WORKSHOP PROCEEDINGS

International Workshop on Forest Landscape Restoration and Resilience to Climate Change in Northeast Asia

9 - 13 April 2018 / Beijing & Ordos, China

APAFRI

IUFRO

[Organized by]

Asia Pacific Association of Forestry Research Institutions
IUFRO Working Party 1.01.13

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Editors
Ho Sang Kang, Miin Bang, Tae Hyung Kim

Contributors
Shirong Liu, Wenming Lu, Zengming Song, Yong Huan Jin, Kwang Chun Ryu, Kang Nam Hwang, Ryom Song Hwan, Pak Yong Il, Ri Yong Hun, Pok Kwang Il, Chang Mo Kang, Jeong Bin Im, Hyun Park, Myoung Soo Won, Sang Ho Lee, Ho Joong Yi, Seung Soon Kim, Song Hee Nam, Mathilde Marchisio

CONTENTS

I. Introduction

1. Background

Forests in Asia are unique because of their diverse ecosystems and high biodiversity, and those ecosystems have not only stood at its dignity as itself but also provided essential and valuable services to human beings. Those forest ecosystems, however, has been under enormous pressure of deforestation and forest degradation, induced by both natural factors (i.e., climate change, fire, flood and drought) and anthropogenic factors (i.e., illegal logging, shift cultivation, and over exploitation). Those deforestation and forest degradation have resulted in both environmental damages of soil erosion, land degradation and biodiversity loss and socioeconomic damages of insecure food, water and health, as well as the loss of cultural identity/dignity to the people.

In order to mitigate and combat those challenges in forest sector, international dialogues among various stakeholders have been proceeded for last decades and some agreements/voluntary commitments have been followed such through Bonn Challenge, Aichi targets to the Convention of Biological Diversity, New York Declaration on Forests, REDD+ and Goal No. 15 of Sustainable Development Goals, mostly focusing on forest restoration, sustainable forest management, halting biodiversity loss and combating land degradation. Largely complementing those foci, Forest and Landscape Restoration (FLR), defined and understood as the process of regaining ecological functionality and enhancing human wellbeing across cleared or degraded forest landscapes through promoting large-scale and mosaic restorations, is expected to (i) transform the large areas of degraded and deforested land into resilient, multifunctional assets that can contribute to local and national economies, (ii) sequester significant amounts of carbon, (iii) strengthen food and clean water supplies, and (iv) safeguard biodiversity (IUCN & WRI, 2014).

Indeed, FLR is increasingly being considered in international and national strategies to be one of the effective approaches that can contribute to sustainable forest management as well as sustainable development of human beings, in terms of its possibility to yield a number of economic, social and environmental benefits. The FLR approach has already adopted at the regional level in Asia, which includes the countries of China, DPR of Korea, Mongolia and Republic of Korea, and those countries raised the necessity of holistic approach to forest/land restoration and management considering together with the resilience to natural disaster and socioeconomic stability.

Upon this background, this project convenes the international workshop in Beijing and Ordos, China, inviting the experts from China, DPR of Korea, Mongolia, Republic of Korea, as well as international organizations, i.e. FAO, IUFRO, ICRAF, GEF, GCF and AFoCO to discuss the current status, challenges and future alternatives on FLR and the derived topics such as agroforestry and resilience. Furthermore, the major output of this workshop, as a result of presentations by DPR of Korea on current policy in forest sector and the discussion session, would be the Concept Note for Project Concept Paper (PCP) on FLR project to be implemented in DPR of Korea sponsored by international organizations i.e. FAO and/or IUFRO.

2. Objectives

The objectives are:

- To share and understand the current status of deforestation and land degradation, and challenges in forest restoration and resilience to climate change in Northeast Asian region;
- To share and understand the FLRM initiated by FAO;
- To share the up-to-date information and recent policy of DPR of Korea on reforestation, agroforestry, seeds/seedling production, control of land sliding and sloping land management etc.;
- To make the project concept paper (PCP) on reforestation, agroforestry projects to be implemented in DPR of Korea sponsored by FAO and/or IUFRO, NGOs; and
- To conduct field excursion to GEF project and plantation sites (*Hippophae rhamnoides*) in Ordos, Inner Mongolia.

3. Date/Venue

April 9-13, 2018 / Beijing (workshop) and Ordos (field excursion), China

4. Program

Time	Program	Remark
9 April		
Arrival at Beijing Capital Airport		
10 April		
Workshop		**Moderator: Dr. Ho Sang Kang (IUFRO)**
08:30-09:00	Registration	
09:00-09:05	Welcome Address	Dr. Shirong Liu (Vice President of the Chinese Academy of Forestry(CAF)/ IUFRO Board Member)
09:05-09:10	Congratulatory Remark	Mr. Kwang Chun Ryu (Director, General Bureau of Forestry, MoLEP)
09:10-09:15	Congratulatory Remark	Dr. Hyun Park (Director, Global Forestry Research Division, NIFoS)
09:15-09:30	Group photo	
Session 1. Forest and Landscape Restoration Mechanism		
09:30-10:00	Achievements and the way forward of FLR Mechanism	Dr. Song Hee Nam (Senior Forestry Officer, FAO Headquarter)
10:00-10:30	The prospect of finance and resource mobilization for FLRM	Ms. Mathilde Iweins (FAO Beijing Office)
10:30-11:00	Q&A / Discussion	
11:00-13:00	Lunch	
Session 2. Reforestation and Agroforestry		
13:00-13:30	China-GEF Partnership on Land Degradation in Dryland Ecosystems:	Dr. Zengming Song (GEF project manager, CAF)

	Sustainable and Climate Resilient Land Management in Western PRC	
13:30-14:00	Forest Restoration Campaign in DPR Korea	Mr. Kwang Nam Hwang (Senior Officer, General Bureau of Forestry, MoLEP)
14:00-14:30	Lessons Learned from Successful Forest Greening in the Republic of Korea	Dr. Hyun Park (Director, NIFoS)
14:30-15:00	Situation of Agriculture and Government Policy for Agricultural Development in ROK	Prof. Jeong Bin Im (Professor, SNU)
15:00-15:30	Coffee Break	
Session 3. Ecosystem Resilience to Natural Disaster		
15:30-16:00	Erosion Control Works and Rehabilitation Examples of Landslide Damage in ROK	Dr. Sang Ho Lee (Director, Korean Association of Soil and Water Conservation)
16:00-16:30	Introducing Status and Prospect of Agroforestry Management in DPRK	Mr. Song Hwan Ryom (Senior Officer, General Bureau of Forestry, MoLEP)
16:30-17:00	Main Forest Pests and Control Measures in DPR Korea	Mr. Yong Il Pak (Director of Forest Breeding Research Institute, Academy of Forest Sciences)
17:00-17:30	Prediction of Forest Fire Danger Rating (FFDR) in DPRK	Dr. Myoung Soo Won (Senior Researcher, NIFoS)
17:30-18:00	Q&A / Wrap-up	
18:00-20:00	Welcome Reception	
11 April		
Planning Workshop on Agroforestry / FLRM		**Moderator: Dr. Ho Sang Kang**
Session 1. Presentation by DPR of Korea		
09:00-09:30	중국과 조선의 산지생태계와 생태복원 및 향후 협력	Prof. Yonghuan Jin (Associate Professor, Institute of Applied Ecology, CAS)
09:30-10:00	Outlook on Propagation, Cultivation and Prospection for Introduction of Vitamin Tree No.4 at the Northern Areas of Ryanggang Province in DPR Korea	Mr. Yong Hun Ri (Researcher of Afforestation Research Institute, Academy of Forest Sciences)
10:00-10:30	Breeding and Use of 1st Generation Hybrid of Key Species for Reforestation in DPR Korea	Mr. Kwang Il Pok (Officer of External Economic Cooperation Department, MoLEP)
Session 2. Project Concept Paper (PCP) for Agroforestry / FLR project in DPR of Korea		
10:30-12:00	**DISCUSSION** - Dr. Hyun Park (Director, NIFoS) - Dr. Song Hee Nam (Senior Forestry Officer, FAO Headquarter) - Mr. Kwang Chun Ryu (Director, External Cooperation Department, General Bureau of Forestry, MoLEP, DPR of Korea) - Mr. Chang Mo Kang (Deputy Director, Korea Forest Service) - Ms. Seung Soon Kim (Activist, Forest for Life) - Dr. Ho Joong Yi (Executive Secretary, Agriculture and Fisheries Policy Forum)	
12:00-13:30	Lunch & Packing for Departure to Ordos	

13:30-14:30	Move to Nanyuan Airport	15:50-17:20 (KN 5308)
Move from Nanyuan Airport, Beijing to Ordos. 15:50-17:20 (KN 5308)		
18:00-18:20	Arrival at Wulan International Hotel & Cjeck-in	Airport pick-up
18:20-20:00	Dinner	Wulan International Hotel
12 April		
08:30-10:00	Move to Hippophae Industry Factory	(Minibus)
10:00-11:00	Visit to Hippophae rhamnoides seedling nurturing	Visit Hippophae seedling storage site, learn about moisture keeping methods
11:00-12:30	Visit to Hippophae rhamnoides plantation site in ex-mining restoration areas	
12:30-13:10	Move to lunch place	
13:10-14:00	Lunch	
14:00-15:30	Move to Qingyan technology center of Salix cheilophila industry	(Minibus)
15:30-17:00	Visit Qingyan processing site of Salix cheilophila products	Visit processing site of Salix products in Qingyan technology center of Salix industry
17:00-17:30	Visit Salix cheilophila plantation site	Visit Salix growing site (300m East to the gate of the Industry Park)
17:30-18:00	Move back to Wulan International Hotel	(Minibus)
18:00-20:00	Farewell Dinner	Wulan International Hotel
13 April		
07:40-08:00	Check-out	
08:00-08:30	Move to Ordos Airport	(Minibus)
Move from Ordos to Nanyuan Airport, Beijing. 09:20-10:50 (KN 5305)		

※ Accommodation:

- Beijing (Jianguo Garden Hotel, 北京建国门内大街17号 no.17 jianguomennei Avenue,Beijing,100005)
- Ordos (Wulan International Hotel 乌兰国际大酒店, Inner Mongolia, Ordos, Ejin Horo, Wulanmulun St.)

5. List of Participants

No.	Country	Name	Position, Organization
1	China	Dr. Shirong Liu	Vice President of the Chinese Academy of Forestry
2		Dr. Zengming Song	GEF Project Manager
3		Dr. Yong Huan Jin	Associate Professor, Institute of Applied Ecology, CAS
4	DPR of Korea	Mr. Kwang Chun Ryu	Director of External Cooperation Department, General Bureau of Forestry, Ministry of Land and Environment Protection (MoLEP)
5		Mr. Kwang Nam Hwang	Senior Officer of Science and Technology Department, General Bureau of Forestry, MoLEP
6		Mr. Ryom Song Hwan	Senior Officer of Afforestation Department, General Bureau of Forestry, MoLEP
7		Mr. Pak Yong Il	Director of Forest Breeding Research Institute, Academy of Forest Sciences
8		Mr. Ri Yong Hun	Researcher of Afforestation Research Institute, Academy of Forest Sciences
9		Mr. Pok Kwang Il	Officer of External Economic Cooperation Department, MoLEP
10	Republic of Korea	Mr. Chang Mo Kang	Deputy Director, Korea Forest Service
11		Prof. Jeong Bin Im	Professor, Seoul National University
12		Dr. Hyun Park	Director, NIFoS
13		Dr. Myoung Soo Won	Senior Researcher, NIFoS
14		Dr. Sang Ho Lee	Director, Korean Association of Soil and Water Conservation
15		Dr. Ho Joong Yi	Executive Secretary, Agriculture and Fisheries Policy Forum
16		Ms. Seung Soon Kim	Activist, Forest for Life (NGO)
17		Mr. Tae Hyung Kim	Photographer, Seoul National University
18		Ms. Miin Bang	Researcher, Seoul National University
19	International Organizations	Dr. Song Hee Nam	Senior Forestry Officer, FAO Headquarter
20		Ms. Mathilde Marchisio	FAO Consultant on FLRM finance
21		Dr. Ho Sang Kang	Deputy Coordinator, IUFRO Working Party 1.01.13

II. Presentations

1) Achievements and the Way Forward of FLR Mechanism

Dr. Song Hee Nam

Senior Forestry Officer, FAO Headquarter

Food and Agriculture Organization of the United Nations

FLR Mechanism: Achievements & way forward

SONGHEE NAM
Senior Forestry Officer
FLR Mechanism team

FLRM

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Contents

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1. Concept, Principles and Key issues of Forest and Landscape Restoration

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1-1. Definition of Forest and Landscape Restoration (FLR)

(FLR) "An active process that brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader patter of land uses " –GPFLR

(Land degradation) "Persistent decline" in the provision of goods and services that an ecosystem provides, including biological and water related goods and services as well as land-related social and economic goods and services (FAO/LADA).

(Forest degradation) Reduction of the capacity of a forest to provide goods and services (FAO, 2011).

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1-2. Global FLR Initiatives

Restore 150 million ha By 2020

Aichi Target 15

Restore 15% of Ecosystems By 2020

NYDF 5

Additional 200 million ha by 2030

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1-3. Principles of FLR Planning

A. ***Flexibility in planning*** to thematic needs and specific local conditions

B. ***Phased process*** of FLR
- Identification and analysis of the agents and drivers of degradation
- Build up enabling environment, institutional setting and capacity development
- Establish pilot project sites
- Scale up restoration

C. ***Integrated land-use*** restoration (community-based landscape planning, inter-sectoral cooperation, management of land use and tenure, and improved policies)

D. ***Mosaic approaches*** to restoration

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A. Flexibility of FLR Planning

Flexibility in planning and implementation of FLR in context of purposes, scale, temporal, and conditions

-Single objective
-Multi combined objectives
-Cross sectoral objectives

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B. Phased process of FLR

Identification and analysis of agents and drivers of degradations

Create enabling environment and support institutional and operation mechanism (preparation of FLR National Action Plan)

Establish pilot models and large-scale implementation of FLR by supporting finance and resource mobilization

Monitor the FLR efforts and disseminate the best practices

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C. Mosaic approaches to restoration

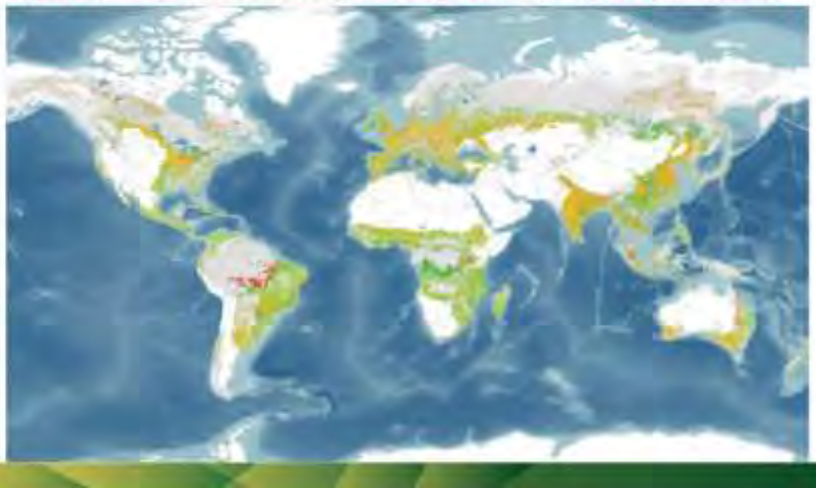
Up to 2 billion hectares of deforested and degraded land – size of South America

Forest and Landscape Restoration Opportunities

- Wide scale Restoration
- Mosaic Restoration
- Remote restoration

Other Areas

- Croplands on former forest areas
- Recent tropical deforestation
- Urban areas
- Forest without restoration needs
- Naturally non forested lands



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D. Integrated land-use Management

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Case1. How can we plan Mosaic Restoration in this site?

Photo source: GPFLR

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Case2. How can we plan Mosaic Restoration in this site?

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Case3. The Traditional Restoration Method for Forest

Photo source: KFS

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Case4. Restoration for Forest? Restoration for Forest & Landscape?

Photo source: DPRK

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1-4. Key issues to address FLR planning and implementation

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2. Implementation of the FLR Mechanism at a glance

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2.1. Overview of Implementation of FLR Mechanism

- **Goal** : to support the planning, funding and implementation of FLR at the global, regional and country level
- **Fund**
  - o ROK (KFS) : 3,698,963 US $ (2014-2020)
  - o Swedish (SIIDA) : 3,000,000 US $ (2015-2017)
- **Work frame**
  - o FLR Mechanism team - target country (consultant)
  - o Advisory group – Partnership in close collaboration with partners

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2-2. ROK Funding as a seed money for FLR

The success factors in ROK

- A strong leadership and national priority
- Intersectoral cooperation and among government agencies
- Community voluntary participation
- Comprehensive rural development

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2.3. Components of FLR Mechanism Implementation by FAO

- Lead global initiatives with other Partners, create common guidelines, organize capacity development, capitalize knowledge, get finance and mobilization, and monitor FLR efforts.
- Support regional initiatives, organizations of events, facilitation of regional agenda and strategies and dissemination of knowledge in the decentralized process.
- Support institutional and operational work frame, enabling environment, sustainable financing, demonstration of pilot projects and implementation at large-scale in beneficiary country
- Establish pilot site with innovative models replicable to other regions, consult technical and practical skills and monitor FLR efforts.

