# «Miwe» - the taste of Turkmen nature!

***The Turkmen experience of fruit and vegetable farming adaptation to climate change. The success story of the Agricultural Holding "Miwe"***

The Open Joint-Stock Company "Miwe" was founded in 2019. Its shareholders include the economic companies "Hemsaýa", "Gök Bulut", "Miweli Atyz", and "Datly Miwe". The Agricultural Holding was allocated a total of 1,200 hectares of land within the Daikhan Association "Watan" in the Kakinsky etrap of Akhal velayat, an administrative region in southern Turkmenistan. In 2019, the land—located near the Karakum Desert—was an undeveloped area with a semi-arid climate, limited fertile soil, and scarce water resources.

Over the past five years, unique gardens have flourished on newly developed land, complemented by the construction of state-of-the-art greenhouses. The joint-stock company is dedicated not only to cultivating traditional regional crops such as fruits, nuts, and vegetables but also serves as a pioneer in banana cultivation. In addition to agricultural production, the company has expanded into fruit and vegetable processing, offering freeze-dried products in vacuum-sealed packaging, as well as dried fruits and frozen goods (Photo 1).


Photo 1. Products by the “Miwe” company. Dry and frozen fruits are sailed under the “Erem” trademark

Today, more than 1,300 professionals are employed at Agricultural Holding "Miwe." The company supplies its products to both the domestic market and international buyers. Wholesale sales are managed by the holding’s sales department, including through Turkmen Exporter[1], an expert platform for Turkmenistan’s producers. Turkmen Exporter is an online B2B platform that connects global buyers with manufacturers in Turkmenistan, offering high-quality goods in bulk at competitive prices. The platform primarily features products from three key industries: agriculture, textiles and clothing, and construction and industrial materials. By using Turkmen Exporter, buyers gain access to a comprehensive database of trusted suppliers, a diverse range of export products, direct negotiations with manufacturers, and cost-effective wholesale pricing.

In 2024, “Miwe” Agroholding was awarded the prestigious GLOBALG.A.P. international certification, recognizing its commitment to the highest standards in product quality, employee working conditions, and environmental sustainability in its production areas.

**GLOBALG.A.P.**

This internationally recognized certification scheme allows farms and agricultural holdings of any size to demonstrate compliance with good agricultural practices. Using a modular approach, it provides customized certification that helps improve efficiency, reduce the number of audits, and expand access to new markets.

GLOBALG.A.P. covers a wide range of agricultural products, including fresh fruits and vegetables, seeds, cattle breeding, dairy products, pig farming, poultry farming, agricultural crops, flowers and ornamental plants, tea, coffee and aquaculture.

[1] https://turkmenexporter.com/

This certification grants access to global markets, with the European market—following the CIS countries—being the first to receive almonds produced in Turkmenistan.

## Major Challenges of Climate Change

Climate change is a global challenge, and each country responds to it based on its unique geographical location, climate, soil conditions, water resources, scientific advancements, and economic capabilities.

The business community's growing interest in developing and implementing water-saving technologies is well-founded. The country's sharply continental and arid climate, coupled with low precipitation levels, results in a sparse and unevenly distributed hydrographic network. Notably, 98% of Turkmenistan's water resources originate outside its borders. Additionally, the soil is generally poor in organic matter but rich in carbonates and sulfates. The climate of Turkmenistan’s flatlands is characterized by extremely high air and soil temperatures, intense summer dryness, and stark weather contrasts. Dust storms, growing in frequency and intensity due to climate change, occur year-round across the country. From May to September, Turkmenistan experiences an exceptionally clear sky, leading to a strong influx of solar radiation. Land suitable for traditional agriculture is limited, as more than 70% of the country is covered by the vast Karakum Desert. Given these challenges, climate change poses serious risks, particularly to agriculture. As a result, adaptation measures have become a priority not only for government agencies but also for farmers themselves. These measures encompass a wide range of practices, with strong emphasis on the adoption of water-saving technologies.

