

MINISTRY OF AGRICULTURE AND FORESTRY

## Soil & Water Researches in Adaptation to Climate Change: Turkey Case

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#### **OUTLINE OF PRESENTATION**



Agricultural Research System in Turkey

> Climate, Precipitation Distirbution & Arid Regions in Turkey

> > TAGEM Research Initiatives and Projects Related to Soil & Water Practices in Drylands









#### Ministy of Agriculture and Forestry

General Directorate of Agricultural Research and Policies (49 Research Institutes- TAGEM)

#### Ministry of Industry and Technology

The Scientific and Technological Research Council of Turkey(TUBITAK)

#### > Universities

- ✓ Faculty of Agriculture
- ✓ Faculty of Veterinary
- ✓ Department of Food Engineering
- ✓ Faculty of Fisheries

#### Private Sector and NGOs







**Research Institutes (49)** 



#### **Research Areas**





- Plant Breeding and Agronomy
- Plant Health
- Livestock Breeding and Husbandry
- Animal Health, Food and Feed
- Aquaculture
- Soil and Water Resources
- Biodiversity
- Agricultural Economy



#### **TAGEM Research Institutes (49)**





## Institutions, authorized with research studies

8 Veterinary Control Institutes

13 Food Control Laboratory

- 10 Central Research Institutes
- 10 Regional Research Institutes
  - 29 Subject Based Research Inst.



### Initiatives



Present initiatives in Agriculture to increase the resilience of sector to climate change have been developed. Works are ongoing..

- Agricultural Research Master Plan (2016-2020)
- Ministry Strategic Plan (2018-2022)
- Agricultural Drought Action Plan has been prepared
- Work started to widely implementing the zero tillage, good farming practices and organic farming
- Programme started to implement subsidies for water saving irrigation technologies
- Programme implemented for the production of drought-tolerant crop varieties developed by research institutes
- Programme improved with the plant-atmosphere simulating model projects using climate senarios
- Uverks on water harvesting, precising farming , soil carbon mapping, renewable
  - energy









#### **Agricultural Drought Coordination Council**





In this plan, the measures that should be taken by the public and organizations in provincial level have been determined and put into practice. 8



#### **Plant Drought Tolerance Test Center**





- Plant Drought Tolerance Test Center" was established within the Konya Bahri Dağdaş International Research Institute in 2010.
- □ The Center is cooperating with ICARDA and other international organizations.
- With the ongoing projects, Center supporting to food security of the region.









Only 0,4% of Turkey is composed of perhumid, 26,8% humid, 31,6% semi-humid, 33,2% aridsemi-humid and 8,5% semi-arid areas. The semi-arid areas cover a wide area in the South East and Central Anatolia Regions.















#### **Climate Changes Projections** Water scarcity as a result of CC





- As part of the southern belt of Mediterranean Europe, Turkey is extremely vulnerable to anticipated climate change impacts.
- It can be observed that in winter seasons, estimated temperature increase is higher especially in the eastern part of the country;
- In summer seasons this pattern is reversed and the western half of the country, especially the Aegean Region experiences temperature increases up to 6 °C.
- Precipitation decreases along the Aegean and Mediterranean coasts and increases along the Black Sea coasts.



#### **Agricultural Lands Suffer From Shortage Of Rainfall**







#### Increased Frequency of Mediterranean Drought

- Climate is the main factor for agricultural production
- Drought is increasing in the most regions
  - It is necessary to develop
    well-considered strategies
    dealing with food security
    and climate change
- In this context, the main purpose is to ensure the sustainable and productive use of natural resources



#### **Increase water use efficiency**







Neutron probe



 New equipments and computer models are using to measure water & soil & crop & atmosphere relations by Soil And Water Research Institutes





