Agricultural Drought Policy & ADMS
(Republic of Korea)
Lecturers

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**<Education Background>**
- BA on Konkuk Univ. (1993)  
- MA on Konkuk Univ. (1995)  
- Ph.D. on Konkuk Univ. (2000)

**<Research Background>**
- P.E. Water Resource Development  
- 2010, Visiting scholar NDMC (Naional Drought Mitigation Center), Lincoln, NE  
- 2012~2014, Residential Representative of KRC (Jakarta, Indonesia)  
- 2015~present, Member of National Drought Mitigation TF  
- Board Member of Korea Society of Agricultural Engineers  
- present, Director of Agricultural drought mitigation center  
  (Korea rural community Corporation, KRC)
Contents

1. Definition of Agriculture Drought
2. Agriculture Drought in Korea
3. Agriculture Drought Policy
4. Agriculture Drought Forecasting & Warning System
5. Education of Water Saving
6. Conclusion
1. Definition of Agriculture Drought

- **Agricultural Drought**

- **No Rain**

- **No Water**

- **Non Irrigation Area**
Natural hazard is . . .

The probability of occurrence, within a specified period of time in a given area, of a potentially damaging natural phenomenon (exposure).

– Each hazard poses a level of risk which varies spatially and temporally and occurs with varying degrees of intensity and severity.
– Extreme natural events may affect different places singly or in combination.
– Each hazard event has an epicenter or area of maximum severity or magnitude.
Natural Hazard Types

**Hydro-meteorological**
- Hurricanes
- Tornadoes
- Floods
- Droughts
- Frosts
- Hail, severe thunderstorms
- Wind
- Snow, ice storms, blizzards
- Lightning
- Cold winters
- Heat waves

**Geologic**
- Earthquakes
- Volcanoes
- Tsunamis
- Landslides
Ranking of Natural Hazards: 
What factors can we use?

- Population affected
- Loss of life
- Economic loss/property damage
- Intensity
- Duration
- Spatial extent
- Onset (slow vs. fast)
- Social and environmental effects
- Long-term impact
What are examples of human-induced disasters?

How do natural hazard-induced disasters and human-induced disasters interact?
I. The ISDR within the UN

B. Composition and position within UN

II. Données statistiques

Factors explaining distribution

- Exposure to hazards
- Size of country
- Vulnerability

EM-DAT: The OFDA/CRED International Disaster Database
(http://www.cred.be; email: cred@epid.ucl.ac.be)
Questions

• Are the economic losses or impacts from natural disasters worldwide increasing?
Questions

• Are the economic losses or impacts from natural disasters in your nation increasing?
Questions

- Are the number of people affected by natural disasters worldwide increasing?
Questions

• Are the number of natural hazards worldwide increasing?
Questions

• Are the number of fatalities from natural disasters in the country increasing or decreasing?
Questions

• When does a natural hazard become a natural disaster?
The Cycle of Disaster Management

Risk Management

Planning

Monitoring and Prediction

Mitigation

Disaster

Impact Assessment

Protection

Response

Recovery

Reconstruction
Disaster Risk Management

• Activities directed at reducing the risk of future disaster events.
  – Monitoring and Prediction
  – Planning
  – Mitigation
Monitoring and Prediction

• Monitoring: activities that provide an early warning of the likely occurrence of a natural disaster event, or an assessment as an event is occurring.

• Prediction: Activities that provide an advanced warning about the occurrence of a natural disaster event.
Planning (Preparedness)

• Activities designed to increase the readiness to respond to a natural disaster event.
Mitigation

• Activities implemented in advance of a natural disaster event that reduce the vulnerability (i.e. impacts) to that event.
Mitigation

Actions taken to reduce the long-term risk of natural hazards on people and property

**STRUCTURAL**

Relies on engineered solutions

**NON-STRUCTURAL**

Relies on non-engineered solutions
Mitigation Examples

**STRUCTURAL**
- Dams and levees
- Wind breaks
- Underground power lines
- Improved drainage
- Flood walls

**NON-STRUCTURAL**
- Early warning system
- Zoning laws
- Education/outreach
- Purchase insurance
- Evacuation route
- Planning process
Mitigation

• Saves money, lives, and property

• Multi-hazard Mitigation Council (2005)
  – $1 on mitigation $4 savings on impacts avoided
    • Cost-effective
  – Proactive mitigation most effective
  – Need more “lessons learned”
What is Risk?

