



REPUBLIC OF TÜRKİYE
MINISTRY OF AGRICULTURE
AND FORESTRY

**THE 21st MEETING OF THE COMCEC
AGRICULTURE WORKING GROUP
(October 12-13, 2023)**



“Ensuring the Sustainability of Agricultural Inputs to Combat Food Insecurity in OIC Member Countries”

Breeding Practices and Technologies in Türkiye

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FIELD CROPS CENTRAL RESEARCH INSTITUTE



TAGEM
R & D - Innovation

PRESENTATION OUTLINE

1. Current Situation in Türkiye
2. Agricultural Research Infrastructure
3. Research and Development
4. Genetic Resources Preservation
5. Conclusion and Key Takeaways

Türkiye, officially known as the Republic of Türkiye, lying partly in Asia and partly in Europe.

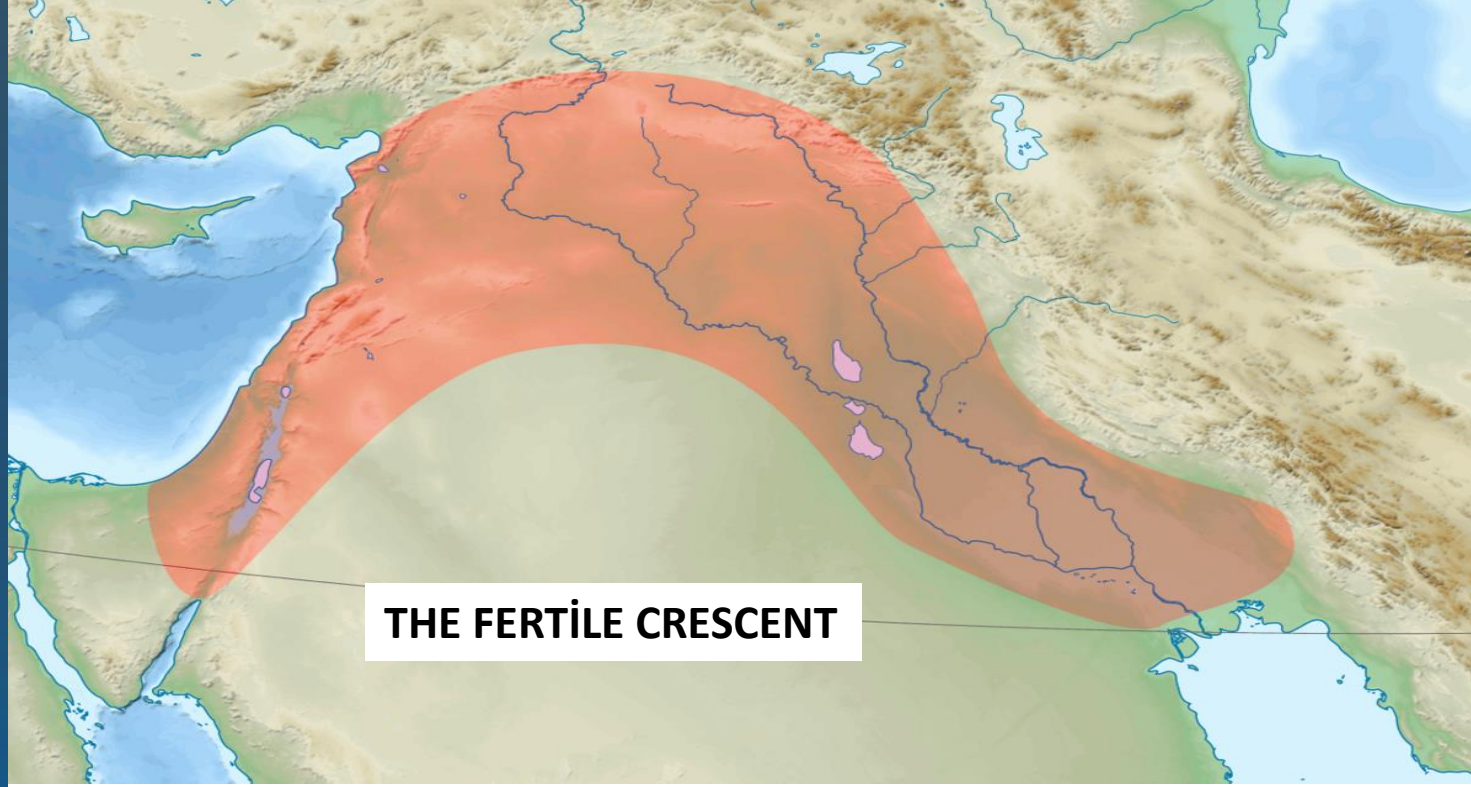
Türkiye is bordered by eight countries, Georgia, Armenia, Azerbaijan, Iran, Iraq, Syria, Greece, Bulgaria.