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3. Achievements of the FLR Mechanism at global, regional and country levels

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3.1. Key achievements at the global level

- FLR Mechanism team and Advisory group was established in the end of 2014
- The FLRM created multiple partners and synergies with various range of organizations
- The FLRM organized and participated in global and regional level events for advocating FLR during key meetings, high-level events, side events and workshops on FLR
- The FLRM regularly updates FLRM newsletter and good practice factsheets to develop capacity
- Infrastructure for a global FLR knowledge platform was established and webinars and on-line Community of Practice are organized
- Guideline documents on FLR monitoring roadmap and local finance prepared and are under review
- The global finance and resource mobilization is ready to open in 2018 to expand more countries

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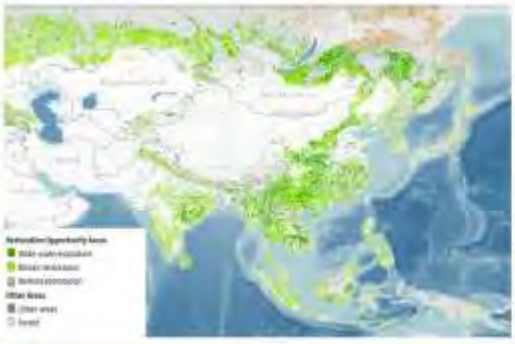
3.2. Key achievements in the regional level

The launch of two new regional initiatives on FLR in the Asia – Pacific region and the Mediterranean region



The Agadir Commitment: to restore 8 million ha by 2030

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3.2. Key achievements in the regional level

- The FLRM also supported with a leading role the launch of **two new regional initiatives on Forest and Landscape Restoration** in the Asia – Pacific region and the Mediterranean region
  - **The Asia – Pacific region:** Endorsement of an Asia-Pacific Strategy and Action Plan on FLR
  - **The Mediterranean region:** launch of a new regional initiative on FLR during the Fifth Mediterranean Forest Week
- The FLRM also played a key role as a technical partner in in Latin America (Initiative 20x20) and Africa (AFR100) on FLR
  - **AFR100 - the African Forest Landscape Restoration Initiative:** a country-led effort to bring 100 million ha of deforested and degraded landscapes across Africa into restoration by 2030

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3.2. Key achievements in the regional level

Technical partner in Latin America (Initiative 20x20) and Africa (AFR100) on FLR

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3.3. Key achievements at the country level

- The FLRM Selected 7 target countries at the 1st phase and is supporting the implementation of FLR
- **Cambodia** Preparation of FERI project, site selection with ROAM, Capacity Development
- **Philippines** Preparation of IKI project, preparation of pilot actions, National FLR plan
- **Lebanon** Operationalization of National Forest Fund, FERI project, IKI project, technical assistant
- **Rwanda** Facilitation of cross-sector platform for agroforest and natural resources management
- **Uganda** FIP project proposal, the Tree Fund proposal and Watersheds pilot activities
- **Guatemala** Preparation of regulation of the law PROBOSQUE, technical support on agroforestry
- **Peru** preparation of National FLR plan, country-wide mapping, selection of FLR sites

Forest **Ecosystem Restoration Initiative (FERI)** developed by the KFS in cooperation with CBD

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4. The Way forward

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4.1. Expand implementation of FLR at large-scale

(Funding) 6 698 962 USD → 69 096 962 USD (Country) 8 countries → 26 countries

Donor	Period	Budget	Country
KFS	2014-2020	3 698 962 USD	Cambodia, Guatemala, Lebanon, Peru, the Philippines, Rwanda and Uganda. DPRK
SIDA	2015-2017	3 000 000 USD	
FFEM	2018-2020	2 000 000 USD	Burkina Faso, Niger(3 villages)
IKI		5 400 000 USD	Ethiopia, Fiji, Lebanon, Morocco, Niger, the Philippines
GEF-6		54 000 000 USD	**(FAO)** Central African Republic(CAR), Democratic Republic of the Congo(DRC), Sao Tome, Kenya, Pakistan **(IUCN)** China, Cameroon, Guinea Bissau, Myanmar **(UNEP)** Tanzania, Kenya

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Target Countries for implementation of FLR on a map

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4.2. Challenges to be overcome

1) To update the logical framework of the FLRM in a changed environment

- It's time to make post-2020 recommendations both regarding human and financial resources to maintain and follow up the outcomes and impacts of FLRM.

2) To improve knowledge and methodology on FLR monitoring

- Monitoring methodology including goals and impact, a set of indicators and metrics indication is an urgent work for better management of FLR, evaluation of success or failures before investing scaling up and taking accountability to stakeholders.

3) To increase more finance and resource mobilization to expand at large-scale implementation of FLR through creating the global issues and events.

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THANK YOU

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Restoring Landscapes for Enhanced Livelihoods

2) The Prospect of Finance and Resource Mobilization of FLRM

Ms. Mathilde Iweins

Consultant, FAO Beijing Office

Food and Agriculture Organization of the United Nations

Resource mobilization for FLR
the FLRM example

Mathilde Iweins, FAO

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Resources mobilization for FLRM

Perspectives for FLR: Projects about to start with the FLRM

- Forest and Landscape Restoration & Sustainable Land Management in Sahel (Burkina Faso and Niger) – French GEF (US$ 2 M)
- The Paris Agreement in action: scaling up Forest and Landscape Restoration (FLR) in the context of the Bonn Challenge to achieve the NDCs by promoting joint mitigation and adaptation approaches in Africa, Pacific Islands and the Mediterranean – IKI Germany (US$ 5.3 M)
- The Restoration Initiative (FAO, UNEP, IUCN) – GEF (US$ 54 M)

FLRM & SLM in Sahel (Burkina Faso and Niger) French GEF (1.8 M€/ US$2 M)

Goal

Incentivize stakeholders to restore/sustainably manage sahelian land to ensure ecosystem services provision on the long term and participate to the Land Degradation Neutrality objective.

Geography

National (Burkina Faso & Niger), Regional (Sahel), Global

Timeline

2018-2021

FLRM & SLM in Sahel (Burkina Faso and Niger) French GEF (1.8 M€/ US$2 M)

Components and Partners

- *Implementation of FLR/SLM policies through innovative/participatory planning, implementation and monitoring at communal level*

Implementing partners: National and GGWISS Agencies, UNCDF, Agrhymet

- *National and regional capacity building on land use monitoring and evaluation & Knowledge development and sharing at regional level*

Implementing Partners: Agrhymet

- *Integration of sahelian partners in global FLR initiative and ressources mobilization & program coordination*

FLRM & SLM in Sahel (Burkina Faso and Niger)
French GEF (1.8 M€/ US$2 M)

Highlights of the program

- ✓3 levels of intervention to generate virtuous circles
- ✓Promoting Packages of Practices decided in participative way
- ✓Local Development Funds integrating FLR/SLM
- ✓FLR resource Mobilization (private sources)

FLR & Bonn Challenge & Paris Agreement
IKI (4.8 M€/ US$ 5.3 M)

Goal

Scaling up Forest and Landscape Restoration (FLR) in the context of the Bonn Challenge to achieve the NDCs by promoting joint mitigation and adaptation approaches in Africa, Pacific Islands and the Mediterranean.

Geography

Asia Pacific Islands (focus: Fiji, Philippines), Africa/Great Green Wall (focus: Niger, Ethiopia), Mediterranean (focus: Morocco, Lebanon)

Timeline

2018-2022

FLRM & Bonn Challenge & Paris Agreement
IKI (4.8 M€/ US$ 5.3 M)

Components (1/2)

Large scale national FLR programmes promoted

- ✓ enabling environment created for implementation of national FLR programmes and scale up through inter sectoral coordination and relevant policy;
- ✓ restoration approaches and technologies implemented/tested in selected sites with a high potential for FLR providing both carbon and non-carbon benefits (e.g. Carood Watershed Model Forest in Philippines) through participatory planning, community driven FLR investments and sustainable economic alternatives implemented at landscape level;
- ✓ monitoring capacity enhanced and both socio-economic and environmental benefits monitored with a minimum set of indicators well adapted to both national and regional contexts.

FLRM & Bonn Challenge & Paris Agreement
IKI (4.8 M€/ US$ 5.3 M)

Components (2/2)

Efficient regional cross-sectoral platforms facilitate FLR implementation and scaling up to achieve the Paris Agreement and the Bonn Challenge

- ✓ knowledge shared and capacity built on FLR including on: planning and implementing good practices, design of new business models, innovative results-based payments such as (REDD+, PES);
- ✓ resources mobilized from impact funds and innovative partnerships (Marketplaces/CSR platforms...) and from climate/land degradation financing instruments (e.g. GCF, LDN Fund, etc);
- ✓ more accurate and harmonized reporting on restoration goals and targets at all levels (NDCs, Aichi Target 15, Bonn Challenge and SDG 15).

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

FLRM & Bonn Challenge & Paris Agreement
IKI (4.8 M€/ US$ 5.3 M)

Region/Country	Political Partner	Implementation Partner
Asia Pacific Islands	**Asia-Pacific Forestry Commission**	
Philippines	Department of Environment and Natural Resources of the Philippines (DENR)-Forest Management Bureau (FMB); Carood Watershed Model Forest (Bohol Island)	Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC); Bagong Pagasa Foundation
Fiji	Ministry of Fisheries and Forests (MFF); Ministry of National Planning, Office of Climate Change	Conservation International; SPC
Africa Globally	The African Union Commission through its Africa Special Risk for the Great Green Wall for the Sahara and Sahel Initiative	
Ethiopia	Ministry of Environment and Forest (MEF)	Forest, Policy, Strategy and Regulation Directorate, Ministry of Environment, Forest and Climate Change;
Niger	Water and Forest Department of the Ministry of Environment, Urban Sanitation and Sustainable Development (DGEF-MESUDD); Permanent Interstates Committee for Drought Control in the Sahel (CILSS)	Niger National Agency for the Great Green Wall for the Sahara and the Sahel Initiative; Centre Regional Agrhymet (CRA)
Mediterranean	**The Committee on Mediterranean Forestry Questions-Silva Mediterranea**	
Morocco	High Commissary for Water, Forest and the Fight Against Desertification / Haut-Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification (HCEFLCD); Ministry of Energy, Mines, Water and Environment	The North West regional Direction of the HCEFLCD (Kenitra provincial direction in charge of the Maamora Forests); Association Marocaine pour l'Ecotourisme et la Protection de la Nature (AMEPN)
Lebanon	Ministry of Agriculture - Directorate of Rural Development and Natural Resources (DRDNR-MoA);	Lebanon Reforestation Initiative (LRI); Jnoubar Loubnan

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

FLRM & Bonn Challenge & Paris Agreement
IKI (4.8 M€/ US$ 5.3 M)

Highlights

- ✓ Regionalization of a global commitment
- ✓ Regional Platforms as FLR multiplier (as it has been in South America)
- ✓ FLR multiple benefits at the center

The Restoration Initiative (with UNEP and IUCN)
GEF (48 M€/ US$ 54 M)

Goal

Contribute to the restoration and maintenance of critical landscapes that provide global environmental benefits and enhanced resilient economic development and livelihoods, in support of the Bonn Challenge

Geography (11 national projects + 1 global project)

Africa: Cameroon, CAR, DRC, Guinea Bissau, Kenya (2), Tanzania, Sao Tomé & Principe

Asia: China, Myanmar, Pakistan

Timeline

PPG: 2016-2017 Implementation Phase: 2018-2022

TRI Structure

11 national child projects

1 Global Learning, Finance and Partnership child project

4 types of interventions

- **TRI Component 1** Policy Identification and Uptake
- **TRI Component 2** Implementation of Restoration and Complementary Initiatives
- **TRI Component 3** Institutions, Finance and Upscaling
- **TRI Component 4** Knowledge, Partnerships, M&E

1 shared objective

"Contribute to the restoration and maintenance of critical landscapes to provide global environmental benefits and enhanced resilient economic development and livelihoods, in support of the Bonn Challenge"

The Restoration Initiative (with UNEP and IUCN)
GEF (48 M€/ US$ 54 M)

Highlights

- ✓ 10 countries and 3 GEF agencies involved, coordinating efforts
- ✓ South South exchange and capacity building
- ✓ Special effort on scaling up (through Finance, Policy and KM)

Expected results of TRI Chilgoza project in Pakistan

Expected results of TRI in South Kivu province (DRC)

Perspectives for FLR: New projects under the FLRM

- New IKI-Germany call: Large scale Forest Landscape Restoration (FLR) in Africa - tree rich landscapes to foster biodiversity, climate change resilience and better livelihoods - 27 M euros FAO with GIZ, WWF-Germany, WRI, IUCN, WB, NEPAFD
- Green Climate Fund in Madagascar and Malawi under development
- GEF 7 – new impact program on Food Systems & Forest and Landscape Restoration – Very relevant for FLRM. An Asia Pacific strategy has been presented at the APFC meeting in October 2017 and bilateral discussions are happening

Questions? Suggestions?

Thank You! 고마워

3) China-GEF Partnership on Land Degradation in Dryland Ecosystems: Sustainable and Climate Resilient Land Management in Western PRC

Dr. Zengming Song

GEF Project Manager, CAF

PRC-GEF Partnership on Land Degradation
in Dryland Ecosystems

Sustainable and Climate Resilient Land Management in Western PRC

Dr. Song Zengming
Central Project Management Office
2018-04-10

Outline

1. the first phase Partnership (2002-2013)

2. the second phase Partnership (2014-2023)

3. Climate Resilient Sustainable Land Management in Western PRC Project

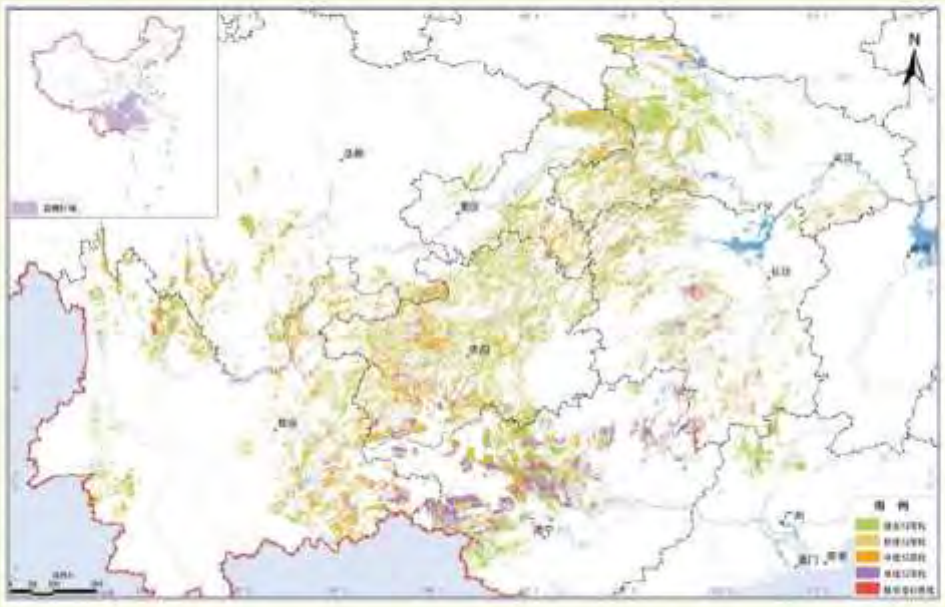
Desertification in China

Decertified land area 2,611,593 km²· 27.2%

Sandification in China

Sandified land area 1,721,175 km² ,17.9%

Rocky Desertification
in Karst Areas of China



Rocky Desertified land area 120,020 Km2

PRC-GEF Partnership on Land Degradation in Dryland Ecosystems (the Partnership)

Director of SFA Mr. Jia Zhibang (right) meeting with the President/CEO of GEF Council Ms. Monique Barbut (left)

PSC Director Mme. Jiang Zehui (right) meeting with the President/CEO of GEF Council Ms. Monique Barbut (left)

成立于2002年10月，旨在运用综合生态系统管理（IEM）方法在中国西部地区开展土地退化防治

Established in October 2002, the Partnership aims to combat LD in western China using IEM approaches

6

Framework of the Partnership

中国－全球环境基金干旱生态系统土地退化防治伙伴关系 5 个项目基本信息表
Information on the eight projects under the Partnership

Projects	Project duration	Implementing agency	Executing agency	Project sites	Objectives
Capacity Building to Combat Land Degradation Project	July 2004 - December 2009	ADB	Department of Science and Technology, SFA	Shaanxi, Gansu, Ningxia, Inner Mongolia, Qinghai, Xinjiang, Inner Mongolia	
Gansu and Xinjiang Pastoral Development Project	September 2004 - June 2010	WB	Scientific Cooperation Center, MOA	Gansu and Xinjiang	
Ningxia Integrated Ecosystem and Agricultural Development Project	August 2005 - July 2014	ADB	Foreign Debt Management Office, Ningxia	Ningxia	
Management and Policy Support to Combat Land Degradation Project	May 2006 - December 2013	ADB	Department of Science and Technology, SFA	Inner Mongolia, Shaanxi, Gansu, Ningxia, Qinghai and Xinjiang	
Forestry and Ecological Restoration Project in Three Northern Provinces	2010 - 2017	ADB	Afforestation Office, SFA	Hebei, Shanxi and Gansu	
Sustainable Development in Poor Inland Areas Project - Combatting Land Degradation and Adaptation Project	September 2010 - December 2015	WB	The State Council Leading Group Office of Poverty Alleviation and Development	Hebei, Chongqing and Shaanxi	
An EBA Approach to the Conservation of Biodiversity in Dryland Ecosystems	April 2011 - April 2016	IFAD	MOF	Gansu, Ningxia, Inner Mongolia and Shaanxi	
Sustainable Management and Biodiversity Conservation of the Lake Ado Basin	August 2011 - August 2014	WB	Forestry Department, Xinjiang	Xinjiang	