Risk = Hazard \times Vulnerability

(natural event) \quad (social factors)
Components of Disaster Risk Management

- Severity or magnitude
  - Intensity and Duration
- Frequency—probabilities
- Spatial extent
- Trends
  - Historical
  - Future projections
- Impacts
Vulnerability

• Characteristics of a person/group (society) in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard.
  – Varies between individuals, population groups, economic sectors, ecosystems, and countries
  – Dynamic (shifts with time)
Components of Disaster Risk Management

- Population growth
- Population shifts
- Urbanization
- Technology
- Land use practices
- Environmental degradation
- Water use trends
- Government policies
- Environment awareness
Why Plan for Disaster?

“And it was the first time I had planned ahead! Any planning that I did in those early days was such a surprise to me and so successful that I was delighted with even a small plan.”

--Sam Gribley in Jean Craighead George’s
My Side of the Mountain, 1959
Drought Planning Progress

• Nation level
• Local level
  – Municipalities
  – River Basins
  – Counties
  – Producers
• province level
Components of Successful Drought Mitigation Plans

• Monitoring, early warning, and prediction
  – Foundation of a drought mitigation plan
  – Indices/indicators linked to impacts and triggers

• Risk and impact assessment
  – Who and what is at risk and why?

• Mitigation and response
  – Pro-active programs and actions to reduce risks
  – Safety net/programs

Most drought plans contain only the monitoring and response components.
Agricultural Drought

- No Rain

- No Water

Non Irrigation Area
Agricultural Drought

- Paddy
- Upland
Agricultural Drought Cycle

- Rain
- Apathy
- No Rain
- Concern

Agricultural Drought

- No Rain
- Rain
- Apathy
- Concern

- Image of a field with dry soil and cracks, indicating no rain.
- Image of a field with young plants, indicating rain.
- Image of a person holding an umbrella, indicating apathy.
- Image of a family enjoying a picnic outdoors, indicating concern.
- Crops use mostly
- Quantity change
- Public
- Eco-friendly
- Multi purpose
- Reuse
2. Agriculture Drought in Korea

- Drought Occurs

Increasing of frequency and intensity of drought

Climate Change, Spatial Distribution of rainfall

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Map 2013" /></td>
<td><img src="image" alt="Map 2014" /></td>
<td><img src="image" alt="Map 2015" /></td>
<td><img src="image" alt="Map 2016" /></td>
</tr>
</tbody>
</table>

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KBS NEWS

'봄 가뭄 걱정...'...경기도 저수율 평년보다 22%↑

News report image of drought-affected fields.

KBS NEWS
- **Precipitation condition (2016~2018)**

- **Monthly precipitation**

- **Accumulated precipitation**
Reservoir water rate (2016~2018)
## 2. Drought Condition in Korea

### Drought Occurrences in Korea (2015~2017)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Jun ~ July</td>
<td>Aug ~ Sep</td>
<td>May ~ July</td>
</tr>
<tr>
<td>Damage</td>
<td>39 cities 7,356ha</td>
<td>85 cities 39,825ha</td>
<td>107 cities 9,457ha</td>
</tr>
<tr>
<td>Occurrence</td>
<td>ʼ15.5~ʼ15.6 Rainfall 153mm(59%) ʼ15.7 WS rate 50%(74%) * ( ) : normal year rate</td>
<td>ʼ16.6~ʼ16.8 Rainfall 446mm(62%) ʼ16.9 WS rate 49%(65%) * ( ) : normal year rate</td>
<td>ʼ17.1~ʼ17.8 Rainfall 224mm(49%) ʼ17.6 WS rate 37%(62%) * ( ) : normal year rate</td>
</tr>
</tbody>
</table>

### Mapping

![Mapping 2015](image1.png) ![Mapping 2016](image2.png) ![Mapping 2017](image3.png)
3. Agriculture Drought Policy & Action Plan

- Drought Policy Changes
  - Past

How to knowing?