Current Situation in Türkiye

Fertile Crescent



Agriculture was first started in the region known as the ‘Fertile Crescent’ that covers the southeast region of Türkiye. The Fertile Crescent is historically significant for the domestication of various important crop species such as wheat, barley, and legumes.

Grains: Türkiye is a major producer of essential grains, including wheat, corn, and barley, meeting both domestic food demand and export needs.

Fruits and Vegetables: Türkiye is famous for top-quality fresh produce, including tomatoes, cucumbers, peppers, eggplants, and grapes, which are significant in its agricultural exports.

Dried Fruits and Nuts: Türkiye leads globally in hazelnut production, with over 75% of the world's output, and also exports significant quantities of pistachios, almonds, and figs.

Livestock: Türkiye's cattle, sheep, and goats contribute significantly to its agricultural sector, providing meat and dairy products for both domestic consumption and export.

Fisheries: With a rich marine environment and extensive coastline, Türkiye produces a variety of fish and seafood, including anchovy, sardine, and sea bream.



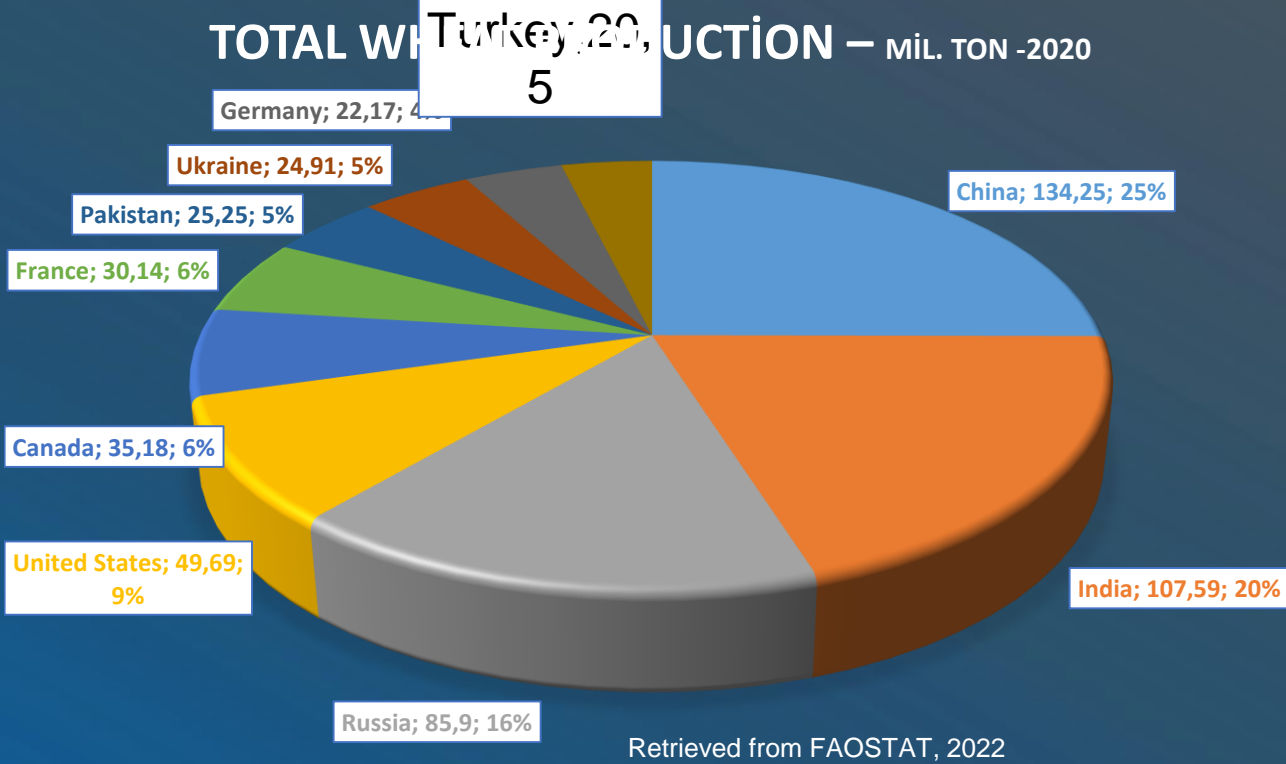


Current Situation in Türkiye

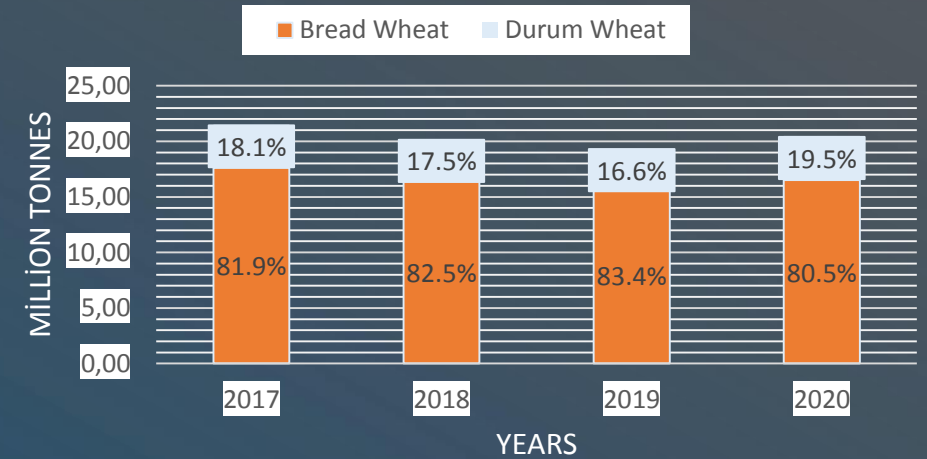


Wheat Production in The World

TOTAL WHEAT PRODUCTION — MIL. TON -2020



Wheat Production in Türkiye



Türkiye had 20.5 million tons of wheat production in 2020. In the past 20 years, the total wheat yield is around 280 kg/da.

Türkiye's wheat production was ranked 10th in the world (FAOSTAT, 2022).



Agricultural Research Infrastructure

- History of the TAGEM
- History of the Institute
- Facilities



Global population is increasing - expected to reach 10 billion by 2050.



Country's population is growing - projected to be 100 million by 2050.