- Combat LD
- Alleviate poverty
- Conserve biodiversity
- Rehabilitate dryland ecosystems

Achievements of the first phase Partnership

Outline

1. the first phase Partnership (2002-2013)

2. the second phase Partnership (2014-2023)

3. Climate Resilient Sustainable Land Management in Western PRC Project

9

SLM comprehensive strategy in Western PRC 2014-2023

- **Domestic and international situation is changing, it is necessary to innovate/develop the strategy on land degradation control**

  Climate change, ecological sustainability, poverty alleviation/reduction

  land degradation in western PRC remains severe, resources and environmental restrictions, ecological civilization development strategy;

10

Institutional arrangements

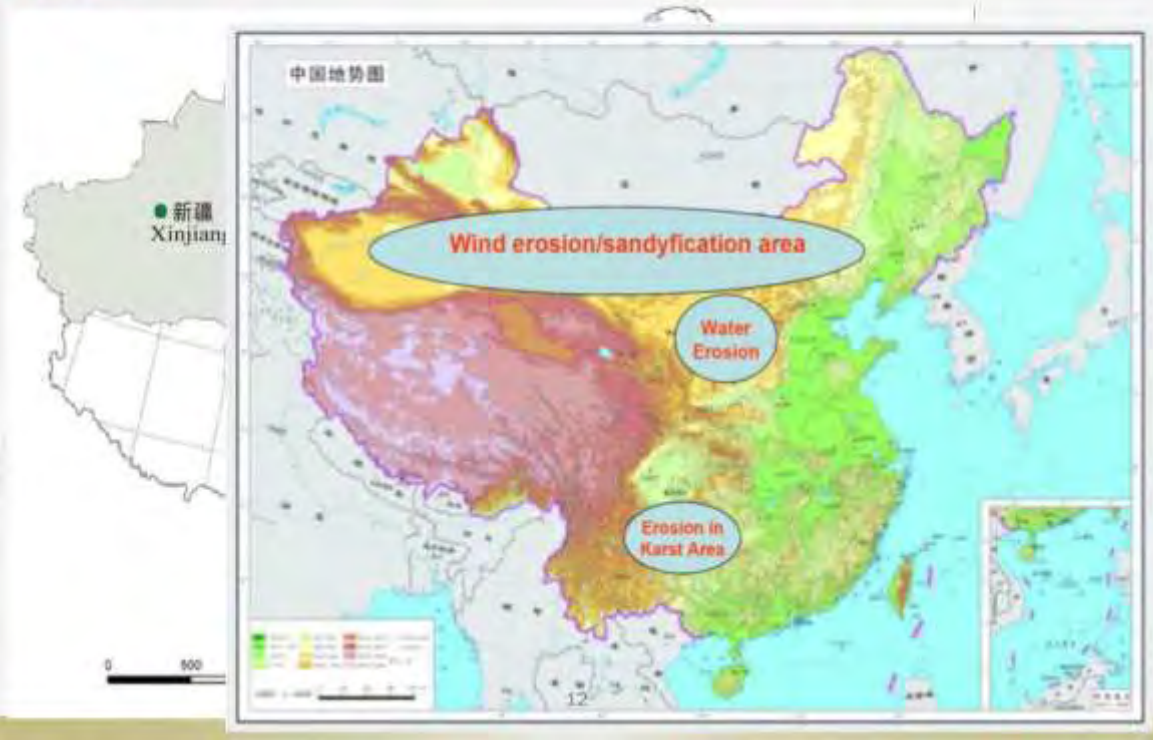
At the central level, continue to strengthen the coordination of the Project Steering Committee, CPCO and CPMO, and include new member agencies (the Leading Group for Poverty Alleviation and Development Office of the State Council)

At the provincial level, strengthen the multi-level and cross-sectoral Provincial Leading Groups, PPCOs, and PPMOs

At the international level, enhance the cooperation with ADB, WB, IFAD, GEF, and promote the participation of other international organizations, such as UNDP, UNEP, WWF, and TNC, etc.

11

Scope of the Partnership Development Strategy



12

Strategic priorities

13

Key innovative technologies and approaches in the strategy

1. Up-scaling of best practices;
2. Market-based mechanisms for up-scaling;
3. Innovative SLM climate-resilient technologies;
4. Improved monitoring and evaluation;
5. Global Environmental Benefits
6. Cost-effectiveness;
7. Green development;
8. Gender and vulnerable groups;
9. women's participation;
10. Alternative livelihood;
11. Strengthened ecological legislation ;
12. Improved sustainable land management mechanisms.

14

Benefits of the Partnership Development Strategy

Local benefits

- ✓Degraded land improved by SLM;
- ✓Vegetation coverage increased;
- ✓Land productivity increased;
- ✓Water resource management improved;
- ✓Average income raised compared with 2013; and
- ✓with all the benefits of a prosperous society.

15

Benefits of the Partnership Development Strategy

Global environmental benefits

- ✓Improved provision of agro-ecosystem and forest ecosystem goods and services;
- ✓Reduced greenhouse gas emissions from agriculture, deforestation and forest destruction, increased carbon sequestration; and
- ✓Reduced vulnerability of agro-ecosystem and forest ecosystems to climate change and other human-induced impacts.

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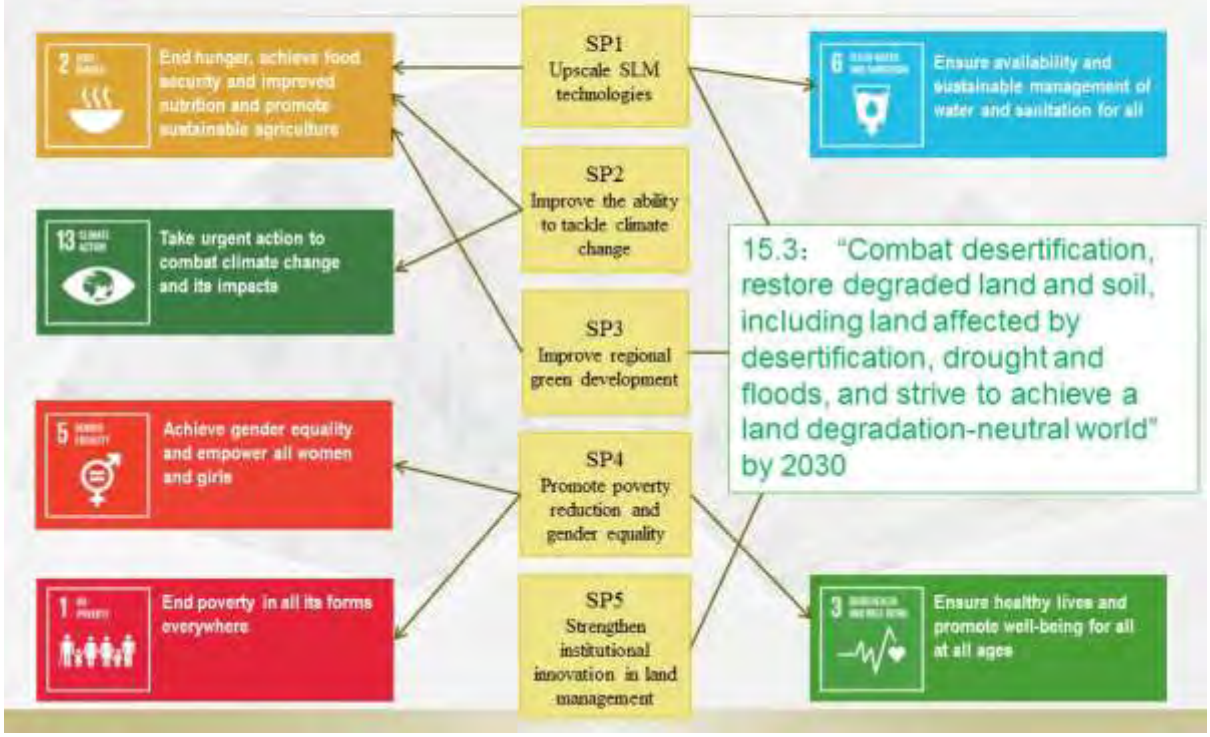
Linkage with the sustainable development goals



Outline

1. the first phase Partnership (2002-2013)

2. the second phase Partnership (2014-2023)

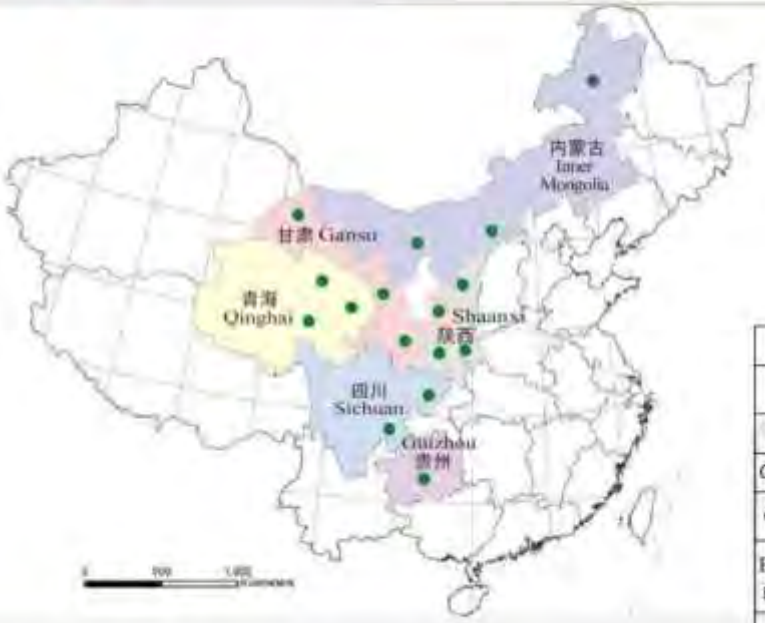
3. Climate Resilient Sustainable Land Management in Western PRC Project

Climate Resilient Sustainable Land Management in Western PRC Project

The objective of the project is to restore degraded land, enhance climate resilience, conserve biodiversity and improve livelihoods through sustainable land management

Component 1: Improved the resilience of landscapes and ecosystems to climate change	Component 2: Strengthened management of degraded lands to support rural livelihoods and green development	Component 3: Enhanced SLM enabling environment and capacity for upscaling of SLM in Guizhou and Sichuan

Project overview



Project Area	SLM sites
Inner Mongolia	3
Shaanxi	3
Gansu	4
Qinghai	3
Guizhou	1
Sichuan	2
Sum	16

Thematic focus	Num	Project Area
PPPs	2	Inner Mongolia, Shaanxi
PES	2	Gansu, Shaanxi
Carbon Sequestration	2	Qinghai (2)
Green Development	4	Sichuan(2), Shaanxi(1), Guizhou (1)
Forestland, farmland, grassland restoration	6	Inner Mongolia (2), Gansu (3), Qinghai(1)
E+, Cooperatives, Eco-tourism, Scientific Poverty alleviation, etc		

Inner Mongolia activities snapshot

Tree machine cutting

Watering and fertilizing

Provisional planting seedlings

Gully control (watershed management)
2014 2017

Water drilling and excavation

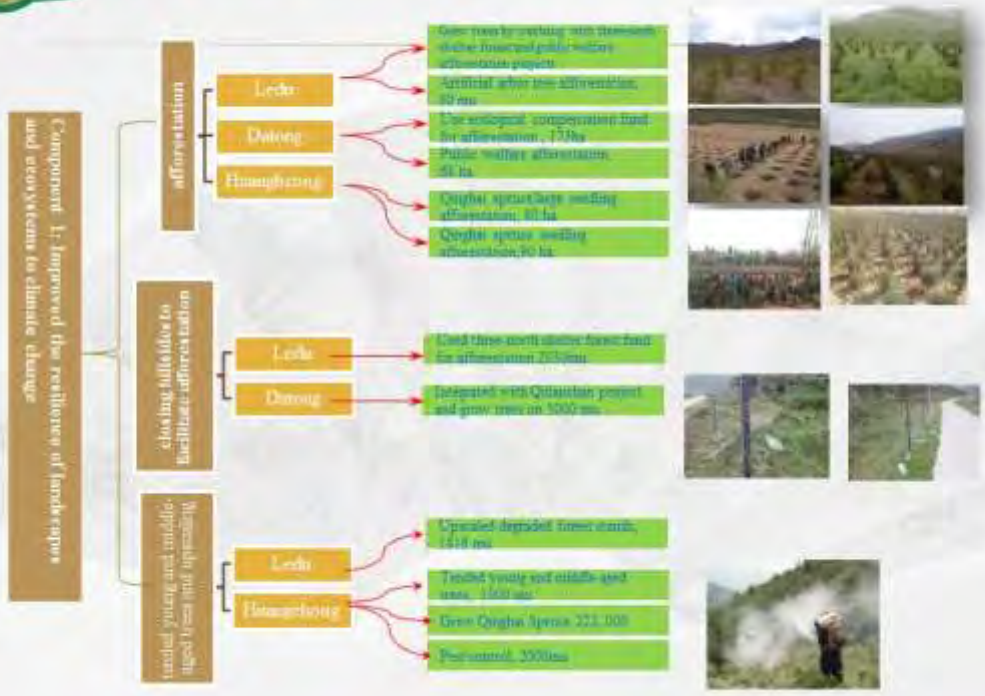
Grassland restoration after sustainable grassland management

Main Activities in Gansu

Double ridge filming

Main Activities in Gansu (continued)

Main Activities in Qinghai



Main Activities in Sichuan (design activities)

Main Activities in Sichuan (extended activities)

Bamboo tending for Huangying Giant panda

Lacquer tree promotion in Junlian

Achievements of the Project

Experience Sharing and International Cooperation

5th China-GEF Project Management Conferenc
July, 2016

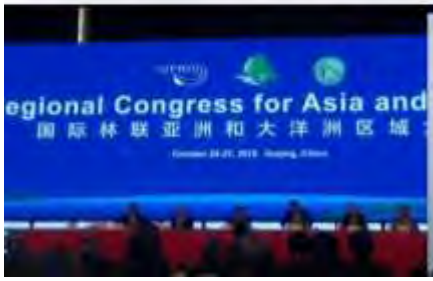
Introduce the Partnership experience by Madam Hu Zhangcui

Experience Sharing and International Cooperation

Oct 26, 2016

UFRO Regional Congress for Asia and Oceania 2016

Introduce: Sustainable and Climate-Resilient Land Management in Western PRC - Achievements and Prospects of the GEF-PRC Partnership on Land Degradation



Experience Sharing and International Cooperation

June, 2017

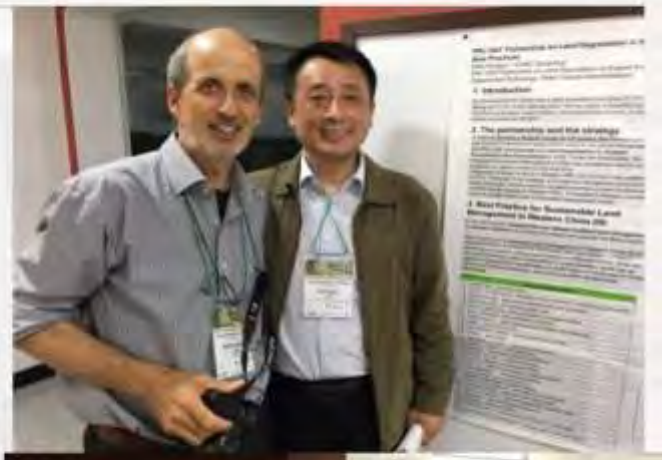
Central Asian Countries Desertification Control Training Workshop

Experience Sharing and International Cooperation

June 13-17, 2017

WOCAT Symposium and the 18th WOCAT Network Meeting

in Cali, Colombia



Experience Sharing and International Cooperation

Expert Workshop on Dryland Forest Restoration and Conservation in Central and Northeast Asia

August 13-18, Ulaanbaatar, Mongolia.

1) provide a platform for sharing of knowledge and experiences on dryland forest ecology and forest restoration in respective countries, and
2) identify specific areas of forest cooperation in the future.

Experience Sharing and International Cooperation

- **Sustainable and Climate Sm**
  Services
- The symposium brought toget
  improvement of ecosystem se
  approach in dryland ecosysten
  address climate change related issues, explore
  improving ecosystem services can contribute t
  China, and showcase the related progress and
  the world.

Experience Sharing and International Cooperation

Keynote paper

Specific report

Panel


Experience Sharing and International Cooperation


Experience Sharing and International Cooperation

4) Lessons Learned from Successful Forest Greening in the Republic of Korea

Dr. Hyun Park

Director, NIFoS

Workshop on FLR & Resilience to Climate Change in NE Asia

Lessons learned from Successful Forest Greening in the Republic of Korea

2018. 4. 10.

Hyun Park
Division of Global Forestry
National Institute of Forest Science

Outline

1. *A Question raised as an ODA Planner to transfer Korean successful story*
2. *Let's see the details, what we found & realized …*
3. *Then, What to do in the future?*

I. A Question raised as an ODA Planner
- *to transfer Korean successful story*

01. At a glance, what a miracle !

After Korean War (1953)		Present
		
GNI per capita : US $67	(450 times)	GNI per capita : US$ 30,000
Population : 26 million	(2 times)	Population : 52 million
Forest Stock : 6 ㎥/ha	(30 times)	Forest Stock : 180 ㎥/ha

❖ How ?

