.°	Equipment name	Designation	Production	The owner of the equipment
9	Spraying system	For growing vegetables in greenhouse conditions	“Hoogendoorn” Holland	ES «ÝIGIT»
10	The design of the greenhouse complex	For growing vegetables in greenhouse conditions	“IJAN sera sistemleri” Turkey	
11	Pumps for boilers	For growing vegetables in greenhouse conditions	“Ebara Corparation”, Japan	

Appendix

PROFILING ACTS OF THE LEGISLATION OF TURKMENISTAN IN THE SPHERE OF ECONOMY, DIGITALIZATION, INNOVATIVE DEVELOPMENT, SCIENCE, EDUCATION, LABOR MARKET

1. The Constitution of Turkmenistan dated September 14, 2016 (as amended);
2. Law of Turkmenistan dated August 16, 2014 "On innovation";
3. Law of Turkmenistan dated August 16, 2013 "On "On Science and Technology Parks";
4. Law of Turkmenistan dated 01.03.2014 "On "On the state scientific and technical policy";
5. Law of Turkmenistan dated 15.09.2009 "On "On enterprises" dated June 15, 2000;
6. Law of Turkmenistan dated 09.11.2013 "On "On Scientific Organizations"";
7. Law of Turkmenistan dated September 30, 1999 "On Scientific Intellectual Property";
8. Law of Turkmenistan dated January 10, 2012 "On copyright and related rights";
9. Law of Turkmenistan dated October 23, 2008 "On Trademarks, Service Marks and Appellations of Origin";
10. Law of Turkmenistan "dated 04.11.2017 "On the legal protection of industrial designs";
11. Law of Turkmenistan "dated November 4, 2017 "On the legal protection of inventions";
12. Law of Turkmenistan dated 04.08.2011 "On "On the legal protection of breeding achievements";
13. Law of Turkmenistan dated September 23, 1994 "On the legal protection of algorithms, programs for electronic computers, databases and topologies of integrated circuits";
14. Law of Turkmenistan dated June 18, 2016 "On Employment";
15. Law of Turkmenistan dated June 8, 2019 "On Trademarks";
16. Law of Turkmenistan dated June 8, 2019 "On appellations of origin of goods";
17. Law of Turkmenistan "On Foreign Investments";
18. Law of Turkmenistan 17.11.2017 "On free economic zones"
19. Decree of the President of Turkmenistan dated May 14, 2010 No. 11061 "On approval of the National Program for the Socio-Economic Development of Turkmenistan for 2011-2030";

20. Decree of the President of Turkmenistan dated May 27, 2011 No. 11649 "On improving the system of employment of the population in Turkmenistan";
21. Decree of the President of Turkmenistan dated September 30, 2011 No. 11845 "On approval of the regulation on licensing activities in the field of education and professional training";
22. Decree of the President of Turkmenistan dated 01.05.2015 No. 14226 "On Approval of the Program for Improving the Sphere of Employment and Creating New Jobs in Turkmenistan for 2015-2025";
23. Decree of the President of Turkmenistan dated June 11, 2015 No. 14291 "On approval of the Program for the Development of Innovation Activities in Turkmenistan for 2015-2020";
24. Decree of the President of Turkmenistan dated August 14, 2015 No. 14379 "On approval of the Program for the Development of the Intellectual Property System in Turkmenistan for 2015-2020";
25. Decree of the President of Turkmenistan dated September 15, 2017 No. 340 "On approval of the Concept for the development of the digital educational system of Turkmenistan";
26. Decree of the President of Turkmenistan dated February 1, 2019 No. 1111 "On approval of the Program of the President of Turkmenistan for the socio-economic development of Turkmenistan for 2019-2025";
27. Decree of the President of Turkmenistan dated June 12, 2019 No. 1268 "On financial support for the development of the science system of Turkmenistan";
28. Decree of the President of Turkmenistan dated June 14, 2019 No. 1270 "On approval of the Program for adaptation of youth to the labor market and improvement of their employment";
29. Decree of the President of Turkmenistan dated March 26, 2020 No. 1723 "On approval of the Program for transferring the sphere of science to the digital system in Turkmenistan in 2020-2025";
30. "Program for the development of the intellectual property system of Turkmenistan for 2021-2025", approved by the Decree of the President of Turkmenistan dated 04.12.2020. No. 2007 "On approval of programs, plans and strategies of Turkmenistan for cooperation with international organizations";
31. Decree of the President of Turkmenistan dated 03.07.2020 No. 1809 "On Approval of the National Program to Reduce the Impact of Difficult Circumstances in the World Economy on the Country's Economy and the Sustainable Development of the National Economy";

32. Decree of the President of Turkmenistan dated 08.01.2021 No. 2080 "On approval of the State program in the field of state youth policy of Turkmenistan for 2021-2025";
33. Decree of the President of Turkmenistan dated 12.02.2021 No. 2135 "On approval of the Strategy for the management and reform of enterprises with state participation in Turkmenistan for 2021-2025";
34. Decree of the President of Turkmenistan dated 12.02.2021 No. 2136 "On approval of the State program for the development of the digital economy in Turkmenistan for 2021-2025";
35. Decree of the President of Turkmenistan dated 12.02.2021 No. 2138 "On approval of the Investment Program"
36. Decree of the President of Turkmenistan dated 21.05.2021 "On the establishment of the Interdepartmental Commission for the Protection of Intellectual Property Objects";
37. Decree of the President of Turkmenistan dated 08.06.2021 "On State Financial Support for Entrepreneurship";
38. Decree of the President of Turkmenistan dated 09.07.2021 "On the transfer to economic accounting of some higher educational institutions of Turkmenistan";
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