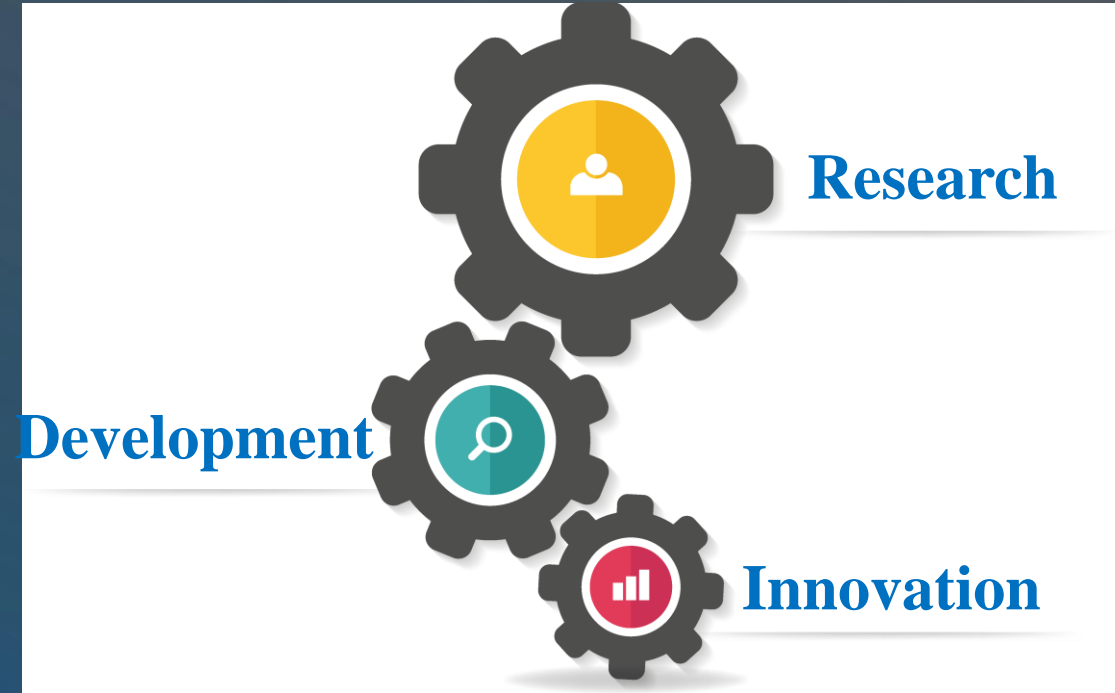
Food demand is rising - estimated to increase by 60-70% by 2050.



Climate change is impacting agriculture.



Natural resources are depleting and becoming polluted.





- **General Directorate of Agricultural Research (TAGEM) was established in 1991 .**
- **In 2011, it was named “General Directorate of Agricultural Research and Policies”.**
- **TAGEM has a rich history with 129 years of R&D experience and 32 years of corporate culture.**
- **It is one of the top 10 organizations in the world in its field.**
- **Turkey's most established, largest, and widespread R&D institution.**
- **It focuses on public-private sector and university R&D collaboration.**
- **TAGEM owns 70% of our country's Agricultural Know-How.**