3/25

02. Trials of Forest Restoration

| With laws and plans |

Partial success, Slow progress

- 1945 Liberation from Japanese occupation
- 1946 Arbor day designation (April 5; early spring)
- 1950 Korean War broke out (~ 1953)
- 1951 Temporary Forest Protection Act
- 1952 3-year reforestation plan
- 1953 5-year erosion control plan
- 1954 2nd 10-year private forest reforestation plan
- 1958 10-year upstream soil conservation plan
- 1959 5-year fuelwood forest establishment plan

Planting by President Lee SM (1948~1960)

❖ **Looks like impossible ~ !**

4/25

03. Continuous failure

| Kept a plateau in Forest Stock|

- Considerable devastation to the Forests in Korea until early 1950s
  - During Japanese occupation (1910-1945), Korean War (1950-1953)
  - Due to poor condition (1953-1970s): for fuelwood, for cropland
- Remained stagnant until 1972, despite of considerable efforts to rehabilitate

5/25

04. Rapid changes by strong leadership?

| Under the military government |

Special interest (philosophy) of top leader?

- **Keen interest in Economy & Forest**
  - Enactment of Forest Law : Dec. 27, 1961
  - Erosion Control Act : Jan. 15, 1962
  - Establishment of Korea Forest Service in 1967 (enlarge the organization : bureau ⇒ agency)

Military Coup by General Park (May 16, 1961)

- **Eradication of 5 major social ills**
  1. Smuggling
  2. Narcotics
  3. Illegal timber harvesting
  4. Gangster
  5. Quasi-reporter

治山治水

一九七二年 四月二日

大統領 朴正熙

※ Put 600 people into jail due to illegal logging in 1964

Incidence of large-scale illegal logging

6/25

05. Factors of Successful Forest Restoration

| Multiple Factors, but by the excellent leader |

Significant Changes in Policy - Leadership

- Reorganization of Forestry administration (1967, 1973)
  - Establish Korea Forest Service (KFS) from bureau level to Administration
- Empowerment for cooperative participation with 'Saemaul Movement'
  - Establish Korea Forest Service (KFS) from bureau level to Administration
- **Strategic Plan & Practical Implementation to ensure the outcome**
  - 1st and 2nd 10-year Rehabilitation program (1973~1978; 1979~1987)

治山治水

一九七二年 四月二日

大統領 朴正熙

❖ **Strong Leadership, Systematic approach**

7/25

06. For the practical perspectives, are you satisfied?

Excellent Leader? Lucky situation! We are envy you !!

- ❖ *Strong Leadership – good philosophy, spiritual campaign*
- ❖ *Strong Administration - law enforcement, control*
- ➢ *Without an Excellent Leader, is it impossible ?!?*

As a Forester, Forest policy makers …

- ❖ *What was the role of Forest policy maker (FPM) ?*
- ❖ *To implement the successful story,*

  What do I have to do now, as a forester in developing country?
- ➢ ***What was the role of FPM in forest greening in Korea?***

8/25

II. Let's see the details, what we found & realized …

01. New perspectives for the success factors of FR

| What's the momentum of the changes in 1973 ? |

- As an outcome of 1st 10-year forest greening plan (1973-1978)
  - Right at the point (initiation time) of the greening project? Magic?
- Growing stock is calculated targeting only for trees thicker than 6cm in DBH
  - Planted small trees, so at least 5 years prior to get statistics … then, before 1967?

02. Readiness – Fundamentals for FR policy

| Systematic Approach with Scientific Basis |

- Forestry society provided scientific and technological tools for the policy making during 1960s.
- The 5 key technologies for successful forest greening (during 1960s)
  (i) Forest survey & inventory : understanding the situation
  (ii) Tree improvement : for long-term investment, selection of suitable trees
  (iii) Seeds & Nurseries : high-quality seedlings
  (iv) Tree planting & tending : not for a tree, but for making forests
  (v) Forest pest control : endless tending, nurturing (until now)
- Some technologies contributed greatly to forest restoration coupled with cooperation with the private sector (extension, use of developed technique)

❖ **From fundamentals prior to the practical policy !**

03. Extension for implementation & Cooperation

| Practical use of developed techniques |

- Nitrogen fixing bacteria
  - For leguminous species used as fertilizer trees
  - *Rhizobium spp.*, 10 tons/yr in 1967 and 1968 ※ before the 1st greening plan
- Natural Enemy Production (from 1970s)
  - To control forest pests such as pine caterpillar, fall webworm
  - *Beauveria bassiana*, 18,000–40,000 units per year by 1983

Root nodules made by Rhizobium sp.

Caterpillar occupied by B. bassiana

12/25

04. Strategic approach for FLR* (1)

* Forest Landscape Restoration

PLAN (P)

Establishment of Plan at the National Level (1973 ~ 1987)

❖ Announcement of the 1st and 2nd 10-year Forest Rehabilitation Plans

❖ A Hard Copy of the 10-year Forest Rehabilitation Plan

- Landscape : A large area defined by common productive characteristics or administrative management (ex. Production region, supply-shed, eco-region, biome, state, municipality) ※ human resources (governance)

13/25

05. Strategic approach for FLR (2)

DO (D)

Seed and Seedling Production (for righteous planting)
: proper tree species in each site (pioneer species & fertilizer trees such as legumes) ※ income source for the local people


14/25

06. Strategic approach for FLR (3)

CHECK (C)

Maintenance and Enforcement ※ human resource management
: with 3rd step inspection system for checking survival rate of planted trees



- Cross-Inspector from County (city), Province & Federal government
- Survival rate (90% in average) was linked into the evaluation of government officials

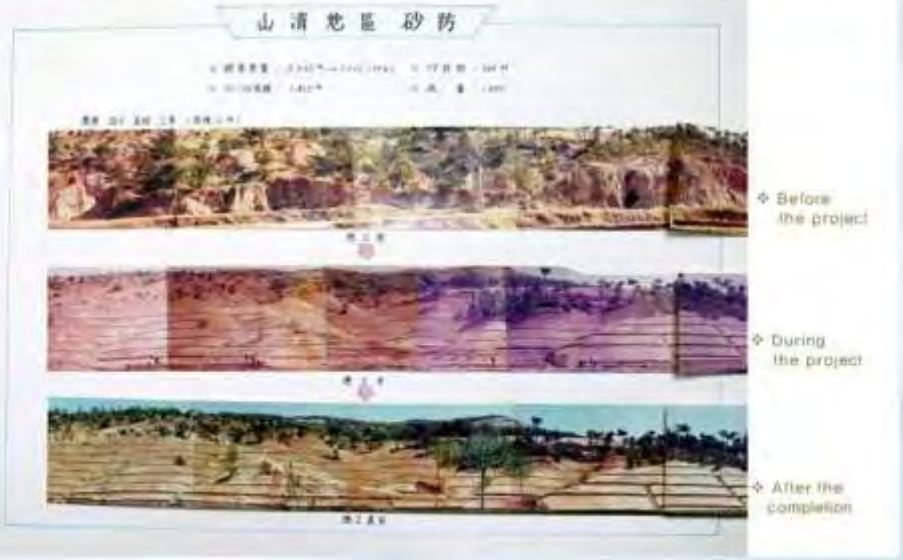
※ Limit of replanting (impossible to use false trick)
⇒ Sincere efforts (irrigation, fertilizer) & Implementation of science, technology

15/25

07. Strategic approach for FLR (4)

ACT (A) : Not just planting, but with good care

Erosion Control, Fuel-wood Plantation, Reforestation(tendering)
: under good inventory (national survey) & scientific technology



16/25

08. Strategic approach for FLR (5)

ACT (A)

Participation, Governance

Spiritual campaign : Patriotism

"If you love your country, plant trees"

Park, Chung-hee
Late President of the Republic of Korea

17/25

09. Summary - Way to get Successful Greening

| Strategic approach & Strong leadership |

Plan – Do – Check – Act (PDCA) strategy

- **Whole scale** approach : Establishment of plan at national level
  - Based on fundamentals : *Forest soil & Forest resources Survey*
    ※ under the support of UNDP, FAO, GTZ (GIZ; Germany)
  - ***1st (1973~1978) and 2nd (1979~1987) 10-year Forest Rehabilitation plans***
- **Scientific** approach : With considering future - righteous planting
  - With production of Seed and Seedling : *Seed orchard, Nursery clusters*
  - Black locust, Alder, Pitch pine, Poplar ... ***for greening*** (vs. future use)
- **Management** approach : Maintenance and enforcement - inspection system
- Consensus from people : Erosion control for cropland, fuelwood plantation
  - With empowerment for the planting activity : appeal to patriotism

10. (Tips) Additional, but Critical tools for success

| Practical implementation |

Not just for forestry, but for operational tools

- Reorganization of Forestry administration (1967, 1973)
  - Establish Korea Forest Service (KFS) from bureau level to Administration
  - Move from Min. of Agriculture to Min. of Home Affairs (local government)
- Empowerment for cooperative participation with 'Saemaul Movement'
- **Practical Implementation to ensure the outcome**
  - Not just for planting, but for the survival rate
  - Three-step inspection system to monitor survival rate of planted trees

Social change –Industrialization, Economic growth

- Successful result of 'Resettlement policy' to prohibit the 'slash & burn farming'
- Changes in fuel from wood to charcoal & petroleum fuel

❖ **Strong Leadership, Systematic approach, Social Condition**

III. Then, What to do in the future ?

01. Instruction

| Readiness : Science & Technology is the Basis of FLR |

- The technologies covering the greening processes preceded forestry policies.
  : The 5 key findings of R&D for successful forest greening in Korea were (i) Forest survey & inventory, (ii) Tree improvement, (iii) Seeds & Nurseries, (iv) Tree planting & tending, and (v) Forest pest control.
- Some technologies contributed greatly to forest restoration coupled with cooperation with the private sector.
- Forest greening projects should be developed with a systematized policy with landscape approach with considering PDCA process.
- In developing countries, forestry experts are struggling to create appropriate conditions of forest rehabilitation due to technical and economic limits. In that case, the obstacles could be overcome by Official Developing Assistance (ODA) from international communities.

❖ **ODA for FLR need to be focused on readiness (start from S & T) !**

21/25

02. Cooperative activity with publics

| Not only by foresters, but by publics ! |

Awareness of the role of forest & forestry

- Fact : Forest Rehabilitation took a key role for rural development in Korea
  - In a rocky country, FM is the base for preventing flood (for stable farming)
  - Ultimately, FM was one of the key components for economic development
- However, the public says — No forester is needed, anymore !
  - Yes, Planting tree is good !
  - But, Planting forest is not good, because it is almost useless.
  - Trees are growing naturally, it is easy to make our land green.
- Needs to enlarge awareness of the role of forest & forestry
  - Forest still provides us lots of benefit such as ecosystem services
  - Forest needs continuous tendering as nurturing kids

❖ **Forestry as the 1st and 2nd industry is not attractive to public in Korea**

03. Forest Ecosystem Services

04. Sustainable Development Goals (SDGs)

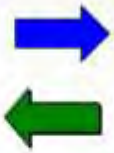
| For the Global Societies |

Forest for Peace & Happiness

- Sustainable Forest management in the past ※ Focused on the Yield of timber
  - Normalized forest (developed in 18th century from Germany)
  - Harvesting timber as the same amount as the growth of stand
- Sustainable Development in Forestry
  - Good forest is the starting point for further progress
  - Comprehensive and long-term plan is a prerequisite of proper use
  - Need to focus on people rather than just on forest & forest products
- To keep/expand the function of forest as the ecosystem service provider
  - Various SDGs targets : 1(livelihood), 2(food), 5(equity), 6(water), 8(job), 13(climate change), 15(terrestrial ecosystem), 17(global partnership)
  - Holistic approach to keep 'homeostasis' of global society

❖ **It is time to think about forestry from inclusive approach !**

SAVE OUR FORESTS



Thank you for your attention !

5) Situation of Agriculture and Government Policy for Agricultural Development in ROK

Prof. Jeong Bin Im

Professor, Seoul National University

Situation of Agriculture and Government Policy for Agricultural Development in the Republic of Korea(ROK)

April. 10. 2018

Jeongbin Im
Professor, Department of Agricultural Economics
Seoul National University

Contents of Presentation

I. Introduction

- The ROK was a typical underdeveloped country by 1970s
- Successful export-oriented industrialization transformed it into a modern industrialized country
  - With rapid growth of over 7% per annum over 40 years
  - GDP: US$ 8 billion(1970) to US$ 1,340billion(2015), 11th in the world
  - Per Capita GNI : US$ 254(1970) to US$ 27,440(2015), 46th in the world

❖ **Objectives of presentation**

- How has the ROK's agriculture and policy been changed in the process of rapid economic development and trade liberalization?
- What are the recent policy goals in the ROK's agricultural sector?

3

4

II. Agricultural Situation in the ROK

(1) Farmland Structure of Korea

- Total land: 10 million ha (99,538㎢)
- Cultivated land: 1.7million ha, 17% of total land area
  - Paddy Field : 0.93 million ha, 56% of total cultivated land
  - Upland : 0.76 million ha, 44% of total cultivated land
- About 64% of Total Land is mountainous and hilly area

5

(2) Status of Agriculture in the the ROK's Economy

- Agricultural share in national GDP is decreasing
  : 27.4%(1970) → 7.9%(1990) → 2.0%(2015)
- The share of agriculture in total employment is also declined
  : 50.4%(1970) → 17.9%(1990) → 5.2%(2015)
- The radical decreases of agricultural share in national economy have been occurred within one generation in the ROK.

  : It is a result of the rapid industrialization and urbanization.
- However agriculture still plays important roles in not only the land use and employment, but also social and economic stability and livelihood in rural area of the ROK.

6

Economic Development & Agriculture

- The ROK has made a rapid economic growth since 1960s
  - Annual average growth rate of GDP is 6.7% during 1970-2010, which is mainly led by non-agricultural sector
  - Manufacturing sector grew sharply, annual growth rate is 10.5%
  - Agricultural sector showed a relatively low growth rate of 1.7%

< Table 1> Annual Growth Rate by Sector(CAGR, %)

Period	GDP	Ag-Forestry& Fisheries	Mine & Manufacturing	Electricity, Gas & Water	Service
1970~1979	8.4	3.6	15.5	12	9.7
1980~1989	8.6	4.0	10.2	9.6	9.9
1990~1999	7.2	2.0	9.5	10.2	8.6
2000~2010	3.8	1.0	8.3	7.5	4.7
1970~2010	6.7	1.7	10.5	13.2	6.4

7

(3) Production Share by Commodity

- Agricultural Production has been steadily increasing from KRW 6 trillion (1980) to 45 trillion(2015)
  - The share of Livestock, Fruits and Vegetable in the value of agricultural production has been increasing
  - However the share of rice production in total agricultural production has been decreasing since 1990

< Table 2> Production Value and Share by Farming Type

Unit: KRW trillion won, %

	1980	1990	2000	2015
Total Agriculture Production	6.34(100)	17.73(100)	31.97(100)	44.52(100)
Rice	2.18(34.4)	6.54(36.8)	10.50(32.8)	7.70(17.3%)
Livestock	1.27(20.0)	3.95(22.3)	8.08(25.3)	19.13(42.9%)
Fruit	0.25 (3.9)	1.31(7.4)	2.58(8.1)	3.69(8.3%)
Vegetable	1.44(20.6)	3.32(18.7)	6.74(21.1)	8.99(20.2%)
Others	1.20 (18.9)	2.61(14.7)	4.07(12.7)	5.52(11.3%)

8

(4) Farmland Size

- Total planted land is decreasing in the process of urbanization
  : 2.3 million ha(1970) → 1.7 million ha(2015) (26% decrease)
- Number of farm-household is decreasing much faster than planted land
  : 2,483 thousands(1970) → 1,089 thousands(2015)
  (56% decrease)
- Therefore, average farmland size per farm is increasing
  : 0.93 ha(1970) → 1.54 ha(2015)
- But farmland size in the ROK are still very small compared to other countries
  : Arable Land size per farm
  Japan-1.7ha, Netherlands-22ha, U.S.A.-120ha

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(5) Rice Dominant Farming System

- Rice farming takes dominant position in ag. production and farm economy in the ROK
- Rice(2015) accounts for
  1) 16% of total agricultural production
  2) 54% of total agricultural land
  3) 58% of total farm household
  4) 19% of total farm revenue
- The reasons are as follows:
  1) Staple food, government have maintained price and income support
  2) Rice farming is relatively easy and time saving due to mechanization
  3) Rice was exempted from market opening through WTO and FTA.

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(6) Agricultural Trade

- Agricultural import is increasing rapidly
  : 0.5 billion US $ (1970)→ 34.8 billion US $ (2015)
- Agricultural export is also increasing
  : 0.1 billion US $ (1970)→ 8.0 billion US $ (2015)
- Agricultural trade deficit has increased greatly
  : 0.4 billion US $ (1970)→ 26.7 billion US $ (2015)

< Table 3> Situation of Agricultural Trade

Unit: US$ billion

		1970	1980	1990	2000	2015
Import	Nation wide	1.8	21.6	69.8	160.4	436.5
	Agriculture	0.5	3.1	5.4	6.8	34.8
Export	Nation wide	0.9	17.2	65.4	172.3	526.8
	Agriculture	0.1	1.1	1.1	1.3	8.0

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(7) Food Self-sufficiency Rate

- Self-Sufficiency rate for all grains (including feed grains) has continuously dropped since the 1980s
  : 48.4%(1985) → 23.8%(2015)
- Self- sufficiency rate for wheat and corn became less than 1%
  : However rice is almost self-sufficient level

<Table 4> Self-sufficiency Rate of Major Grain

Unit: %

	1985	1990	1995	2000	2005	2010	2015
Rice	103.3	108.3	91.4	102.9	102.0	104.6	101.1
Barley	63.7	97.4	67.0	46.9	60.0	24.3	21.9
Wheat	0.4	0.1	0.3	0.1	0.2	0.9	0.7
Corn	4.1	1.9	1.1	0.9	0.9	0.9	0.8
Soybeans	22.5	20.1	9.9	6.8	9.7	10.1	9.4
Total for all grains	48.4	43.1	29.1	29.7	29.4	27.6	23.8

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(8) SWOT of the ROK's Agricultural Sector

III. Agricultural Policy Changes: Historical Perspective

(1) Agricultural Policy : 1950s and 1960s

- The ROK's agricultural policy has undergone a number of significant changes since 1950s and 1960s.