#### **Solar Energy Irrigation System**









Solar Energy Irrigation System





- □ 30-80% water saving, 40% energy saving, 50% fertilizer, 30% saving chemicals and 20-50 % yield increase. Thus, primarily of water and other inputs has been saved largely.
- Presently almost 400 000 ha of land have been opened to irrigate by pressurized systems.
- Deficit Irrigation Projects have ben implemented to support program
- Open systems are converting to closed tile systems





#### **FATIMA Project**



- 11 countries participated to the project, the demonstration areas was established in Spain, Italy, Greece, Netherlands, Czech Republic, Austria, France and Turkey.
- The project aim: to develop new tools to optimize the use of water and fertilizer for intensive agriculture within the scope of adaptation to climate change.
- A WebGIS technology package was created combining observation and sensor data with satellite imagery.
- With the use of these tools, weather forecasts and local observation data can be combined to estimate the optimum irrigation scheme and fertilization requirements for the farmers.













- The purpose of this research to investigate the effect on the volumemetric soil moisture in different micro-catchment water harvesting techniques.
- To determine the effect of semi-circular micro-catchment water harvesting techniques on the development and growing of the products like olive trees, vegetables and etc.





#### Negarim Type Micro Basins Water Harvesting Projects



The rainfall is insufficient in Tektek Basin. 23 years average annual rainfall is 370.8 mm. Water harvesting is seen as the best way of soil and water conservation in Semi-arid areas.

Water Harvesting by Used Different Mulch Materials with Negarim Type Microcathment Technique at the Pistachio Gardens in Şanlıurfa Region 2005-2019



Agricultural Drought Monitoring with Palmer Drought Severity Index in the Thrace part of Marmara Region and Determination of Drought Vulnerability





2.4% of the research area was found to be drought sensitive, 45.5% of them were moderately sensitive, 41.6% of them were mildly sensitive and 4.0% of them were not "sensitive".



#### WIND EROSION PROBLEM IN TURKEY







Wind erosion and sand dune movement that make up an interesting example worldwide has occurred in the Akselendi plain.

Wind erosion and deposition phenomena can be seen in a substantial part of the plain. In addition, a very serious wetland destruction has occurred on the plain, which used to have large areas of wetlands.

Major environmental damage has occurred in the plain, due to incorrect practices.



Study of Change of Land Degradation, The Effects and Environmental Evaluation on Manisa Akselendi Plain under The Effect of Wind Erosion (*Şahin-Taysun et al, 2019*)

#### Sand Dune Farming





Lands covered by sand dunes and sediments carried by wind have been transformed into intensive agriculture, especially with the spread of drip irrigation.

In areas with similar features, covered with sand dunes or covered with wind sediments, these areas can easily be converted to agriculture if enough water provided for drip irrigation.



#### WIND EROSION PROBLEM IN TURKEY



Wind erosion is a process of detachment, transport, and deposition of soil particles.



In Turkey, wind erosion is a detrimental problem especially in the southern part of the central Anatolia-(Konya-Karapınar) which is the driest zone of the country. However, wind erosion also occurs in coastal areas.



# PREVENTION WORKS ON 4300 ha AREA of SAND DUNES





#### TAGEN THE LOCATION OF KARAPINAR, KONYA



## KARAPINAR 1950s

## KARAPINAR 1985

## KARAPINAR 2018

Sentinel 2 image 08/06/2018



## CONSTRUCTION AND ESTABLISHMENT OF REED





Reed-screens were used to reduce the velocity of wind and stabilize the sand dunes Establishment of the screens counter to dominant wind direction were applied.

Reed-Screen used in the control works is at the height of 1-2 m. Space between the reed-screen is 8-10 times of height of these screens. After reducing the wind speed, grassing practices were applied to cover the soil surface.

Rye (Scale sp.), Agropyron Cristatum, Agropyron Elongatun as well as different weeds were used.









#### TECHNICAL TOURS ON SAMPLE HILL



#### The story of a reinvigoration in Karapınar, Central Anatolia (Turkey)











#### THANK YOU FOR YOUR ATTENTION

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