OPERATING IN AGRICULTURAL R&D IN 35 PROVINCES

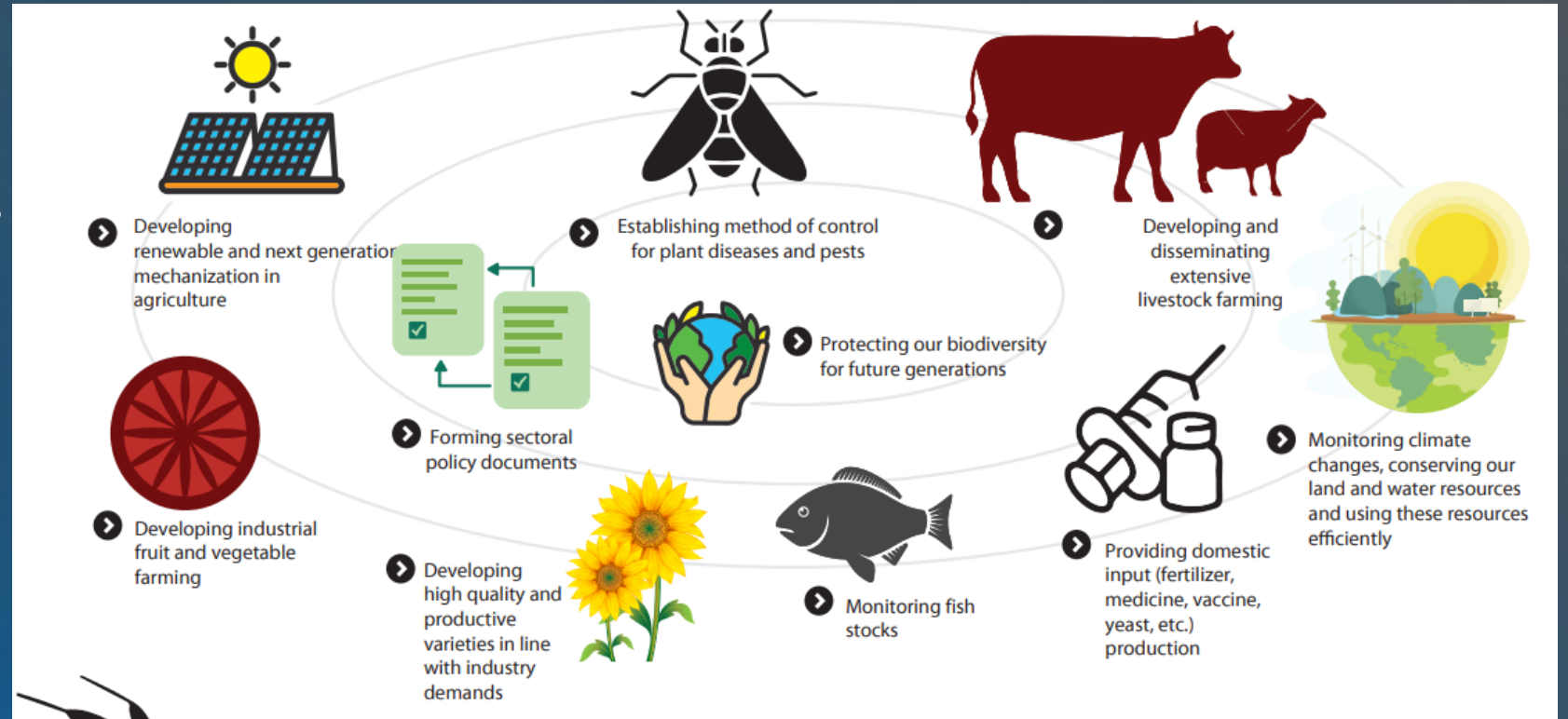
- 10 Central Institutes
- 13 Regional Research Institutes
- 26 Subject Research Institutes
- 28 Advanced R&D Centers
- 300 R&D Laboratories





OBJECTIVES

- Conservation of Genetic Resources
- R&D Innovation
- Developing Agricultural Policies