1950s ~60s

- Policy Issues:
  Main goals of the agricultural policy were to resolve food shortage and to terminate the problems of tenant farmers and landowners.

- Policy Direction:

(1) Creation of owner farming through "Land Reform"
: Farmland reform was implemented from 1950 until 1957 to create independent family farming

(2) Establishment of agricultural administration system
: Rural Development Administration(1962) and ag. cooperative organization(1961) were founded and 'the Basic Agricultural Law (1967)' was enacted to conduct the systematic ag. policy.

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(2) Agricultural Policy : 1970s

1970s

• Policy Issues :
Main goals of the agricultural policy were to increase food production and to modernize the production system.

• Policy Direction:
(1) Increase of productivity through "Green Revolution"
: Expansion of agricultural R &D investment, development of high-yield variety, improvement of irrigation system, agricultural mechanization were pursued.

(2) Price support policy for rice and barley began in 1970.
: As a result, self-sufficiency of rice was achieved in 1977

(3) New town movement called 'Saemaul Undong' launched in 1970.
: Government provided financial and materials supports to farmers and villages for improving the rural living conditions.

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(3) Agricultural Policy : 1980s

1980s

• Policy Issues:
Main goals of the agricultural policy were to increase farm households income to reduce the enlarged income gap between urban and farm households due to the fast growth in non-agricultural sector.

• Policy Direction:
(1) Promotion of cash-crop production such as livestock, fruit, and vegetables
: Price stabilization policy for livestock, fruit, and vegetables began

(2) Creation of off-farm income sources through making the rural industrial complexes
: Rural Income Source Development Law(1983) was enacted
Financial incentives for rural company such as favorable loan and tax exemption

As a result, production of livestock, fruit, and vegetables began to increase and industrial complexes began to appear in rural area

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(4) Agricultural Policy : 1990s

1990s

- Policy Issues :

Main goals of the agricultural policy were to promote the structural reform and to enhance competitiveness in the era of trade liberalization according to the implementation of WTO AoA and FTA .

- Policy Direction:

(1) Reforming agricultural structure to enhance competitiveness

: Large investment plans for agricultural sector and rural area were made in 1991, 1994, 1998 and 2003.

- First investment plan amounting 42 trillion won(1991)
- Second investment plan amounting 15 trillion won(1994)
- Third investment plan amounting 45 trillion won(1998) to reform the agricultural structure and improve the living conditions in rural areas from 1992 to 2004
- Fourth investment plan amounting 119 trillion won was made in 2003, which is a 10-year plan from 2004 to 2013.

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(4) Agricultural Policy : 1990s (continued)

1990s

- Policy Direction:

(2) Creation of large scale commercial farming

- The farm size ownership limit was increased from 3 ha to10 ha(1993) and was abolished(2002) to create large scale commercial farming
- A new farmland banking system was introduced in 2005 to minimize the fragmentation of farmland and encourage young full-time farmers to increase the scale of their farms more easily

(3) Stabilization and support of farm income

- Several DP programs have been introduced for supporting farm income
- Direct payment for early retirement of aged farmers(1997)
- Direct payment for environmentally friendly farming (1999)
- Direct payment for rice income support(2001, 2002, 2005)
- Direct payment for less favorable areas(2004)

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(4) Agricultural Policy : 1990s (continued)

1990s

- Policy Direction:

(4) Promotion of environmentally friendly farming to maintain sustainable agricultural production and to preserve environment
: 'Environment-friendly Agricultural Promotion Act' was legislated in 1997
- Introduction of direct payment for environmentally friendly farming (1999)

(5) Strengthening of rural development policy to enhance the quality of life in rural areas
: 'The Special Law for the Improvement of Quality of Life in Rural Areas' enacted in 2005
- Investment plan for RD amounting 20 trillion won, which is a comprehensive plan for RD during 2005-2010

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(5) Agricultural Policy : since 2000

Recent

- Policy Issue :

Main goals of the agricultural policy to find the new engines of growth for the continuous development in agricultural sector

- Policy Direction:

New government established in 2012 is pursuing a more offensive approach in agricultural policy

(1) Promotion of value added agro-food processing industry
: Focus of Ag. policy shifted from mainly raw production to not only primary production but also secondary food processing industry and thirdly green tourism.

(2) Building up a consumer-oriented agricultural system and Strengthening a food safety management system
: Customer of Ag. policy changed from mainly farmer to not only farmer, but also consumer and food processing enterprises.

(3) Expansion of agro-food exports
: 5 billion US $(2012) → 10 billion US $(2017)

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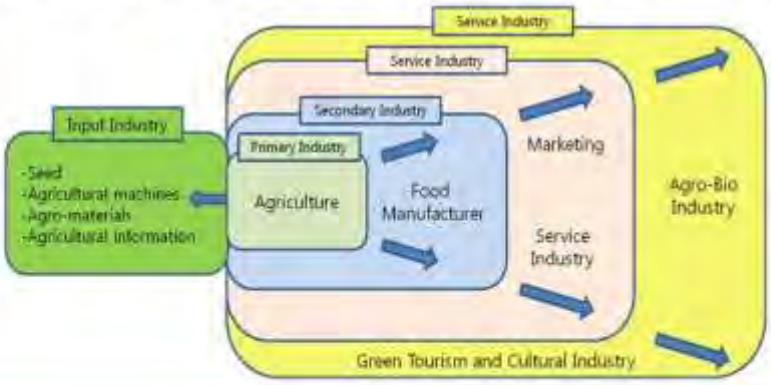
Recent Agricultural Policy Focus: 6th industrialization of agriculture

○ Recently the Korean government is pursuing the integration of tradition agriculture with food processing, leisure and tourism industry.

- It is for creating the high value-added agriculture and enhancing the farmer's income.

<Figure 1> Expansion to value-added agribusiness from traditional agriculture



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Ⅳ. Agricultural Development Strategies

1. Basic Structure of Agricultural Policy

"Four Areas for Government Policy"

1) **Policy for Farmer, which is to make economically self-survival farmers**

2) **Policy for Agriculture, which is to make productive and sustainable agriculture with enhancing the competitiveness of agricultural sector**

3) **Policy for Rural Community, which is to create vitality of rural society and to improve the living conditions in rural area**

4) **Policy for Agricultural Related Industry, which is to effectively set up the vertical integration from input industry(Seed, Fertilizer, Pesticide, Machinery and Equipment) to value added food-processing industry**

2. Objectives of Agricultural Policy

"Five Objectives of Agricultural policy"

1) Goal for Farmers, which is to provide opportunity for high income

2) Goal for agricultural industry, which is to create higher value chains

3) Goal for Consumers, which is to provide freshness, quality and safe food

4) Goal for Rural Residents, which is to enhance the quality of life

5) Goal for Future Generations, which is to transfer clean environment and beautiful landscape in rural area

Thank you for listening!

jeongbin@snu.ac.kr

6) Erosion Control Works and Rehabilitation Examples of Landslide Damage in ROK

Dr. Sang Ho Lee

Director, Korean Association of Soil and Water Conservation

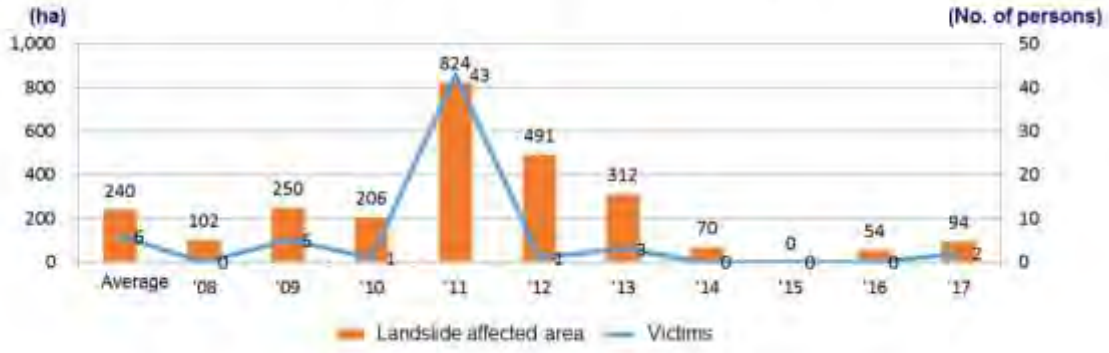
Erosion Control Works and Rehabilitation Examples of Landslide Damage in ROK

Dr. Sang Ho LEE

Korean Association of Soil and Water Conservation

Climate and Landslide in ROK

- Annual precipitation in Korea : 1,200~1,500mm
- Rainy season(Jun~Sep) : 50~60% of annual precipitation
- The average precipitation of rainy season in 2016 : 645.1mm(about 50% of that of annual average precipitation (1,272.5mm)
- Landslide occurrence
  - (Landslide & Debris flow Hazard) the recent decade('08~'17) : 240ha on average, 54ha in '16, 94ha in '17
  - (Victims) the recent decade('08~'17): 6 casualties on average, zero in '14~'16



Successful reforestation by erosion control works

Degraded forest

After erosion control works

Successful reforestation

Classification of Erosion Control Works

Erosion control work in mountainous districts : A landslide prevention work, A landslide restoration work, A mountainous district conservation work, A mountainous district restoration work

BEFORE	AFTER

Classification of Erosion Control Works

Erosion control work in coastal areas : A work to create a forest for damage prevention along the beach, A work to prevent coastal erosion.

A work to create a forest for damage prevention along the beach

A work to prevent coastal erosion

Classification of Erosion Control Works

Erosion Control Work in wild stream : A mountain stream conservation work, A mountain stream restoration work, A construction work of an erosion control dam

A mountain stream conservation work

A construction work of an erosion control dam

Effects of Erosion Control Works

❖ Conservation of national land, prevention of disasters, water resources conservation, environmental preservation, etc.

* Erosion control dam 2,550㎥/1site, a mountain stream conservation 1,770㎥/1km

Erosion Control Dam


Concrete Dam


Boulder Dam


Concrete Block Dam


Steel Dam

Slit Dam

Screen Dam

Eco-Pillar Dam

Multi-function Dam

Wire rope Dam

Timber Dam

Eco-friendly Erosion Control Works

A mountain stream conservation work (Gyeongnam)

A mountain stream conservation work (Jeonbuk)

Inter-stream grade stabilization structures, channel, revetment using vegetation sacks, introduction of aquatic organisms around project site

History of Erosion Control Works

- In 1907
  - "terrace sodding works" and "terrace planting works" were adopted to the area near of the Changui-mun, Seoul
- Since 1918
  - erosion control works in Geum, Nakdong, and Seomjin rivers for securing water resources
  - forest areas was partially recovered from 1922 to 1947
- In 1952
  - Village Forest Association in the county level were organized
  - wheat flour, which was donated by the UN Korean Reconstruction Agency, was provided as a labor charge for the rehabilitation works in the eroded area

The First Erosion Control Works in ROK
Changui-mun

History of Erosion Control Works

- torrent erosion control works has been executed in 1955 through the assistance of the International Cooperation Agency
- In 1962, Erosion Control Law was enacted
- the first 10-year Forest Development Plan (1973-1978); 82,268 ha hillside erosion control works, and 500 km of torrent erosion control works
- the second 10-year Forest Development Plan (1979-1988); 78,268 ha hillside erosion control works, 3,300 km of torrent erosion control works
- the Forest Resources Enhancement Plan (1988-1997); 4,710 ha hillside erosion control works, 2,410 km of torrent erosion control works, and 1,300 of erosion control dams
- the fourth 10-year Forest Development Plan since 1998-2007
- The fifth 10-year Forest Development Plan since 2008-2017

Landslide in Mt. Woomyeon in Seoul (2011)

Video source : KBS

Landslide in Mt. Woomyeon

Mt. Woomyeon (293m)

Date	Area	Sites	Damaged area (ha)	Victims	Rehabilitation Cost (million USD)
Jul 27, 2011	Total	81	109.7	Deaths 16, Injury 51, Evacuee 413	56
	Woomyeon	12	69	Deaths 16, Injury 50, Evacuee 413	40
	Others	69	40.7	Injury 1	16.2

Precipitation	A site	B site	C site
1 hour	85.5 mm	112.5 mm	85.5 mm
cumulative (24hrs)	230 mm (15hrs)	424.5 mm (24hrs)	364.5 mm (24hrs)

Information source : Seoul Metropolitan Government

BEFORE

AFTER

Photo source : Seoul Metropolitan Government

BEFORE

AFTER

Photo source : Seoul Metropolitan Government

BEFORE

AFTER

Photo source : Seoul Metropolitan Government


BEFORE
AFTER
Photo source : Seoul Metropolitan Government


BEFORE
AFTER
Photo source : Seoul Metropolitan Government


Thank you!
Acknowledgement
The Korea Forest Service and Seoul Metropolitan Government provided photos and information on erosion control works, ROK

7) Prediction of Forest Fire Danger Rating (FFDR) in DPRK

Dr. Myoung Soo Won

Senior Researcher, NIFoS


국립산림과학원
Prediction of forest fire danger rating(FFDR) in DPRK:
Modeling of MODIS fire product, 5km-resolution meteorological data, daily weather index(DWI), fuel model index(FMI) and topography model index(TMI)
Myoungsoo Won, Ph.D.
Div. Of Forest Ecology and Climate Change, National Institute of Forest Science


Korea Forest Fire Danger Rating System(KFFDRS)

KFFDRS

- **K**orean **F**orest **F**ire **D**anger **R**ating **S**ystem
  - This system has been operating at the NIFoS since 2003.
  - Forest danger rating index has provided an hour everyday to people, central and local government.

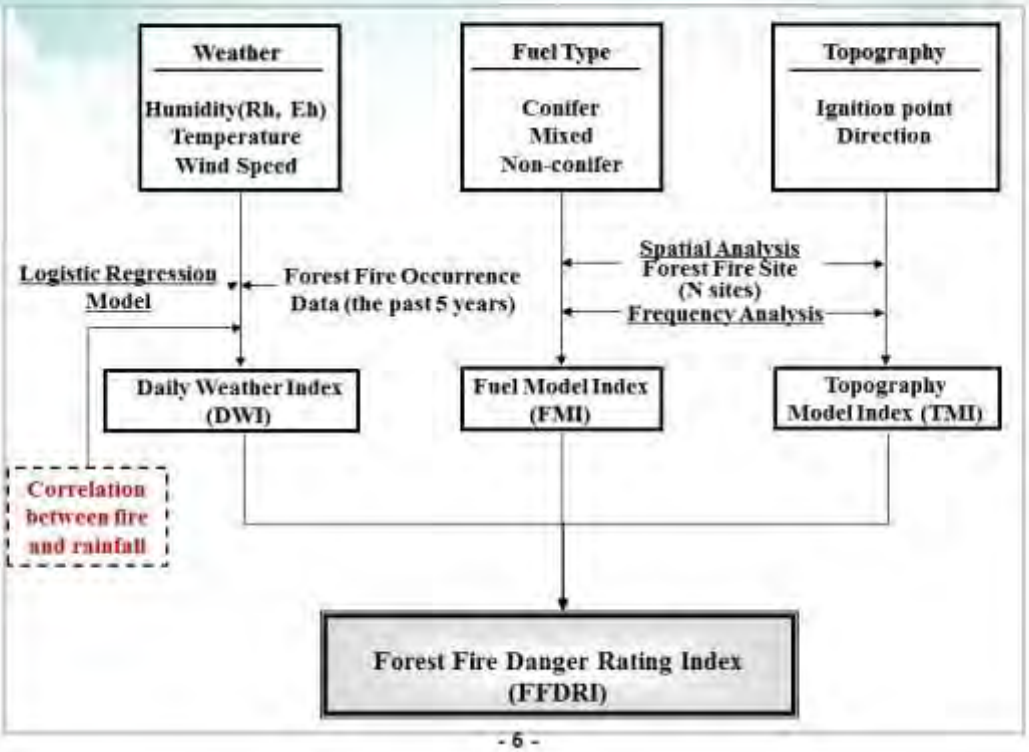
KFFDRS Database

- **K**orean **F**orest **F**ire **D**anger **R**ating **S**ystem Database
  - National Fire Database (from NIFoS and KFS)
  - Weather Database (KMA)
  - Mountain Weather Database (NIFoS)
  - Hotspot Database (NIFoS)
  - National Topography Database (NGII)
  - National Forest Database (NIFoS and KFS)

KoMIS

- **Kor**ean **M**ountain **M**eteorology **I**nformation **S**ystem
  - KoMIS supply mountain weather data such as a temperature, humidity, wind and precipitation per minute from NIFoS.
  - In current, 200 automatic mountain meteorology stations(AMOS) were installed at the mountain area.
  - AMOS will be installed more than 620 stations by 2021