This is unsurprising, as climate projections indicate that the most significant impact of climate change will be a decrease in the water content of the Amu Darya River—the primary water source supplying nearly 90% of Turkmenistan's economic water needs (Diagram 1).

Given that the Amu Darya is a transboundary river supplying water to three upstream countries—Afghanistan, Tajikistan, and Uzbekistan—all of which are actively developing their agricultural sectors, it is evident that water conservation must be a daily practice. As agriculture is the primary consumer of water resources in Central Asia, efficient water use is essential for long-term sustainability in the sector.

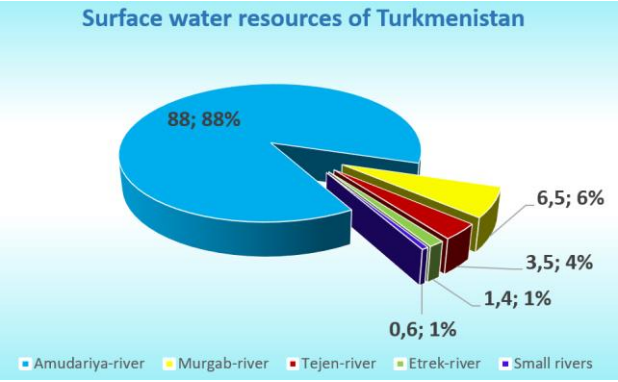


Diagram1: Surface water resources of Turkmenistan, aggregated by river shares in Turkmenistan's water supply

Experts have observed a rise in average annual temperatures, along with an increase in the frequency and duration of droughts, indicating that soil salinization will become an increasingly severe issue over time. In Turkmenistan, the probability of drought ranges from 50% to 75%, posing a significant threat to agriculture. During dry years, crop yields on rainfed lands decline by 20% to 40%, while irrigated areas, despite mitigation efforts, still experience yield reductions of up to 30%. Given that agriculture is the primary consumer of land and water resources, Turkmenistan’s climate challenges are deeply intertwined with its agricultural sector. Reduced water availability and increased soil erosion can have far-reaching consequences, including:

- Decline in agricultural production.
- Reduced food availability, exacerbating food insecurity.
- Shifts in the labor market due to changing demands for agricultural workers and the emergence of new industries.
- Lifestyle changes and increased climate-induced migration.
- Additional challenges stemming from fluctuating energy demands for both fossil fuels and renewable resources.

Droughts inflict lasting damage on natural ecosystems, accelerating soil degradation and biodiversity loss. Turkmenistan lies within a fragile ecological zone, where any mismanagement of land and water resources can trigger irreversible disasters. These challenges underscore the urgent need for comprehensive preventive and adaptive measures.

## UNDP Strengthening Private Sector Resilience to Climate Change

For several years, UNDP has been actively supporting Turkmenistan in strengthening its resilience to the adverse impacts of climate change. From May 2021 to April 2025, in partnership with the Ministry of Environmental Protection of Turkmenistan and with support from the Green Climate Fund, UNDP implemented the project "Developing a National Adaptation Planning Process in Turkmenistan" (NAP). One of the project's key objectives was to raise awareness and build the capacity of national stakeholders on climate change adaptation.

From the outset, the private sector, including companies like "Miwe", played an active role in the project's implementation. These businesses benefited from a variety of capacity-building activities, such as a series of 12 workshops focused on the private sector in the pilot regions of Ashgabat and Dashoguz. Furthermore, quarterly dialogues created a platform for government officials, academia, civil society, and the private sector to discuss critical climate adaptation challenges, particularly in the water sector. These conversations also sparked interest in innovative solutions, such as climate risk insurance, which could offer long-term benefits to local agricultural producers.