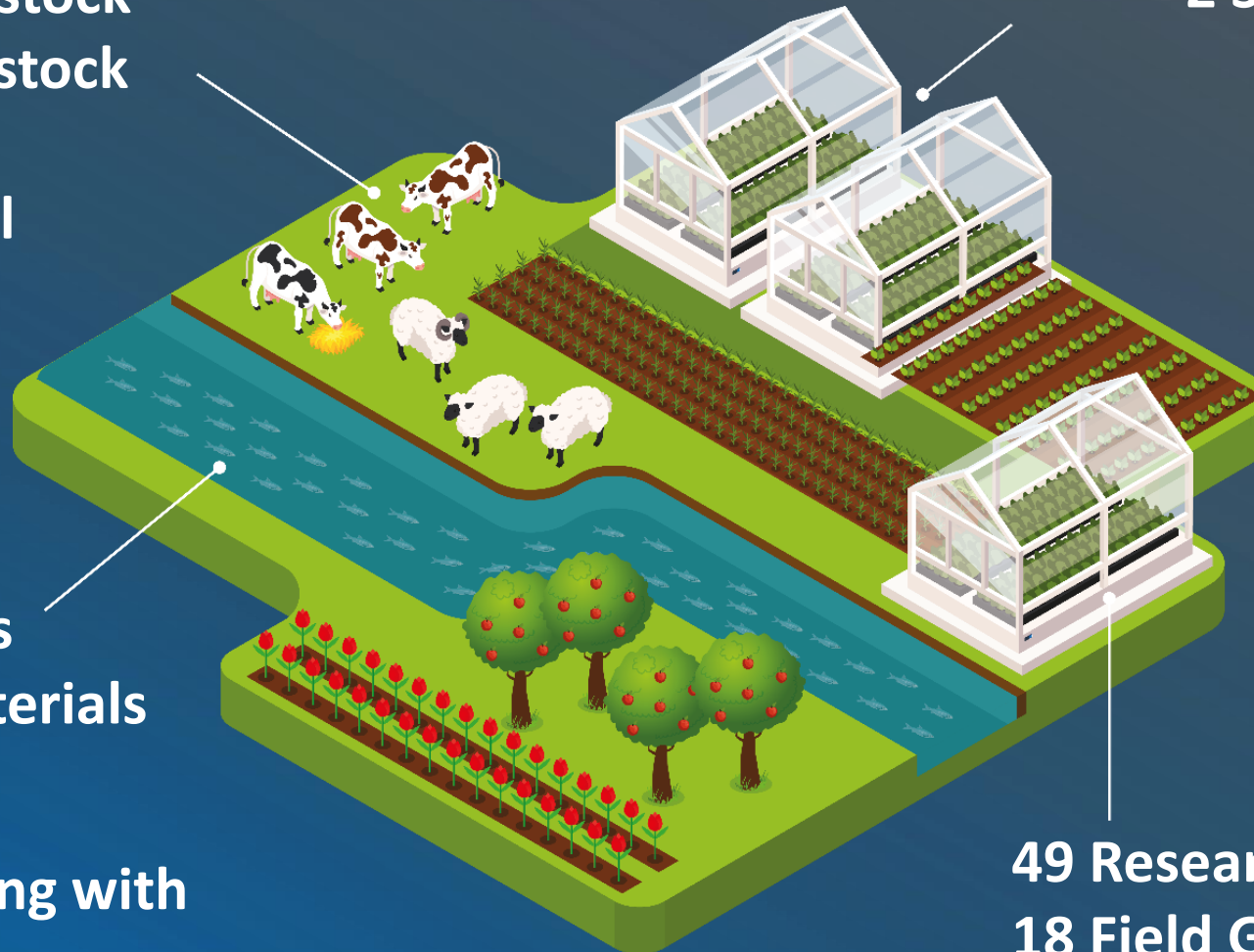
Agricultural Research Infrastructure

Conservation of Genetic Resources (TAGEM)



8,000 Small Livestock
8,250 Large Livestock
88,484 Animals
Genetic Material

2 Seed Gene Banks
121,000 Seeds



263 Aquatic Species
24,076 Genetic Materials

8.5 Million Fish along with
Fish Farming

49 Research Institutes
18 Field Gene Banks
107 Species 10,055 Living Materials



TAGEM proudly registers a diverse range of varieties:

953 Field Crops

588 Fruits

261 Vegetables

150 Grapes

24 Medicinal and Aromatic Plants

28 Ornamental Plants





- In order to ensure food safety and reliability, and to increase yield and quality for the increasing world population,
- it is necessary to carry out R&D studies in the field of plant breeding, variety improvement and seed science and seed technologies; therefore, increasing the production and use of certified seeds.

21 Institutes, 550 Researchers and 431 Projects.

TAGEM's Share in Certified Seed
Production in Türkiye

In Bread Wheat	%58
In Durum Wheat	%64
In Barley	%68
In Triticale	%72
In Oat	%67
In Rice	%72
In chickpea	%69
In Tobacco	%100

More than 40% of our country's 1.4 million tons of Certified Seed Production (2022) consists of TAGEM varieties.



Field Crops Central Research Institute was established in 1926 under the name of **General Agriculture Laboratory**.





In field crops,

To develop new varieties in line with the needs and demands of producers, industry, and consumers,

To conduct applied basic and strategic research within the framework of economic, social, and environmental sustainability principles that can provide solutions to the country's agricultural problems in accordance with changing global conditions,

To carry out research in a multidisciplinary manner and in the framework of national and international cooperation.

To train visionary and innovative researchers who will shape the country's agriculture,

To ensure coordination among national-level institutes in the field of field crops,

To contribute to sectoral development through the varieties and technologies developed as a result of conducted research.



In Quality and Technology Department, all physical, chemical, physicochemical, rheological and textural analyzes are being conducted to evaluate the quality.

