Agricultural Water Use and Productivity in Turkey
Contents

1. Introduction
2. Agriculture
3. Water and land Resources of Turkey
4. Sectoral Uses of Water Resources
5. Agricultural Water Management and Food Safety
6. Water Problems - Challenges
7. Solutions and experiences
8. Cooperation Opportunities
9. Conclusion
Turkey is located on the crossroads of Europe and Asia.
Geographic Location of Turkey

- Total Population: 75 Million
- Rural Population: 17 Million (23%)
- Urban Population: 58 Million (75%)

Land Usage

<table>
<thead>
<tr>
<th>Land Usage</th>
<th>Area Mha</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Land</td>
<td>38,2</td>
<td>49,1</td>
</tr>
<tr>
<td>Farm (Cultivated) land</td>
<td>24,5</td>
<td>31,5</td>
</tr>
<tr>
<td>Natural grass land</td>
<td>14,6</td>
<td>18,8</td>
</tr>
<tr>
<td>Forest Land</td>
<td>21,5</td>
<td>27,6</td>
</tr>
<tr>
<td>Settlement and others</td>
<td>3,5</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Toplam</strong></td>
<td><strong>77,8</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

- 26° - 45° eastern longitudes
- 36° - 42° northern altitudes
2. Agricultural Sector In Turkey

- **Living region**: 23% of population lives in rural

- **Employment**: 6.1 million employee (25%),

- **Export**: 11% of all export share (16 Billion $)

- **Raw material**: For Industry such as textile, sugar industry,

- **Food Production**: 74 million domestic, 30 million tourist

- **Income**: 3622 $

Agriculture is an economic sector
3. Land And Water Resources

**Land**

- Total area: 78 million ha
- Agricultural area: 24.5 million ha
- Erable land: 18.4 million ha
- Economicly Irrigable area: 8.5 million ha
- Irrigated area (2012): 5.5 million ha
- Rate: 65%

**Water**

- Surface water: 98 Billion m³
- Groundwater: 14 Billion m³
- Total available Water (net): 112 Billion m³
The annual average precipitation is 643 mm, but it varies from 250 mm at the central Anatolia to over 2500 mm at the eastern Black Sea region.

Turkey hydrologically is divided into 25 drainage basins.

- The rivers often have irregular regimes.
- 120 natural lakes and 579 artificial lake
According to Available Water

<table>
<thead>
<tr>
<th>Annual available water</th>
<th>Water rich</th>
<th>Poor Water</th>
<th>Water scarcity</th>
</tr>
</thead>
<tbody>
<tr>
<td>m³ per capita</td>
<td>8.000-10.000</td>
<td>2.000 and less</td>
<td>1.000 and less</td>
</tr>
</tbody>
</table>

Turkey is not a water-rich country.

Turkey
1.500 m³
per capita
Irrigation Works in Turkey

- **AGENCIES (investor)**
  - Ministry of Forestry and Water Affairs (large scaled irrigation)
    - DSI
  - Ministry of Interior Affairs (Small scaled)
    - Local Agencies & Authorities
  - Ministry of Food Agriculture and Livestock (production & productivity)
    - TRGM

- Private Sectors – NGO’s
  - Water User Associations & Irrigation Cooperatives

- **Agencies Responsible for Irrigation, Development and Management**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Year 2012</th>
<th>Year 2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation</td>
<td>36 billion m³</td>
<td>72 billion m³</td>
</tr>
<tr>
<td>Domestic</td>
<td>7 billion m³</td>
<td>18 billion m³</td>
</tr>
<tr>
<td>Industrial</td>
<td>7 billion m³</td>
<td>22 billion m³</td>
</tr>
<tr>
<td>Total</td>
<td>50 billion m³</td>
<td>112 billion m³</td>
</tr>
</tbody>
</table>

72 % of the water resources is used for irrigation

- Water is under the pressure of agriculture, industry and service sectors.
- The pressure is increasing against agriculture.
5. Irrigation Management (2012)

Irrigable area economically is 8.5 million ha. Irrigated area is 5.5 million ha (65%).

<table>
<thead>
<tr>
<th></th>
<th>Milyon ha</th>
<th>Oran %</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSİ</td>
<td>3.3</td>
<td>61</td>
</tr>
<tr>
<td>Abolished GDRS</td>
<td>1.2</td>
<td>20</td>
</tr>
<tr>
<td>Private İrrigations</td>
<td>1.0</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5.5</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

1950-2012, more than 9,000 irrigation projects have been constructed.

