



Project Title

Development of Water-Energy-Food Nexus platform associating with climate change impacts (2018-2019)

Soals

- ➤ Evaluation of sustainability of water, energy, food through the analysis of food demand according to population & climate change, and of the amount of water and energy resources use
- ➤ Provide decision-making system and policy scenarios that consider the linkage of climate change, water, energy, food to policy makers



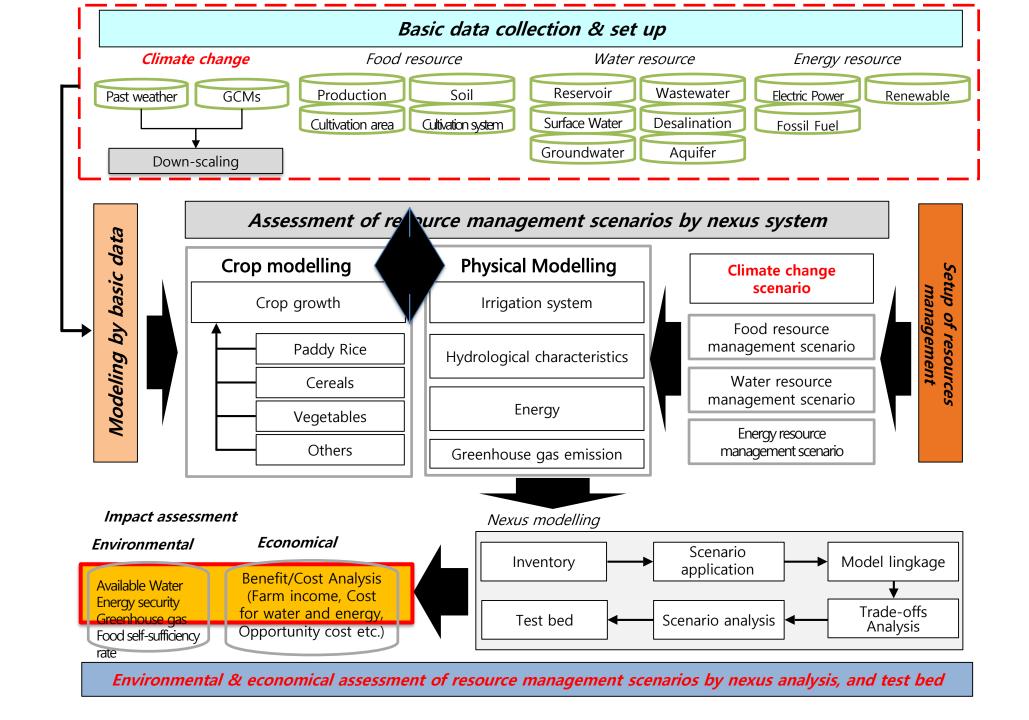














Data Collection

Weather Data

- Weather Station
- Historical Data
- GCM(Climate Change)
- Etc

Water

- Pumping Quantity
- Water Supply System
- Water Use Amount
- Etc.

Food

- Crop Production Amount
- Crops Characteristics
- Soil Types
- Cultivation Methods
- Cropping Systems
- Etc.

Energy

- Energy Type
- Energy Use
- Energy System
- Etc

Reference Data

- Productivity
- Unit Cost
- Unit Value
- Etc.

Inventory Construction

Nexus Terms	Resource, Types	Relation			
Water	Surface water	Resources			
	Groundwater				
	Etc.				
Food	Crops	Crop types			
	Etc.				
Energy	Electric	Resources			
	Oil				
	Gas				
	Solar				
	Wind				
	Etc.				
Water for Food	Water requirement				
Food for Water	-	-			
Energy for Food	Fertilizer	Unit Amount			
	Chemicals	Unit Amount			
	Etc.				
Food for Energy	-				
Water for Energy	-				
Energy for Water	Pumping	Pumping Cost			