Also, the Biotechnology Research Center infrastructure consists of Tissue Culture, Molecular, and Microbial laboratory.



Turkish Seed Gene Bank works as Biodiversity and Genetic Resources Department under Field Crops Central Research Institute.

The research infrastructure of the institute has a total of 12 greenhouses, 9 of them are fully controlled.



The Institute carries out its research trials and production activities on 600 ha land in Ankara.



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Research and Development

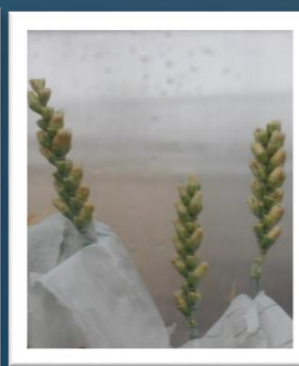
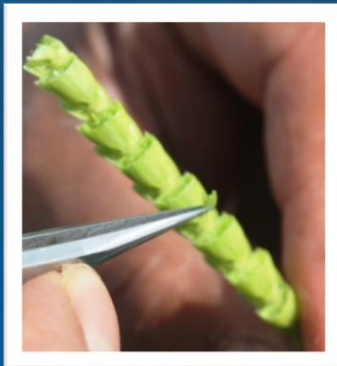
- Breeding Programs
- Biotechnological Studies in the Breeding Programs
- Molecular Marker Studies



The aim of the breeding program is;

to develop varieties for Central Anatolia and the Transitional Regions

- High yields,
- High quality.
- High adaptation,
- Tolerant to abiotic stresses such as drought, heat and salinity tolerance,
- Resistant to biotic stresses,





Creating variation

Germplasm advance
Segregating generations
Doubled haploid populations

Phenotyping
Genotyping

Selection
Characterization

Variety/Germplasm release
Contribution to knowledge

Creating variation

Germplasm advance



Crossing

F₁ | | | | | | | | | | | | | | | | | | | | | |

F₂ ■

F₃ ■

F₄ ■

F₅ ■

F₆ | | | | | | | | | | | | | | | | | | | | | |

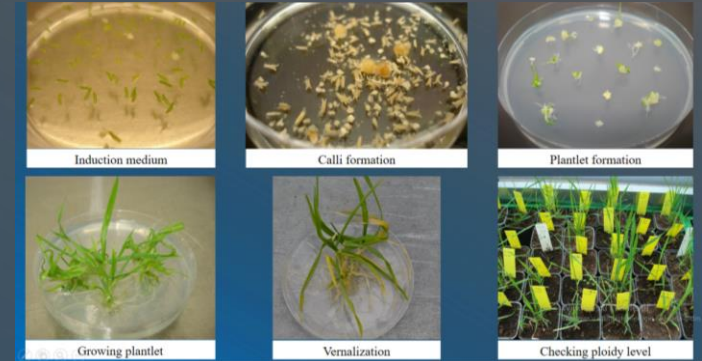
Note: Disease and quality tests are routinely carried out during preliminary and yield trials within a plant breeding programs.²²

Developing a new variety through classical plant breeding typically takes a minimum of 10 years, with the first 5-6 years dedicated to ensuring genetic purity.

We can make this period shorter. We use two different methods to short this time.

1. Anther Culture (including embriyo rescue)
2. Speed Breeding
3. Molecular Marker Studies

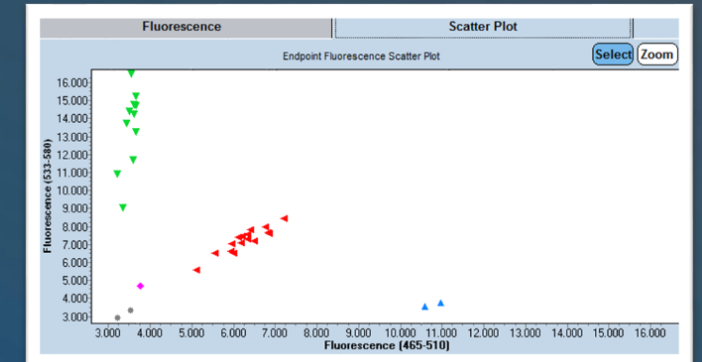
Anther Culture



Speed Breeding



Molecular Markers





From past to present, our contribution in total (140);