Management of irrigation system is transferred to producer organizations such as Water User Assosiation and Irrigation cooperative.

Participatory irrigation management
Participatory Irrigation Management

Irrigation networks built by the State are transferred to NGO’s

✓ To realize participatory irrigation management,
✓ To ensure auto control,
✓ To reduce the operation and maintenance expenses,
✓ To ensure equality in water distribution,
✓ To ensure sustainable irrigation and agriculture.

For these aims;
- 96% of all irrigation networks have been transferred

• Water User Association 400 1,982,000
• (large scaled networks)
• Irrigation Cooperative 1530 560,000
• (Small scaled networks)
According to evaluation of irrigation results

- Irrigation rate: 55%
- Irrigation efficiency: 45%

How to increase the irrigation rates?
How to ensure the effectiveness of irrigation?

Net income (DSİ 2012)

Dry area: $60 /da
Irrigated area: $363 /da
Revenue increase: $303 /da
Possible Threats And Lessons Learned

- Effects of Global Climate Change on agriculture
- Drought treats water use and increases the food crisis.
- Turkey is located in the arid and semi-arid region.
- Irrigation is compulsory for increasing yields of products
- Food production 2/3 is realised irrigated areas.

Turkey is in the highest risk group with respect to the negative impacts of climate change (Report of IPCC)
Problems – Challenges on productivity

1. **Irrigation Networks**
   - 88% Gravity Irrigation
   - 12% Piped Irrigation
   Half of them is over the age of 30

2. **Problems with agricultural Structure**
   - Fragmented and scattered parcels (Appr. 10).
   - Parcel size (*not enough*)
   - to reach to canal directly (*less than 50%*)
   - Parcel is not suitable for mechanization

3. **Problem of salinity and rising of groundwater level in irrigated land**

4. **Operation and production issues**
   - deficit-limited irrigation in drought season
1 Irrigation Networks

DSI  Policy change (2004)
- from an open channel to piped irrigation system
- To support rehabilitation projects
- 3 milyon ha will be projected with piped system by DSI

TRGM

- Modern irrigation systems are supported by the RDSP (RD 3 project)
### Irrigation Supports by the MoFAL (2006-2012)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Total</th>
<th>Area (da)</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collective Pressure Irrigation Systems (75 % Grant)</td>
<td>539</td>
<td>279.236</td>
<td>55.603</td>
</tr>
<tr>
<td>Support for Irrigation Machine &amp; Equipment (50 % grant)</td>
<td>6.424</td>
<td>398.022</td>
<td>6.316</td>
</tr>
<tr>
<td>Individudal support from banks</td>
<td></td>
<td>3.350.000</td>
<td>144.000</td>
</tr>
<tr>
<td><strong>GENERAL TOTAL</strong></td>
<td>6.963</td>
<td>4.027.258</td>
<td>205.919</td>
</tr>
</tbody>
</table>

- % 30-80 water saving
- % 20-50 yield increase
- % 40 energy saving
- % 50 fertilizer % 30 saving chemicals.

**2006-2012** — 200 farmers have been supported by RDS Programm

**400 000 ha** has been irritated by modern irrigation system.

*Thus, primarily of water and other inputs has been saved largely*
Problems with agricultural Structure

Why Land Consolidation?

*Land Consolidation is an important key;*

- To solve social and physical infrastructure problems about farmers
- To degrease public investments costs and to accelerate irrigation investments
Land Consolidation

Channel network

Without land consolidation

Road and channel network

With land consolidation
The Benefits Of Land Consolidation

1. The parcels grow. Implementation of agricultural techniques and irrigation methods are facilitated.
2. Parcel number reduces (40%) Parcel size increases (80%)
3. The distance between operation center and parcels reduces provide significant fuel savings.
4. Irrigation efficiency increases (from 60% to 90%)
7. Machinery and labor savings(2.5 hour/da) can be achieved.
9. Social peace can be created in the project area.
10. Transportation and irrigation problems of all parcels are solved,
Indication Map of the Old Cadastral Status