## Enabling Factors

On September 23, 2019, Turkmenistan's President, Gurbanguly Berdimuhammedov, approved the National Strategy on Climate Change through a formal decree. The strategy highlights that while adaptation options exist across all sectors of the country's socio-economic development, their implementation and effectiveness in reducing climate risks vary by sector and region. In agriculture, climate change adaptation efforts focus on innovative practices such as improved soil management, water-saving technologies, and the cultivation of crops suited to local environmental conditions. Additional measures include the introduction of diverse crop varieties, crop rotation techniques, responsible fertilizer use, and support for community-level adaptation strategies. Furthermore, investments in agricultural productivity and infrastructure play a crucial role in strengthening the sector's resilience to climate change.

The shift to sustainable agricultural production models is achievable only by striking the right balance between private and public sector initiatives.

Thanks to the creation of favorable conditions for business development in Turkmenistan, the number of modern production facilities is steadily increasing. These facilities play a crucial role in establishing import-substituting industries, ensuring food security, enhancing the competitiveness of food products, and expanding exports. The Government of Turkmenistan actively supports entrepreneurship through several key measures:

- Businesses receive land for long-term use (up to 99 years) free of charge.
- Agricultural producers implementing water-saving technologies can access low-interest bank loans at a preferential rate of just 1%.
- Under the Tax Code of Turkmenistan, agricultural producers are fully exempt from all taxes on profits generated from the sale of their products.

## Development Stages of the Agricultural Holding "Miwe"

Turkmenistan lies in a region with challenging agricultural conditions, making government support especially crucial. To encourage development, the state offers land grants of up to 300 hectares for long-term use—free of charge—for 99 years. Taking advantage of this opportunity, four business companies ("Gök Bulut", "Hemsaýa", "Miweli Atyz", and "Datly Miwe") decided to form an open joint stock company (OJSC) to collaboratively address resource-intensive challenges such as road construction,

electricity and water supply infrastructure, and the development of office, technical, and residential facilities. Despite their joint efforts, each founding company maintains its own land and business focus.

The team of specialists from the founding companies brought valuable experience in greenhouse construction, which played a crucial role in developing the feasibility study for the "Miwe" Agricultural Holding. Careful consideration was given to selecting a suitable site for the construction of greenhouses and fruit orchards, as soil quality (including chemical composition, mechanical properties, and structure) and location (proximity to populated areas, waterways, and high-voltage power lines) are essential factors for this type of business (Photo 2).

Photo 2. Fruit orchards of the "Miwe" Agroholding

To determine the optimal site, numerous soil samples were collected from various locations and analyzed in the laboratory. The selection process was conducted by Turkmen specialists in collaboration with their Turkish counterparts, who continue to provide advisory support to the agricultural holding. A well-prepared feasibility study, combined with a thorough understanding of the financial support mechanisms available to agricultural producers from the Government of Turkmenistan, enabled the founders of "Miwe" to establish the necessary infrastructure efficiently. This infrastructure is designed for both consolidation and expansion as the business grows.

After selecting the site, the team of specialists faced the challenge of securing a reliable water supply, as all plantings required irrigation. Initially, they considered drilling wells but ultimately determined that extending a water pipeline from the Karakum River would be more practical. To fund the project, they secured a bank loan on preferential terms at an annual interest rate of just one percent.

A modern network of hydraulic facilities was constructed, comprising pumping stations, water intake and lifting stations, eight reservoirs for step-by-step sedimentation, and water treatment plants. Water is drawn from an intake station at the 630th kilometer of the Karakum River and transported through three lifting stations into reservoirs with capacities of 70,000 $m^3$ and 100,000 $m^3$. The entire water supply system spans 27.5 km, with a total elevation gain of 180 meters. The clay-rich Amu Darya water is settled in the reservoirs, clarified, and then gravity-fed to gardens and greenhouses (Photo 3).

Photo 3. Sedimentation reservoir for the waters of the Karakum River

In winter, reservoir water levels are low, with reserves carefully conserved for spring irrigation. An automated system manages the entire process of water transportation and usage, ensuring efficient distribution. Irrigation is tailored to meet the specific water requirements of various crops. As new facilities are constructed and plantings planned, the irrigation system continues to expand. The company is also exploring alternative water sources, such as mudflows, to enhance sustainability and efficiency.