Who?

When?

What to do?

Irrigation area expand
Reservoir build
Crops produce
Evaluation of Drought Damage
- Draw Drought Anticipatory Area
- Found of Permanent Action Plan
- Set up Drought Anticipatory Action Plan

Agriculture Drought Monitoring
- Analysis of Paddy & Upland Drought Indicator
- Monitoring under ICT
- Apply in Field Drought intensity

Anticipatory Action Plan
- Reuse by Pumping Station
- Directly Water Supply
- Develop of Well
- Education of Water Saving

1st Policy (2015): General preparation policy against Drought
ADMS: Agricultural Drought Mitigation System
AWR: Agricultural water Resource
AD: Agricultural Drought
General preparation policy against Drought (2015)

**Policy Directions**

- Switch-over: Using water
  - Managing water
- Fragmentary actions in response drought
  - Comprehensive measures of drought
- Post drought actions
  - Pre-drought measures

**Development Index**

- Rate of irrigated paddy: ('14) 60% → ('24) 75% → ('30) 80%
- Rate of field irrigation: ('14) 18% → ('24) 24% → ('30) 30%
- Rate of management loss: 35% → 25%
- Rate of repetition use: 15% → 30%
# Action plan

## General preparation policy against Drought (2015)

### 4 Strategies, 16 Actions

<table>
<thead>
<tr>
<th>4 strategies</th>
<th>16 tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of planned &amp; multilateral water use</td>
<td>continuous development agricultural water</td>
</tr>
<tr>
<td>Management of the area not subsidized water</td>
<td>increasing capability of water containing &amp; protection water quality</td>
</tr>
<tr>
<td>Improvement of effective use of water</td>
<td>utilization of river water (4 main rivers) &amp; diversification of water source</td>
</tr>
<tr>
<td>Reorganization of on constant alert system for</td>
<td>development of alternative water source (rain, recycling of effluent water)</td>
</tr>
<tr>
<td>drought</td>
<td>field water for the regular drought area</td>
</tr>
<tr>
<td></td>
<td>enforcement of field water tube well systematically</td>
</tr>
<tr>
<td></td>
<td>guide of transferring rainfed paddy field into field farm</td>
</tr>
<tr>
<td></td>
<td>measures of supplying water for mountainous/ isolated area</td>
</tr>
<tr>
<td></td>
<td>scientification of use of water (ICT, TM/TC)</td>
</tr>
<tr>
<td></td>
<td>repairing old facilities</td>
</tr>
<tr>
<td></td>
<td>fixing broad water installations of water system unit</td>
</tr>
<tr>
<td></td>
<td>enforcement of proper installation of reservoir</td>
</tr>
<tr>
<td></td>
<td>construction of constant alert system for drought</td>
</tr>
<tr>
<td></td>
<td>agricultural drought map &amp; decision of the status of drought</td>
</tr>
<tr>
<td></td>
<td>reinforcement of cooperation between departments</td>
</tr>
<tr>
<td></td>
<td>education of saving water (reminder of drought alert)</td>
</tr>
</tbody>
</table>
General preparation policy against Drought (2015)

1. Planned/diversified expansion of agricultural water

→ Rate of safely irrigated paddy field 60% → 80%

- Identified in order to priority for purpose of comprehensive development of the water supply
- Using 4 major rivers
- Expansion of water-containing capacity
General preparation policy against Drought (2015)

2. Water management in areas of underprivileged water welfare

→ Rate of supplying water for upland fields 18% → 30%

- Increasing of water supply rate to the upland fields which is relatively vulnerable to drought than paddy fields
- Prospect of capacity of 60million ton of water/Yr
- Expansion of water supply for mountainous/isolated area
3. Improvement in efficiency of water usage & functions existing irrigation facilities

- Decrease of water-loss rate 35% → 25%
- Increasing ability of water supplying by well-management
- Supply water to the end of the farm land by repetitive use of reservoirs near river, install pumping stations

Irrigation scheduling with ICT

Supplying water directly
- Distribute Drought map every month to minimize the damage from drought, by foreseeing the drought occurrence