R&D Flow chart: Forest fire occurrence probability model



- 6 -

Key results

1. Extraction of fire spot using MODIS data
   ➲ Building Database of fire ignition points for the inaccessible area

Materials and Methods: info. collection of fire spots

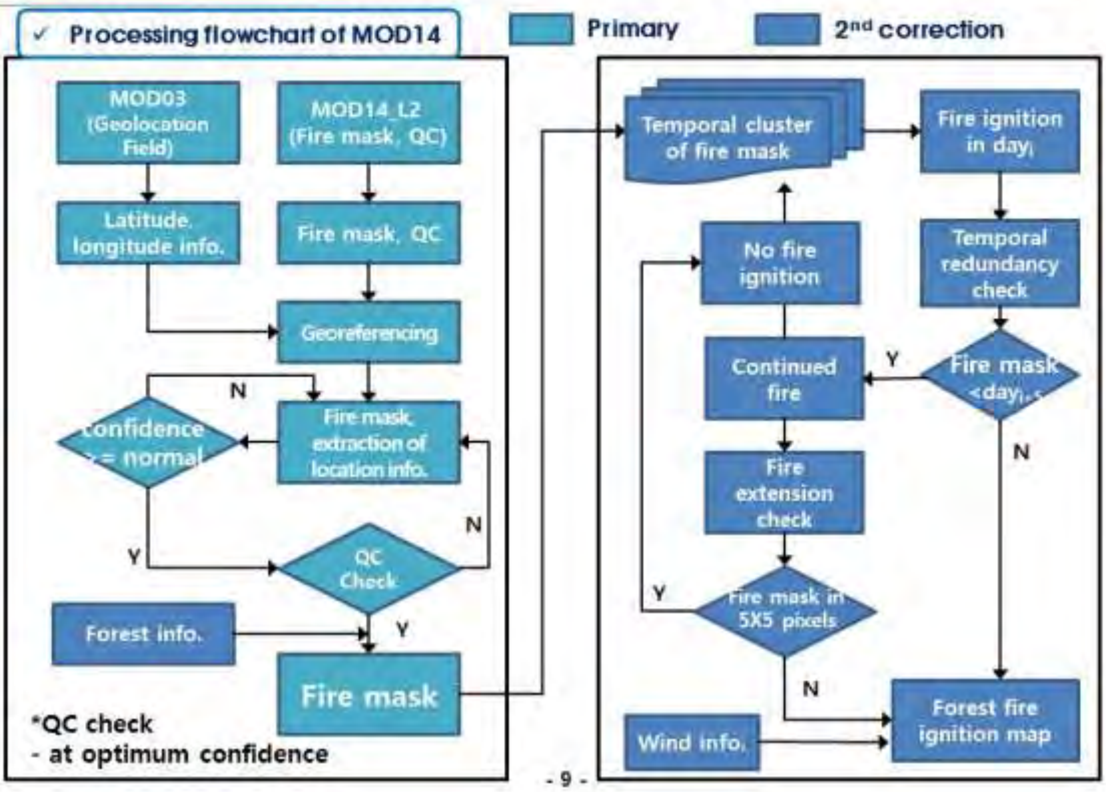
MODIS Sensor

- Pixel resolution: 250, 500, and 1000 m
- Overpass times: 10:30
- Spectral bands: 36 (0.4 – 14.5 um)

✓ **Info. Gathering Web site**

Materials and Methods: Image data processing flowchart

✓ Processing flowchart of MOD14



Materials and Methods: MODIS14 Layer Table (Product, QC)

✓ MODIS14 Fire Mask Product

[illegible]
0 not processed (missing input data)
1 not processed (obsolete; not used in post-launch product)
2 not processed (other reason)
3 water
4 cloud
5 no fire
6 unknown
7 fire (low confidence)
8 fire (nominal confidence)
9 fire (high confidence)

✓ QA Flag (32-bit)

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	00	[illegible]
		01	[illegible]
		10	[illegible]
		11	[illegible]
[illegible]	[illegible]	0	[illegible]
		1	[illegible]
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		1	[illegible]
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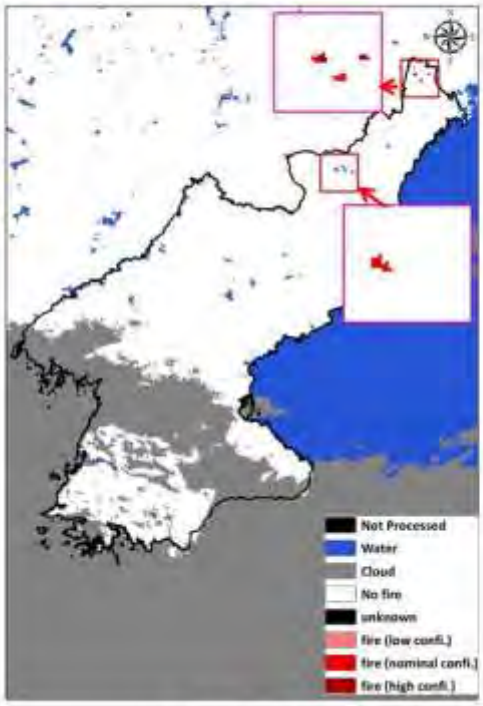
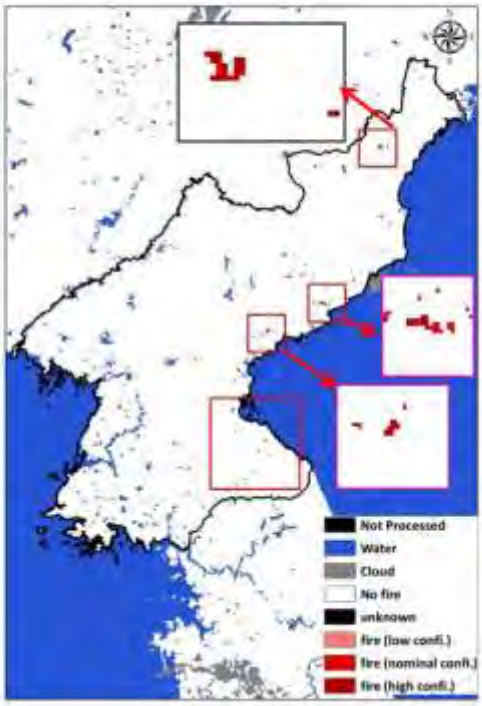
		1	[illegible]
[illegible]	[illegible]	0	[illegible]
		1	[illegible]
[illegible]	[illegible]	0	[illegible]
		1	[illegible]

- ❖ Selection of materials
  - Nominal confidence
  - High confidence
- ❖ QA Flag
  - Optimum confidence
  - Less than optimum confidence

Key results: example of MODIS14 fire mask

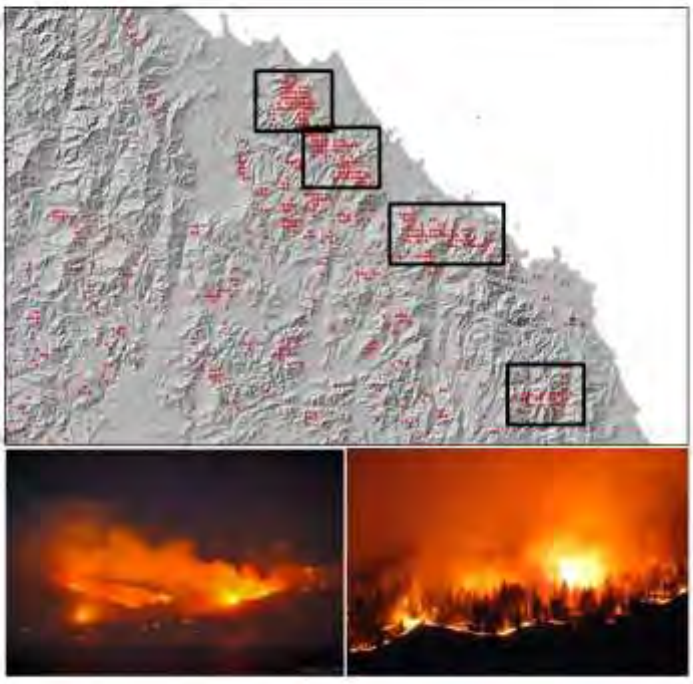


April 29, 2012



April 27, 2015

Key results: Forest fire(FF) spots DB for the inaccessible area



❖ Total 3,637 fire spot points

- Period : 2011~2015 (5yrs)

Key results: Hypothesis for problem solving

[Hypothesis for extraction of fire spot points from MOD-14 Product]

① Consider fire spotting at the time of the first detection when a forest fire was detected continuously at a particular pixel as a fire ignition point and occurrence time

② When a fire spot is detected at different times in the same pixel, it is regarded as an individual forest fire. However, apply only when the ignition time differs by more than 5 days

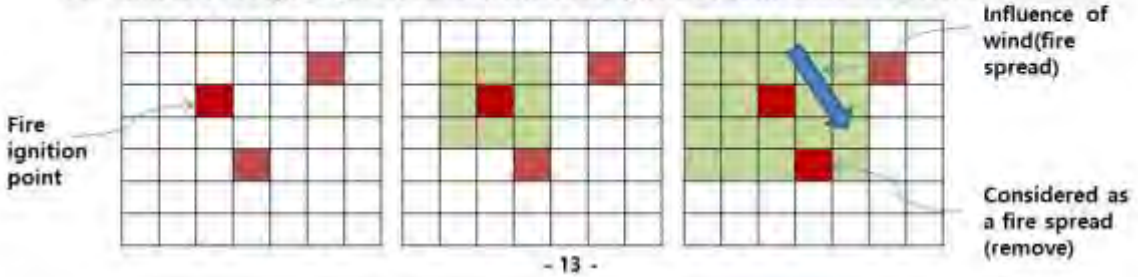
③ Identify whether forest fires have spread by 4 days after the ignition time, centered on ignition points

→ Remove fire spotting after setting 3 x 3 pixel area after ignition

→ After 2 days, check 5x5 pixel area

→ Identification of data after cloud data

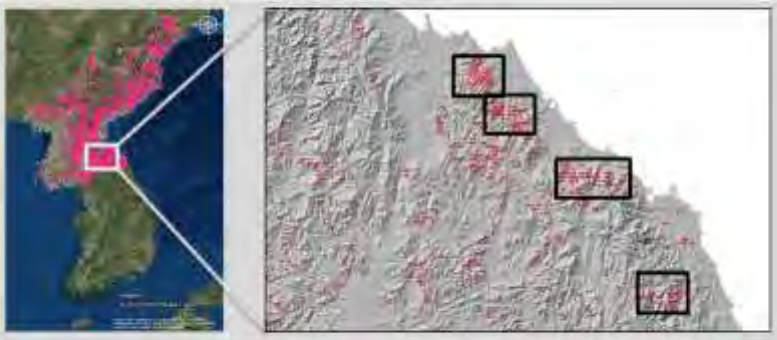
④ Removal of fire spotting in the same forest area using wind UV vector and wind direction



Key results: Reanalysis of fire spots by hypothesis

[Before reanalysis]

❖ (5yrs) A total of 3,637 fire spot points



[Reanalysis]

❖ (5yrs) Extracting a total of 1,469 fire spot points

[Consideration]
- FF detection (April 26) → Fire spread (April 27
- WS_{mean} : 5.0~30.0m/s
- WD : NW

※ Ignition point estimation considering detection time and WS/WD

Key results: Reanalysis of fire spots by hypothesis

[Before reanalysis]

❖ (5yrs) A total of 3,637 fire spot points

2011(1,111 points) 2012(275 points) 2013(283 points) 2014(1,206 points) 2015(762 points)

[Reanalysis]

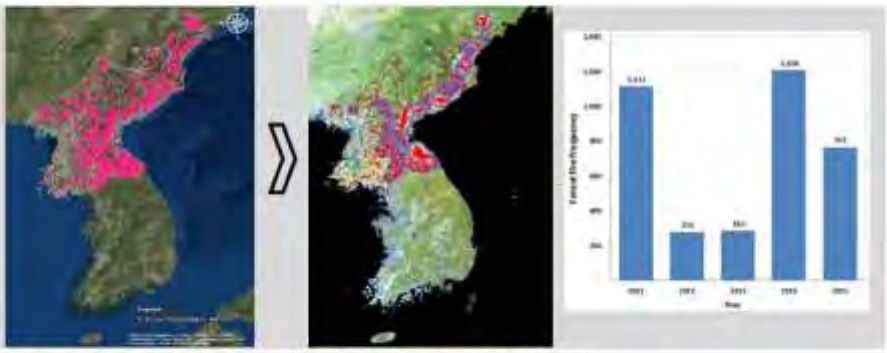
❖ (5yrs) Extracting a total of 1,469 fire spot points

2011(368 points) Remove 67%
2012(151 points) Remove 45%
2013(172 points) Remove 39%
2014(554 points) Remove 54%
2015(224 points) Remove 71%

Key results: Reanalysis of fire spots by hypothesis

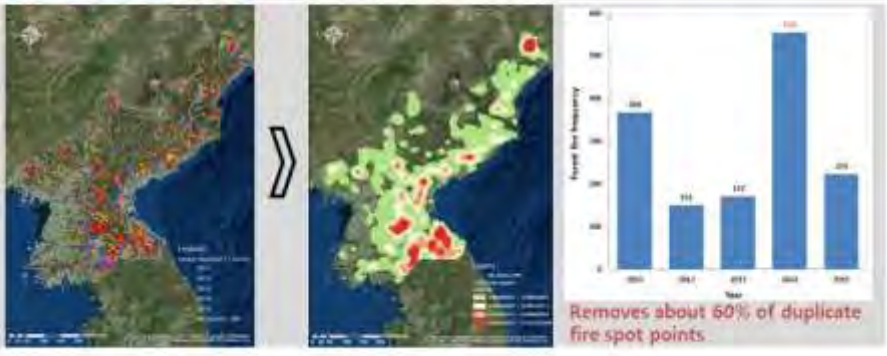
[Before reanalysis]

❖ (5yrs) A total of 3,637 fire spot points



[Reanalysis]

❖ (5yrs) Extracting a total of 1,469 fire spot points

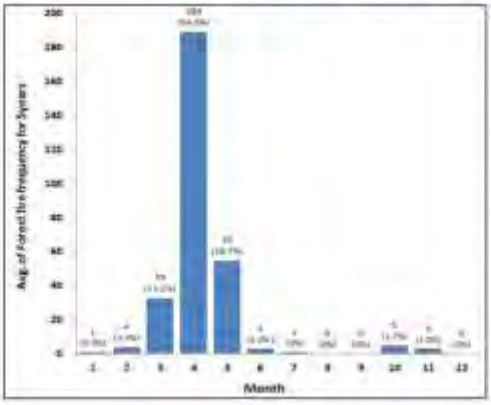


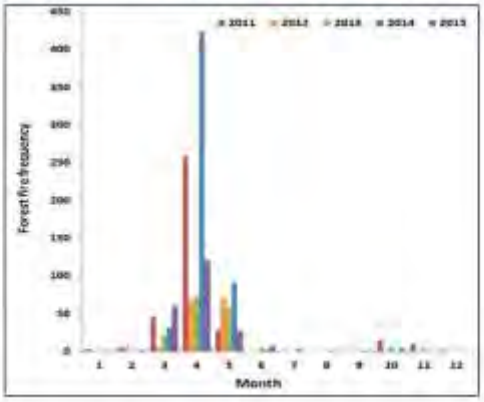
Removes about 60% of duplicate fire spot points

Key results: Monthly FF frequency for reanalysis data

Year	Fires	%
2011	368	25.1
2012	151	10.3
2013	172	11.7
2014	554	37.7
2015	224	15.2
Total	1,469	100.0

M/Y	2011		2012		2013		2014		2015	
1	3	0.8%	0	0.0%	0	0.0%	0	0.0%	1	0.4%
2	5	1.4%	8	5.3%	2	1.2%	0	0.0%	2	0.9%
3	46	12.5%	4	2.6%	22	12.8%	32	5.8%	61	27.2%
4	260	70.7%	67	44.4%	74	43.0%	424	76.5%	120	53.6%
5	28	7.6%	71	47.0%	57	33.1%	91	16.4%	27	12.1%
6	0	0.0%	0	0.0%	5	2.9%	2	0.4%	8	3.6%
7	0	0.0%	0	0.0%	0	0.0%	3	0.5%	0	0.0%
8	0	0.0%	0	0.0%	0	0.0%	1	0.2%	0	0.0%
9	0	0.0%	0	0.0%	0	0.0%	1	0.2%	1	0.4%
10	15	4.1%	0	0.0%	7	4.1%	0	0.0%	4	1.8%
11	10	2.7%	1	0.7%	5	2.9%	0	0.0%	0	0.0%
12	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	368	100.0%	151	100.0%	172	100.0%	554	100.0%	224	100.0%





Key results

2 Establishment of weather database in forest fire area

➲ Development of Daily Weather Index (DWI) model

Materials and Methods: 5km digital weather data of KMA

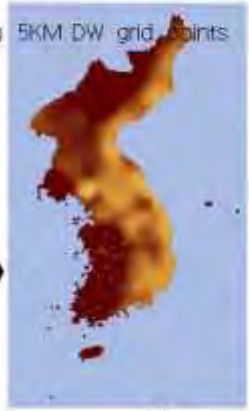
❖ Analysis data : 5km DW data of KMA
- Period : 2011~2015 (5yrs)