- 36 bread, 15 durum, 2 einkorn, and 2 emmer wheat varieties,
- 32 barley varieties,
- 12 chickpeas, 11 lentils and 1 bean varieties,
- 3 clover and 16 vetch varieties,
- spelt, flax, foxtail millet, coriander, medicinal sage, Istanbul thyme, wild barley, pink clover, meadow button, awnless brome, and pasture clover have been developed by selection and hybridization breeding methods.





Research and Development

Seed cultivation activities– Field Crops Central Research Institute



- The institute produces the seeds of the varieties it develops at the original stage and sells them to public and private sector seed companies through contracts.
- Although it varies from year to year, we work closely with approximately 160 companies in 11 species and 63 varieties, making about 600 seed supply-sales contracts with private sector seed companies.



- "Biotech Studies," launched in June 2020, is our institute's biannual peer-reviewed journal, freely accessible.
- It is indexed by Ulakbim, TrDizin, Scopus, CrossRef, and Scientific Indexing Services.
- The journal focuses on various biotechnology fields, publishing original research and reviews in English.
- Topics include agro-biotechnology, plant biotechnology, biodiversity, food biotechnology, animal biotechnology, microbial biotechnology, environmental biotechnology, and more.





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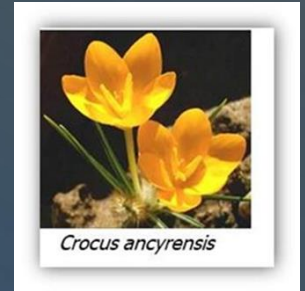
Genetic Resources Preservation

➤ Turkish Seed Gene Bank

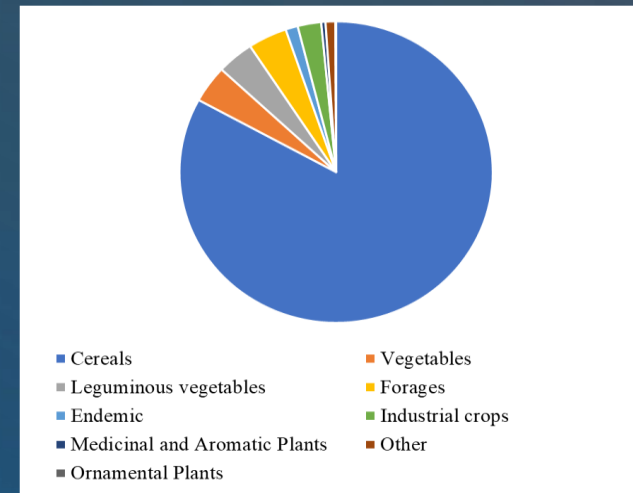
Turkish Seed Gene Bank performs collection, conservation, production, regeneration and periodic viability tests of plant genetic resources.

The Turkish Seed Gene Bank preserves approximately 60,000 accessions, out of a total of 310,000 materials stored across 32 Gene Banks under TAGEM's purview.

Most of the seed samples consist of cereals, mainly wheat, barley, rye, oat etc.



Crocus ancyrensis



Note: Operated Genebank Standards for Plant Genetic Resources for Food and Agriculture, FAO, 2014.²⁸



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Conclusion and Key Takeaways



- Our institute emphasizes crop diversity to enhance resilience against climate change and pests, safeguarding food production in the face of challenges.
- Studies emphasize sustainable practices, reducing farming's environmental impact to ensure long-term agriculture viability.
- Prioritizing modern tech, enhances productivity, minimizes resource use, and reduces waste in agriculture.
- Research supports food security by reducing supply chain losses, addressing food insecurity in Türkiye.
- The institute fosters collaboration among farmers, private sectors, and research institutions to advance sustainable food production and enhance food security.



Thank you for your attention.

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