<table>
<thead>
<tr>
<th>Past</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&lt; Post-drought response&gt;</strong></td>
<td><strong>&lt;Advanced prevention&gt;</strong></td>
</tr>
<tr>
<td>Occurrence of drought</td>
<td>- Publish &amp; announce drought prediction map</td>
</tr>
<tr>
<td>Emergency response</td>
<td>- Assess water supply performance</td>
</tr>
<tr>
<td></td>
<td>to prepare drought contingency measures</td>
</tr>
<tr>
<td>Restoration</td>
<td>- Activate anticipatory drought measures</td>
</tr>
<tr>
<td></td>
<td>for the venerable areas of drought</td>
</tr>
<tr>
<td></td>
<td>- Assess irrigation plan to Increase</td>
</tr>
<tr>
<td></td>
<td>efficiency of water usage</td>
</tr>
</tbody>
</table>
Irrigation techniques and practicalities within given socio-economic settings

- Using ICT, modelling for improved performance of irrigation systems
- Adopting precision irrigation and improving surface irrigation to combat water scarcity

DSS_Irrigation.mp4
4. Agriculture Drought forecasting & warning system

- Ministry of Public Safety and Security
  - Agriculture Drought Forecasting & Warning System
  - National Disaster Management Institute
  - Water Management Information Networking System

- Rural Development Administration
  - ADMS
  - Agriculture Drought Monitoring System

- Korea Rural Community Corporation
  - ADMS
  - Agriculture Drought Monitoring System

Ministry of Agriculture, Food and Rural Affairs
Ministry of Land, Infrastructure and Transport
Ministry of Environment
Korea Meteorological Administration
4. Drought forecasting & warning system

- Function of agricultural drought forecasting system

Checking for past water reserve rate and average rainfall

Checking for average, past and current water reserve rate

Checking for forecast water reserve rate with each facility

Checking for forecast water reserve rate with each district
Function of agricultural drought forecasting system

- Analysis data of rate of water reserve comparing with average year
- Analysis of capability for defense of drought
- Analysis data of the amount of transplantation and use of it depending on rainfall condition
- Embark measures of drought from prediction
5. Education of Water saving

- Agricultural water loss
  + Channel leakage due to aging
  + Farm scale poor water management
  + Illegal water intake by unregistered water use
5. Water saving Education

- Farmers moral hazard: no water fee & service charge
  + Lack of water conservation mind: overuse
  + Poor water management at farm level: overflow
  + Selfish mind on water use: wasting water

❖ Necessity

- Recognizing importance of farmer’s roles in agricultural water conservation
- Propagation of importance of water saving to water user group including farmers
- Necessary to develop farmers education model for saving water in order to manage drought impacts
5. Water saving Education

- Flash moving picture
- Water game (Sticky activity)
- Water saving simulator
- Water saving guide line
- Poster & slogan
## Development of flash moving picture

<table>
<thead>
<tr>
<th>S#</th>
<th>IMAGE</th>
<th>MOTION</th>
<th>NARRRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td><img src="image1.png" alt="Image 1" /></td>
<td>이웃은 울지만 나만 좋아하는 모습</td>
<td>다른 사람들 벌레지 않는 이기적인 생각과</td>
</tr>
<tr>
<td>34</td>
<td><img src="image2.png" alt="Image 2" /></td>
<td>농업용수 사용을 꺽짜라는 모습</td>
<td>농업용수는 아무리 많이 써도 꺽짜라는 인식,</td>
</tr>
</tbody>
</table>

![Diagram](diagram.png)

water saving_ED.mp4
- Development of water saving guideline for farmers & water suppliers
Education Material

- Development of **slogan, banner & poster for promotion**
Field Education

- Action learning based on drought scenarios
6. Conclusion

- Understanding: More People
  - Communicating information for credibility
- AD Monitoring: Using ICT, Forecasting under Climate Change
- More Water
  - Well, Pumping Station, Dredge etc.
- More saving
  - Education, DSS etc.
- Suggestion: More ADMC
Q & A
Reference

• KOICA website : www.koica.go.kr
• KRC website : www.ekr.or.kr
• ADMS website : www.adms.ekr.or.kr
THANK YOU VERY MUCH!