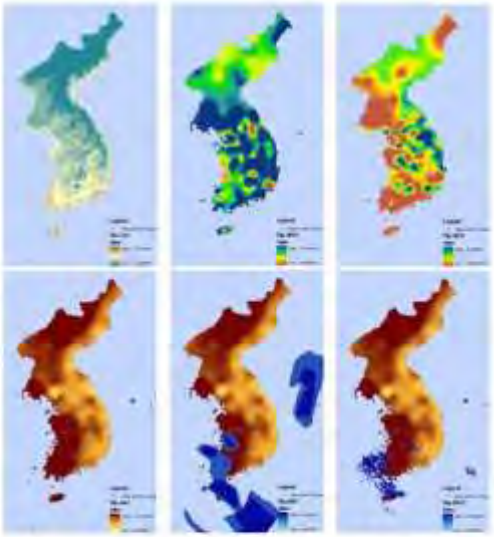
❖ Mesh info. of KMA DW data
- Grid interval : 5km
- Grid # : EW149 × SN 253 → 37,697
- Total grid distance : EW 745km, SN 1,265km
- Standard grid point : (43, 136) / (38.0N, 126.0E)

Materials and Methods: Extraction of weather data of fire spot points

◀ MODIS MOD14
- Extraction of fire spots from the MODIS images

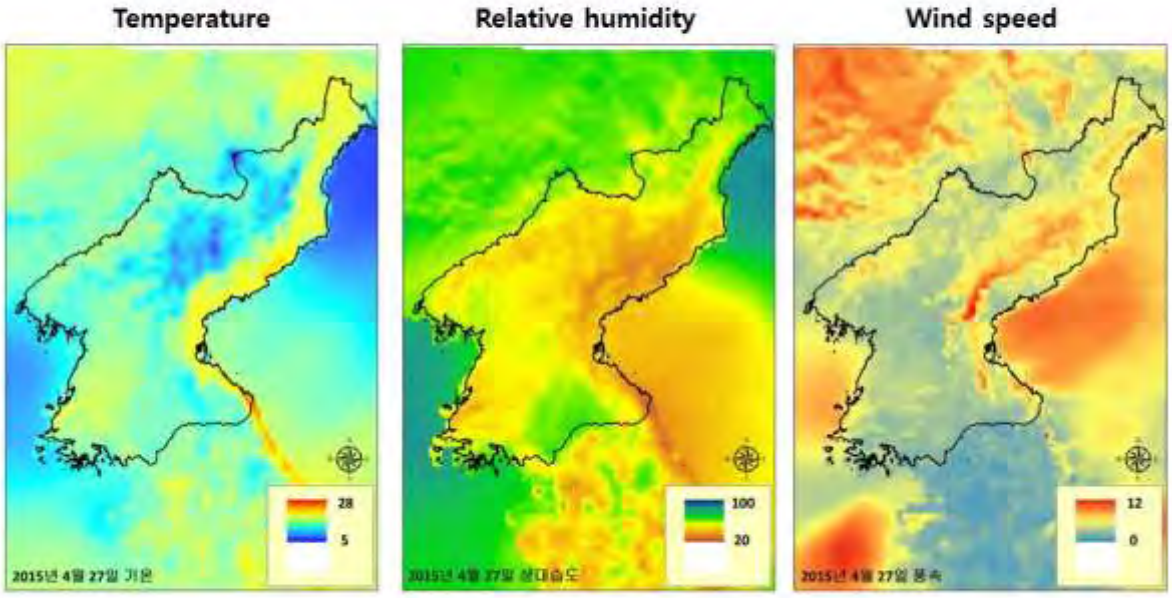
▼Design of 5km grid points for spatial analysis
- Digital weather(ASCII) → Raster
→ building 5KM DW grid points



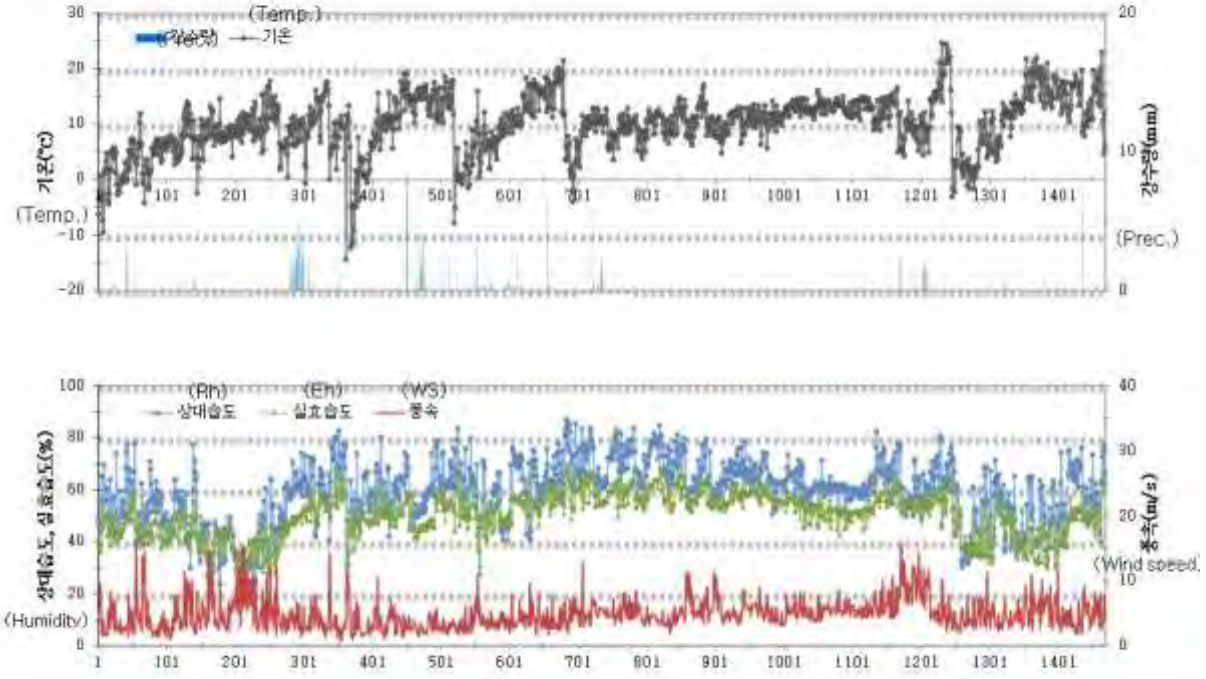


[Climate mapping on the Korean Peninsula(5km grid)]
- Weather factors : Temp., RH, WS/WD, Precipitation

Key results: Weather database(5km grid) of fire spot points



Key results: Weather database(5km grid) of fire spot points



Key results: Development of daily weather index model

Daily weather index (DWI) model

- Logistic Regression
- Weather variables : temp.(mean, max, min), relative humidity(mean, min), effective humidity, wind speed(mena, max), precipitation

$$p = \frac{\exp(\beta_0 + \beta_1 X_1 + \ldots + \beta_j X_j)}{1 + \exp(\beta_0 + \beta_1 X_1 + \ldots + \beta_j X_j)}$$

Estimated Correlation Matrix

parameter	intercept	T1D_max	RH1D_min	EH1D_avg	T1D_avg	T1D_min	RH1D_avg	WS1D_max
intercept	1.0000**	-0.1104	0.3213	-0.4296	-0.0536	0.2036	-0.2282	0.1234
T1D_max	-0.1104**	1.0000	0.2491	0.0518	-0.9312	0.6922	-0.2572	0.0026
RH1D_min	0.3213**	0.2491	1.0000	-0.1107	-0.1490	-0.0208	-0.6791	0.0017
EH1D_avg	-0.4296**	0.0518	-0.1107	1.0000	-0.0890	0.1177	-0.5346	-0.0738
WS1D_avg	-0.4152**	0.0165	-0.1965	0.0848	0.0574	-0.1194	0.2095	-0.8399
T1D_avg	-0.0536**	-0.9312	-0.1490	-0.0890	1.0000	-0.8900	0.2274	-0.0499
T1D_min	0.2036**	0.6922	-0.0208	0.1177	-0.8900	1.0000	-0.1437	0.0738
RH1D_avg	-0.2282**	-0.2572	-0.6791	-0.5346	0.2274	-0.1437	1.0000	-0.0469
WS1D_max	0.1234**	0.0026	0.0017	-0.0738	-0.0499	0.0738	-0.0469	1.0000

** p<0.01

Key results: Development of daily weather index model

Result of the logistic regression analysis

- Sample Number : 10,283(fire spot points of the fire day, 3 days before and after the non fire days)

Response Profile	
Fire	Total Frequency
0	8,814
1	1,469
Probability modeled is Fire = '1'	
-2 Log Likelihood	8,350.885
χ^2	1,297.6859
% predict value	66.6

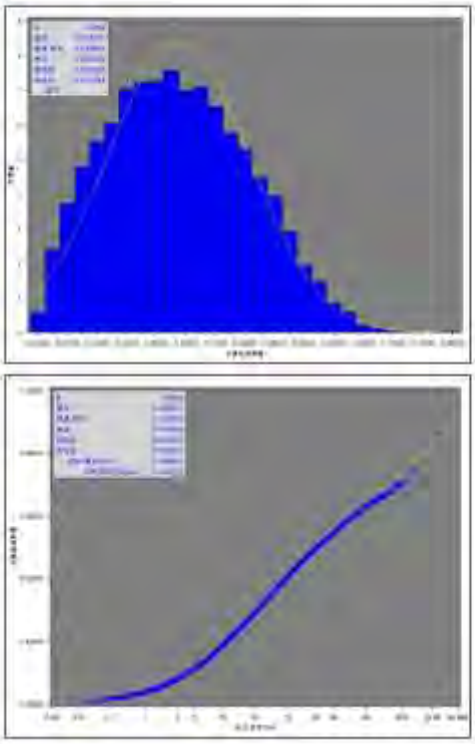
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.7425	0.2587	112.3371	<.0001
T1D_max	1	0.0905	0.0247	13.4266	0.0002
RH1D_min	1	-0.0517	0.00563	84.1784	<.0001
EH1D_avg	1	0.0334	0.00657	25.8035	<.0001
WS1D_avg	1	0.1283	0.0273	22.1316	<.0001
T1D_avg	1	-0.0664	0.0444	2.2346	0.1349
T1D_min	1	0.0116	0.0230	0.2545	0.6139
RH1D_avg	1	-0.00507	0.00611	0.6909	0.4059
WS1D_max	1	-0.00771	0.0140	0.3035	0.5817

* p<0.01

DWI model of DPRK

$$[1+\exp\{-(2.7425+(0.0905*T\_max)-(0.0517*RH\_min)+(0.0334*EH)+(0.1283*WS\_avg))\}^{-1}]^{-1}$$

Key results: The probability interval of DWI model in DPRK

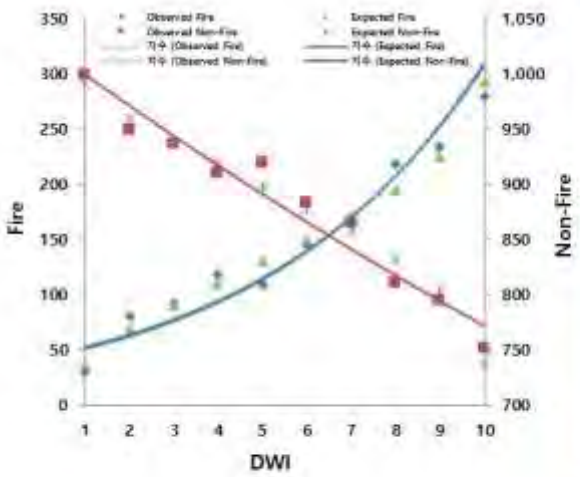


Distribution analysis : FF occurrence probability	
N	10,283
Mean	0.29928
Max	0.86350
Min	0.00708
Standard deviation	0.14305
Dispersion	0.02046
Avg. standard error	0.00141

Interval ratio	DWI	Estimated probability interval
10%	1	[.00000~.11138]
20%	2	[.11139~.16559]
30%	3	[.16560~.21032]
40%	4	[.21033~.25141]
50%	5	[.25142~.29238]
60%	6	[.29239~.33452]
70%	7	[.33453~.37828]
80%	8	[.37829~.43005]
90%	9	[.43006~.49471]
100%	10	[.49472~1.0000]

Key results: Verification of the DWI model in DPRK

The frequency of fire day and non-fire day by DWI model



DWI	Observed Fire	Expected Fire	Observed Non-Fire	Expected Non-Fire
1	30	36.51	998	991.49
2	80	68.88	948	959.12
3	92	90.42	936	937.58
4	118	110.54	910	917.46
5	109	130.57	919	897.43
6	145	150.24	883	877.76
7	164	171.45	865	857.55
8	218	195.23	810	832.77
9	234	224.84	794	803.16
10	279	293.20	751	736.80

Key results

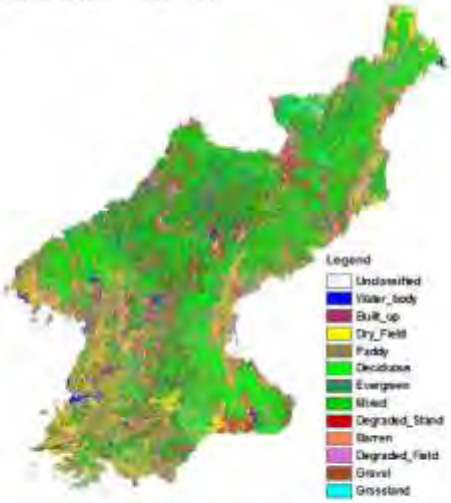
3 Establishment of forest map database in DPRK

➲ Development of Fuel Model Index (FMI) model

Key results: Forest type map in DPRK

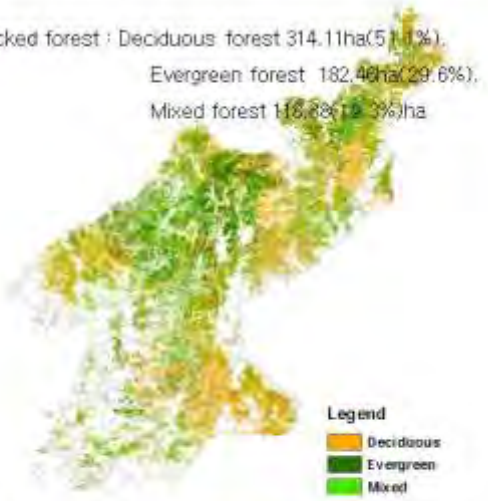
❖ Data : 66 SPOT images(10m resolution)

- Satellite images from 2004 to 2008
- Classification : ISODATA



❖ Results

- Forest area : Approximately 8.98 million ha, 75.45% of DPRK's land area)
  - Stocked forest 6.15 mil. ha / Unstocked forest 2.83 mil. ha
- Stocked forest : Deciduous forest 314.11ha(51.1%), Evergreen forest 182.46ha(29.6%), Mixed forest 118.28ha(19.3%)ha



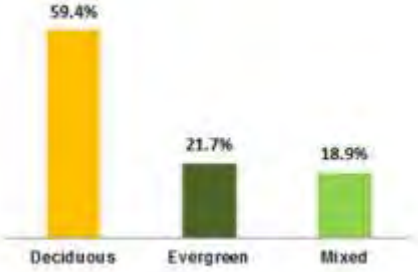
[Data source] National Institute of Forest Science(NIFoS), 2008

Key results: Fuel Model Index(FMI)

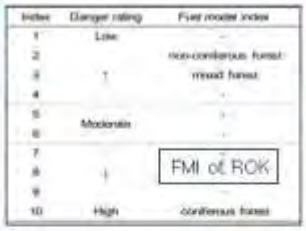
❖ Forest type characteristics of forest fire area in DPRK

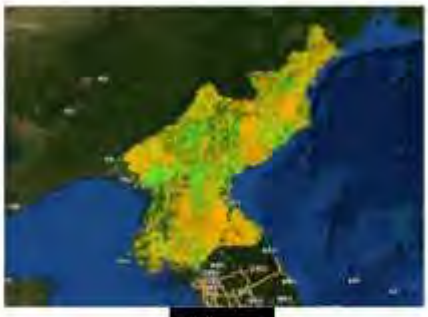
– Deciduous forest 59.4%, Evergreen forest 21.7%, Mixed forest 18.9%

• (ROK) Evergreen 69.0%, Mixed 16.7%, Deciduous 14.3%



Index	Danger rating	Fuel Model Index
1	Low	-
2		-
3	↑	Mixed
4		Evergreen
5	Moderate	-
6		
7		-
8	↓	-
9		-
10	High	Deciduous





FMI map

Key results

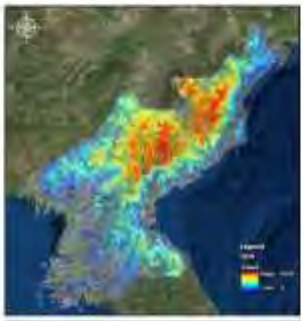
4 Establishment of topographic information in DPRK

➲ Development of Topography Model Index (TMI) model

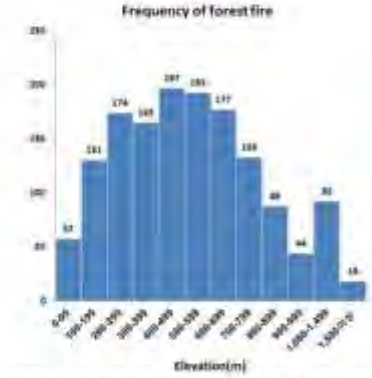
Materials and Methods: Topographic info. in DPRK

❖ Analysis data : 1" DEM(30m grid)