Currently, the agrocomplex features office and technical facilities, along with a campus that accommodates 400 workers from neighboring velayats. Employees of the agricultural holding have access to state-of-the-art machinery and advanced communication systems. Additionally, they benefit from an on-site weather station

designed to optimize production processes. Meanwhile, the construction of new industrial refrigerators for product storage is progressing rapidly (Photo 4).

Photo 4. Construction of new industrial refrigerators for storing of grown products

The establishment of industrial plantings began in 2019 using imported plant material from Turkey, Spain, and Italy. Fruit trees are irrigated and fertilized through advanced drip irrigation systems. Currently, the agricultural holding cultivates three varieties of apple trees and five varieties of peach trees, along with extensive persimmon plantations. In 2022, the first harvest was gathered, yielding up to 500 tons of fruit, including apples, plums, and pears—among them the exotic round Japanese pear (Photo 5).

Photo 5. Winter orchard of the Agricultural Holding "Miwe"

The "Gök Bulut" business company initially planned to produce 370 tons of nuts, 520 tons of apples, 120 tons of plums, 140 tons of peaches, and 1,500 tons of pears annually. The "Hemsaýa" business company aimed for 180 tons of almonds and 2,100 tons of dates. Meanwhile, the "Miweli Atyrau" and "Datly Miwe" companies, both specializing in almond production, set targets of 340 and 320 tons per year, respectively. Currently, fruit trees cover 300 hectares, while almonds are cultivated on 600 hectares. An additional 100 hectares have been dedicated to pistachios, with large-fruited sugar varieties sourced from Turkey. Early ripening apple trees, pears, and peaches are thriving and are expected to reach their production targets by 2025.

Almond orchard seedlings were first imported from Turkey in 2020. Over time, the collection expanded with varietal seedlings from other countries. Today, the agroholding boasts a diverse collection of eleven almond varieties. The first harvest took place last autumn, marking a significant milestone. Specialists at the agricultural holding are working diligently to enhance yields and achieve optimal pistachio production in the near future (Photo 6).

Photo 6. Pistachio nuts just before harvest

The agroholding's specialists receive seed material from all over the world and boldly test new varieties on their production sites. The most promising varieties are accepted for production.

Innovative techniques are widely employed in fruit production, such as using lightweight mesh to

Photo 7. Banana greenhouses (exterior view)

shield trees from direct sunlight and protect fruits from bird damage.

In 2023, the "Hemsaýa" business company established banana cultivation greenhouses spanning five hectares. These modern greenhouses, equipped with advanced technological systems, stand over nine meters tall - matching the height requirements of the exotic plants. The challenge of maintaining an optimal microclimate has been effectively addressed: one boiler room heats every ten hectares, supplying water at a consistent 60°C to regulate temperature. Additionally, automated sprinkler irrigation systems ensure a stable 75% subtropical humidity level, creating ideal growing conditions for bananas (Photo 8).

Photo 8. Advanced technologies for banana production

Automation also regulates subsurface moisture. Every process, including drip irrigation, is managed with advanced technology. Beneath the greenhouse roof, six 250-cubic-meter tanks store water, which is purified using reverse osmosis—a method that removes 90-98% of inorganic compounds (Photo 9).

Photo 9. Reverse osmosis facilities

Banana trees are watered according to a precise schedule, monitored not only by automation but also by a specialist who oversees climate, water levels, and container status from a computer.

In the near future, indoor banana plantations will see significant expansion. By 2025, greenhouse construction spanning 110 hectares will be completed. The holding's founders aim to fully meet Turkmenistan's demand for bananas within the next three years.