Old Parcels: 11,342 Unit

New Parcels: 2,745 Unit

Parceling Map after the Consolidation

Before

27 ------ 1 peace
23 ------ 1
21 ------ 1
20 ------ 1

After

New Parcels: 2,745 Unit
## Land Consolidation And Water Sawing

<table>
<thead>
<tr>
<th>Year</th>
<th>Kiseck Irrigation 24,750 decar</th>
<th>Well Unit</th>
<th>Flow Lt/s</th>
<th>Working hours</th>
<th>Out flow m3</th>
<th>Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Open Channel Irrigation System</td>
<td>45</td>
<td>2.365</td>
<td>74.273</td>
<td>14,583,022</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Underground Irrigation System</td>
<td>46</td>
<td>1.725</td>
<td>68.416</td>
<td>9,681,290</td>
<td>34</td>
</tr>
<tr>
<td>2010</td>
<td>Consolidation + Underground Irrigation System</td>
<td>44</td>
<td>35.064</td>
<td>5,253,177</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

Rate of water saving

64

*Source: Irrigation and Consolidation Project of Karaman Kiseck*

**If land consolidation is applied with irrigation project, composed of more than 50 % water savings**
Karaman Merkez Kisecik LC + Modern Irrigation Project (2750 ha)

Average parcel size
1,61 ha  3,61 ha

Direct access to the irrigation line
61 %  100 %

Consolidation and modern irrigation system ensured
64 % of water savings
Distribution of the suitable areas for Land Consolidation in Turkey

The areas can be consolidated 14,0 Million ha
- Irrigated areas 8,5 Million ha
- Dry areas 5,5 Million ha

GAP (2008-2013) A.P. 2 Million ha will be consolidated (80 % completed)

New strategy basin based and multy purposed land consolidation projects

KOP Action Plan 700,000 ha will be consolidated

The LC of **5,5 million ha** will provide a significant amount of **water savings**
Problem of salinity and rising of groundwater level

- Less water; causes yield and production losses
- More water causes rising groundwater table, deserting and salting, yield losses

Harran basin Irrigation Project 1995- from Atatürk Dam

- Irrigation area: 148,000 ha
- Problematic area: 55,000 ha
- Improved area (2012): 32,000 ha

The structure of the plain is impermeable, it prevents leakage under the ground. Natural drainage is not enough. Over-irrigation led to salinization. Production losses, (for cotton 300 kg)
Drainage work - Trencher

Harran Basin Drainage Project 2009

<table>
<thead>
<tr>
<th>Investment subjects</th>
<th>Planned</th>
<th>Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage area (ha)</td>
<td>55 000</td>
<td>32 000</td>
</tr>
<tr>
<td>Closed Drainage Canals (km)</td>
<td>9 000</td>
<td>4.500</td>
</tr>
<tr>
<td>Engineering Structures (number)</td>
<td>20 000</td>
<td>7.000</td>
</tr>
</tbody>
</table>

Farmers had loosed cotton 300 kg/da each year. (32000 ha)

After drainage;

Recovery is 96.000 ton/year

Farmer income increased by $10,650 yearly
According to data:

- Agricultural Parcels: 30 million
- Agricultural Holdings: 3.1 million
- Average land size: 6 ha
- Parcels per capita: 10 parcel

Agricultural parcels were digitized and Land Parcel Information System (LPIS) was established.

Farmer Register System:
- Location data
- Parcel data (class, str, slope, dry, irrigated)
- Ownership data
- Usage data

Identification number for each parcel

to monitor the parcel based production and supports
✓ Irrigation Networks will be digitilized
✓ It will be integrated with Land Parcel Information System and Farmer Registry system
✓ Irrigation ill be controlled parcel based
Solutions And Experiences

3. Operation and production issues

- Monitoring and evaluation for irrigation networks
- Deficit-limited irrigation during drought

Production Systems Changes

- Water harvesting
- Drought-resistant varieties
- Tillage (toprak işlemesiz tarım)
- Good agricultural practices
- Organic farm
Risk Management in Agriculture

(Good Experience)

- **Turkish Agricultural Insurance System (Tarsım)**
  - Crop Insurance
  - Greenhouse Insurance
  - Livestock Insurance
  - Poultry Insurance
  - Aquaculture Insurance

  - Hail
  - Storm
  - Flood
  - Fire, EQ
  - Landslide
  - Quality Loss
  - Frost (fruits)
Collaboration Opportunities

• Modern irrigation systems, (planning, projecting and training)
• Land Reclamation and drainage systems
• Land Consolidation
• Land use planning
• Monitoring of pollution from agricultural activities (Nitrate Information System - NIS)
• CIS
• Agricultural databases (AIS, FRS, LPIS ....)
• Turkish Agricultural Insurance System (TARSİM)
• Drought Action Plan and Implementations
• Rural Development Plan and Implementations
• ........
• THANKS FOR YOUR ATTENTION