Database Construction

Analysis, Simulation

Weather Data

- Conversion
- Downscaling

Water for Food

- Water Requirement
- Water Productivity

Water for Energy

-

Food for Water

-

Food for Energy

-

Energy for Food

- Unit Energy Use for Fertilizer, Chemical, Machinery, Transportation
- Unit Cost

Energy for Water

- Unit Pumping Energy

Models

- Biophysical Model (AquaCrop)
- Hydrological
- Energy Loads
- Etc

Nexus Construction

M -

Models

- Vensim
- Stellar
- Simulation Models



Sustainability Analysis

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Highlight

https://jabistar.com



Use of SNAK for Agricultural Policy

> Agricultural environment conservation program : Water management for paddy field

Policy Measures		Re	esources Assess	Sustainability				
Irrigation Method	Water (1,000 m³)	Energy (Gcal)	Food production (ton)	GH gas (t CO ₂ eq)	Economic Analysis (B/C)	Water Production (kg/m³)	Potential Water Use per Capita	Energy Production
Continuous	8,122	1,142	5,728	5,837	1.35	0.71	1.92	4.97
Intermittent	6,982	1,106	5,909	5,817	1.39	0.88	1.57	5.35
Change Rate(%)	△14.0	△3.2	3.2	△0.3	3.0	23.9	△18.2	7.5

^{*} Area 1,000ha, Rate of water source (Reservoir 70: Pumping station 30), Amount of fertilizer (9kg/10a)

> Agricultural environment conservation program : Assessment of climate change impact

GCM	Policy Measures	Climate		Re	esources Asses	Sustainability				
	Irrigation Method	Change Scenario	Water (1,000 m³)	Energy (Gcal)	Food production (ton)	GH gas (t CO ₂ eq)	Economic Analysis (B/C)	Water Production (kg/m³)	Potential Water Use per Capita	Energy Production
	G 4	RCP 4.5	8,866	1,167	5,644	5,851	1.33	0.66	2.07	4.84
HAD	Continuous	RCP 8.5	7,463	1,120	5,379	5,825	1.27	0.74	1.74	4.80
GEM 2-CC	Intermittent	RCP 4.5	7,715	1,131	5,759	5,831	1.36	0.77	1.73	5.10
		RCP 8.5	6,390	1,086	5,555	5,807	1.31	0.90	1.44	5.12



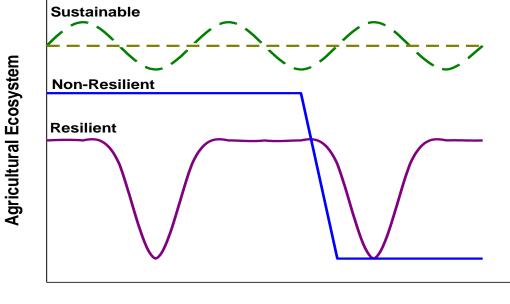
- Use of SNAK for Agricultural Policy
 - > Response to climate change: Evaluation of performance indicator for GH gas reduction
 - **✓** Performance indicator : Rate of intermittent irrigation area in paddy field (97%)

Policy for Climate Change Response	Irrigation Method	Applying Area (10,000ha)	GHG (t CO ₂ eq)	Water (10 ⁶ m³)	Energy (Gcal)	Food Production (1,000ton)	Economic Analysis (B/C)
×	Continuous	86.5	5,049,238	7,025.9	988,198	4,954.9	1.35
0	Intermittent	83.9	4,880,824	5,858.0	927,793	4,957.4	1.39
	Continuous	2.6	151,769	211.2	29,703	148.9	1.35
	Sum	86.5	5,032,593	6,069.2	957,496	5,106.3	
Cha	△0.33	△13.6	△3.1	3.06	2.96		



Future of SNAK

- ➤ Advancement of SNAK : 2 Projects promotion
 - ✓ Development of water-energy food nexus technology for agricultural drought impact assessment (2021-2023)
 - ✓ Development of evaluation index for agricultural environment conservation program using water-energy-food nexus (2021-2025)
- > Future Plan for SNAK : Linkage with Resilience



Time