The agroholding has already turned a profit from its orchards, covering all expenses and now generating steady income. By the end of the loan period, it will have fully financed capital investments in construction, irrigation systems, refrigeration units, warehouses, greenhouses, and machinery. Regarding technical equipment, the company has made substantial acquisitions, including fifty tractors. In 2025, it plans to purchase two almond harvesters. Additionally, combine harvesters were acquired to support increasing production volumes, as a newly planted orchard is set to begin bearing fruit across hundreds of hectares (Photo 10).

Photo 10. Satellite image showing the planting of fruit trees at various stages of maturity. The most mature trees are located in the upper left corner, with progressively younger plantings towards the lower left. The lower right sector features young seedlings, while the upper right corner displays the youngest plantings

The agricultural holding is not only expanding its production areas but also creating more job opportunities for both men and women. Initially, "Miwe" generated 340 jobs for horticulturists, agricultural technicians, mirabas, and irrigation network engineers. Today, the company employs 1,300 people daily, with ambitious plans to

increase this number to 8,500. Employees receive a comprehensive social benefits package, and workers from other velayats are also involved in operations. Currently, 400 employees reside in company-provided campuses, with additional campuses planned to accommodate future growth.

The agricultural holding aims to expand its workforce while also developing a highly skilled team of scientific and engineering professionals trained to meet top international standards. In addition to experts in greenhouse management, the company will require in-house specialists in international certification, global trade and marketing, logistics, automated systems management, and the construction and maintenance of industrial refrigeration units, among other key areas.

The Union of Industrialists and Entrepreneurs of Turkmenistan (UIET) has responded to the growing demand for skilled professionals in the business sector by establishing the University of Business and Entrepreneurship in Ashgabat, set to open in 2025. This institution will accommodate 2,700 students across six faculties, providing specialized education in entrepreneurship and business.

As a premier higher education institution, the UIET university aims to be a leading center for training future business leaders. Notably, the expertise and achievements of the “Miwe” Holding, a flagship in agricultural production, will be integrated into the curriculum, offering valuable insights into efficient production and management.

## Lessons Learned: Key Success Factors, Challenges, and Areas for Improvement

Using the example of the "Miwe" Agricultural Holding, the following key components contribute to its success:

- A strong team with not only technical expertise in greenhouse creation and operation but also a deep understanding of market dynamics and international requirements laid the foundation for success. With a clear strategic vision and the ability to leverage national business development mechanisms and entrepreneurial support programs, the team transformed knowledge into action. This extensive experience enabled the development of a unique synergy of efforts and resources, allowing goals to be achieved in the shortest possible time.
- A comprehensive strategy for agricultural production that includes pooling financial resources to address shared challenges, such as infrastructure and communication.
- Active collaboration with partner organizations to establish effective "vertical" and "horizontal" cooperation, leveraging the expertise of leading specialists from Turkmenistan and international consultants with practical experience.
- Integration of scientific advancements and best international practices to enhance agricultural development.
- Responsibility and discipline in solving production tasks.
- Proper personnel policy, including social guarantees for the holding's employees.

The "Miwe" Agricultural Holding is the example of the efficient response by Turkmenistan business via implementation of activities align the priority state policies aimed to ensure the economic, social and environmental well-being of the population.

Economic well-being focuses on the holistic growth of the export-driven agro-industrial sector by boosting the production of environmentally sustainable food products that are globally competitive. The "Miwe" Agroholding is dedicated to advancing the agricultural sector in the face of a changing climate through the following strategies:

- Adoption of innovative and advanced methods that align with high environmental standards.
- Extensive integration of digital technologies.
- Expansion of the production of high-quality agricultural products across a diverse range.
- Generation of new employment opportunities to foster the development of domestic human resources.

The "Miwe" Agroholding actively promotes the ecological well-being of the region by practicing sustainable management of land and water resources.

Additionally, the Agroholding plays a key role in addressing social challenges, fostering social well-being through a range of initiatives, including:

- Ensuring food security;
- Developing and implementing effective social protection programs;
- Establishing new mechanisms and opportunities for social mobility.

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