- Extraction info. : elevation and aspect distribution map



Key results: Topography Model Index(TMI)

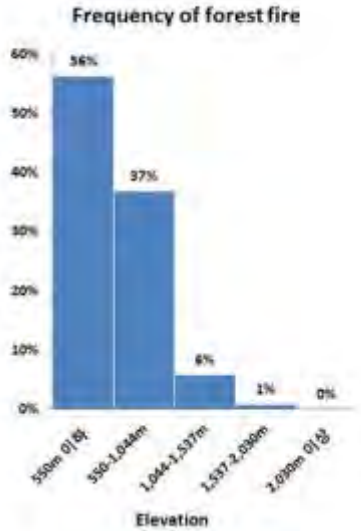


mean(μ) : 796m, Max : 2,539m, S.D.(δ) : 493m

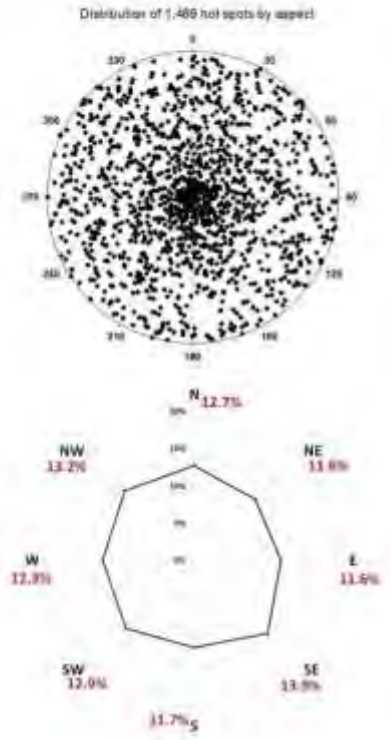
Intervals	Elevation	Fire freq.	Ratio
$x \le \mu - 1/2\delta$	Less than 550m	828	56%
$\mu - 1/2\delta < x \le \mu + 1/2\delta$	550-1,044m	542	37%
$\mu + 1/2\delta < x \le \mu + 3/2\delta$	1,044-1,537m	85	6%
$\mu + 3/2\delta < x \le \mu + 5/2\delta$	1,537-2,030m	14	1%
$\mu + 5/2\delta < x$	More than 2,030m	0	0%
Total		1,469	100%

❖ Results

- (Freq. analysis) extraction of altitude info. of fire spot points in forest area
  - 1,469 fire spot points
  - It is divided into 5 classes using the average of the altitude and the standard deviation



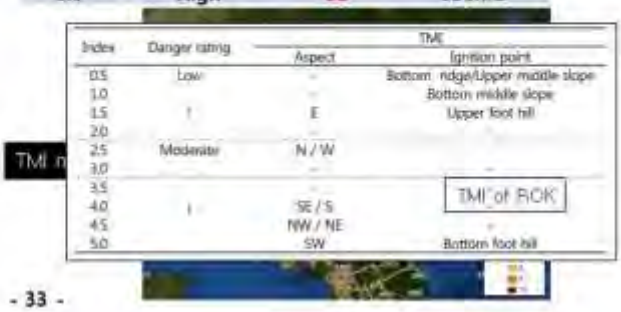
Key results: Topography Model Index(TMI)



❖ Results

- (Freq. analysis) extraction of aspect info. of fire spot points in forest area
  - 1,469 fire spot points
  - Eight aspect analysis of fire spot points

Index	Danger rating	Topography Model Index	
		Aspect	Elevation
0.5	Low		≥1,537m
1.0		NE/E/S	1,044-1,537m
1.5	↑		
2.0		W	
2.5	Moderate		
3.0		SW/N	
3.5		NW	550-1,044m
4.0	↓		
4.5			
5.0	High	SE	550m≤

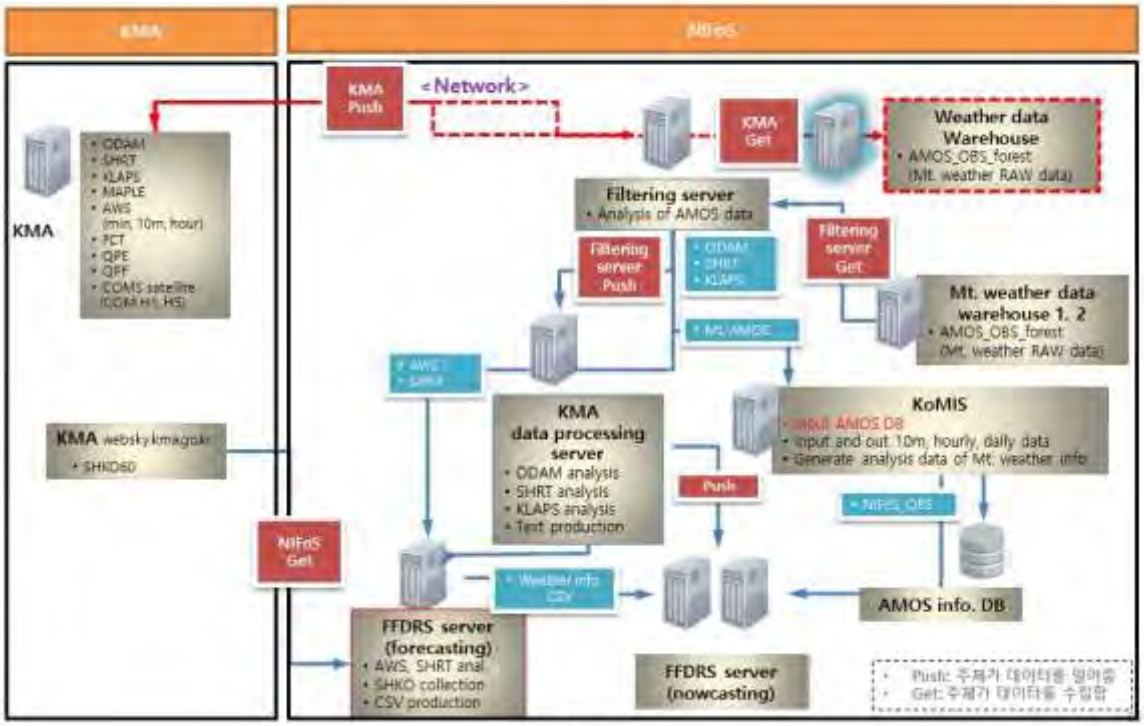


Key results

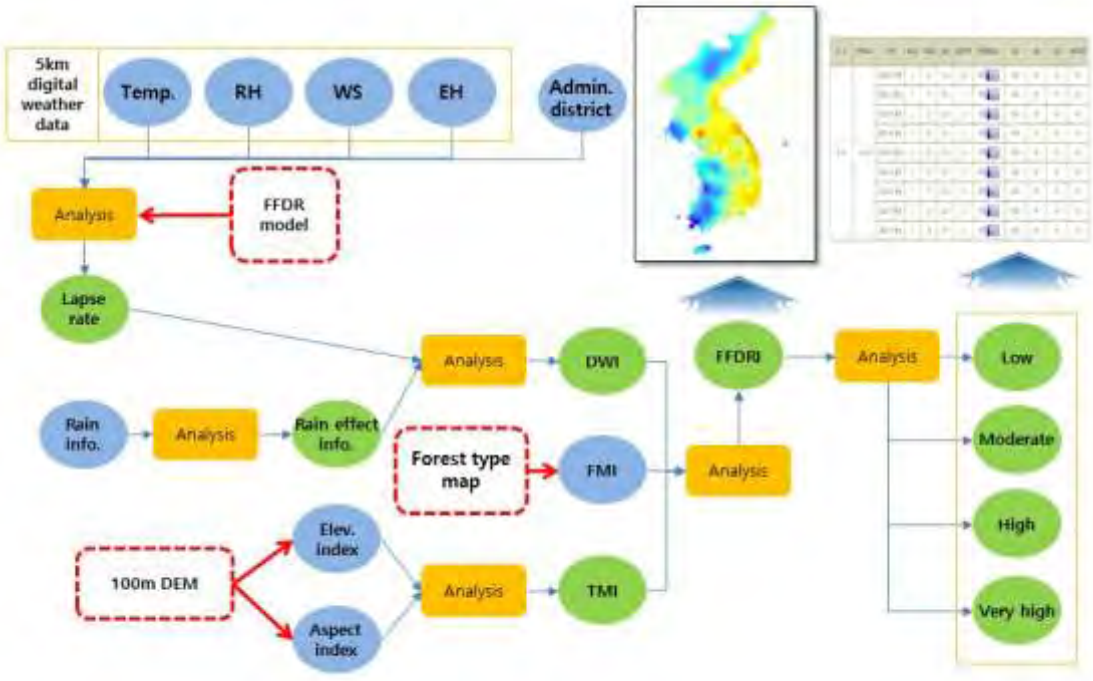
5 Verification of the statistical model by case study

➲ Development of forest fire danger rating system(FFDRS) in DPRK

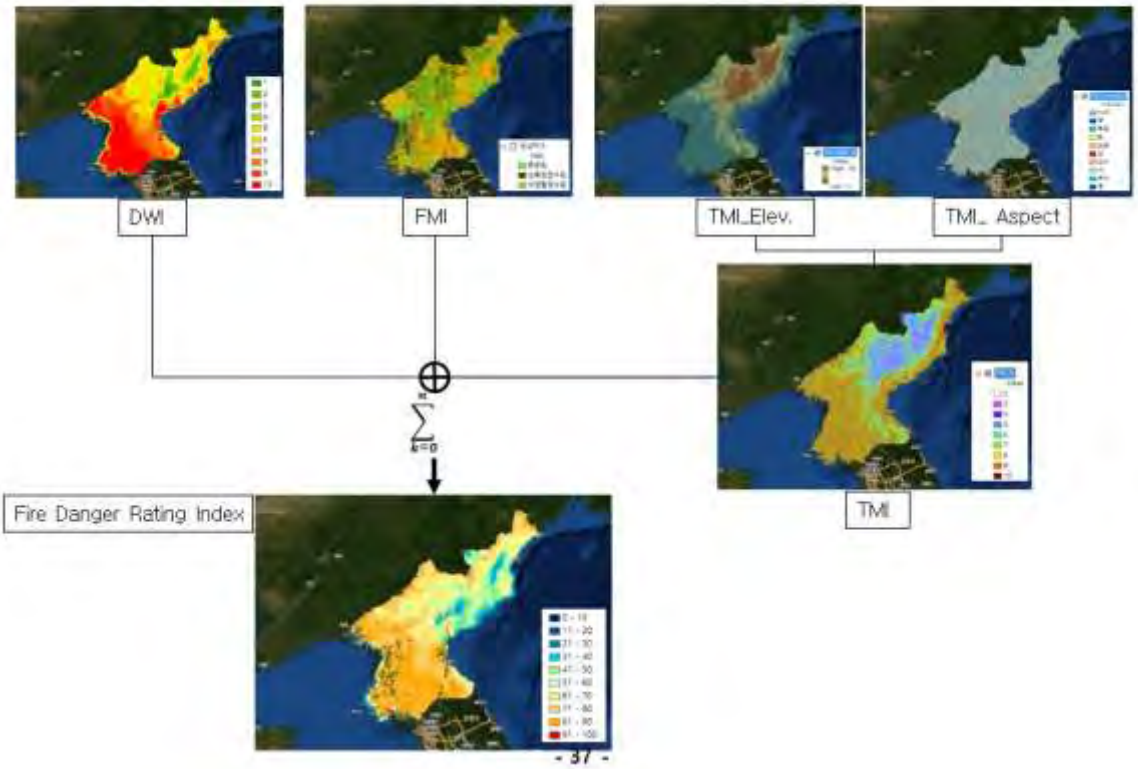
Real-time weather info. sharing system



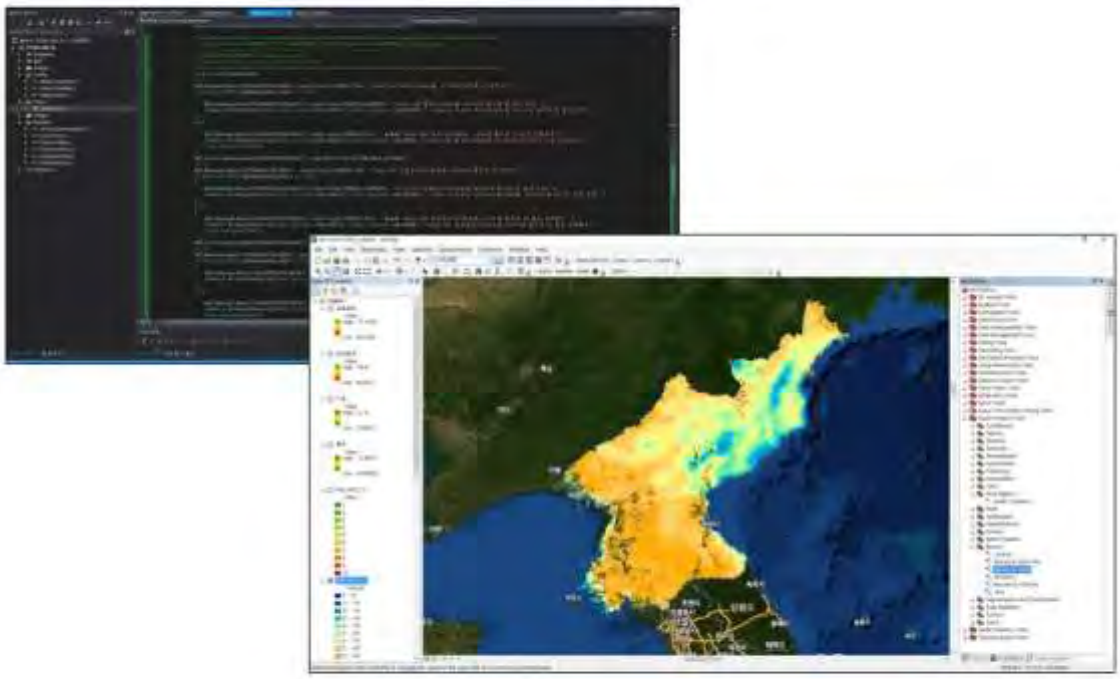
Analysis flow chart for processing FFDRI



Automation of FFDRI Process Model



Automation of FFDRI Process Model

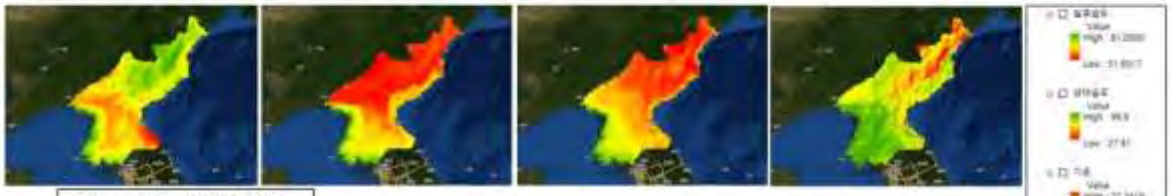


Simulation of actual FF case of statistical model (Case Study)

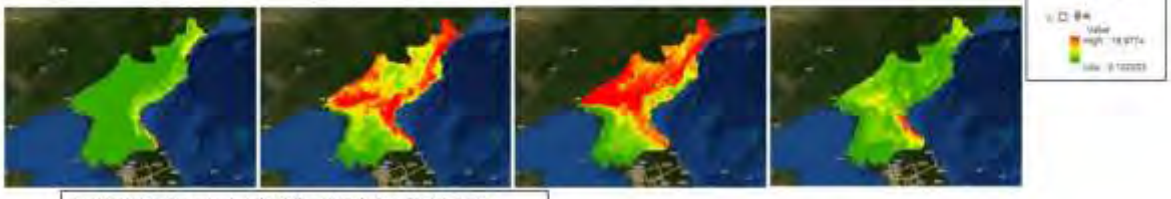
2014 yr	(MM)	3	4	5	6	7	8	9	Fires
(DD)	1	1	5	19					25
	2		15	4					19
	3			19					19
	4		1	3					4
	5	2							2
	6		9	21	1				31
	7		5						5
	8	1	6						7
	9		21						21
	10		3	5					8
	11		36			1			37
	12		9			1	1		11
	13		16			1		1	18
	14	1	8		1				10
	15	1	51						52
	16		29						29
	17		2	1					3
	18		27	2					29
	19	1	2						3
	20		6	4					10
	21	1	3						4
	22	4	26	3					33
	23	2	22	2					26
	24	2	28						30
	25		70						70
	26	6	1						7
	27	4	1	1					6
	28	6							6
	29		15	5					20
	30		7						7
	31			2					2
	Fires	32	424	91	2	3	1	1	554

Simulation of actual FF case of statistical model (Case Study)

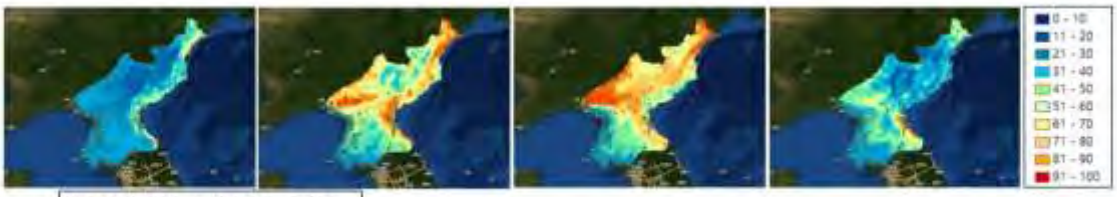
[April 15, 2017]



15hr, Temp./RH/EH/WS



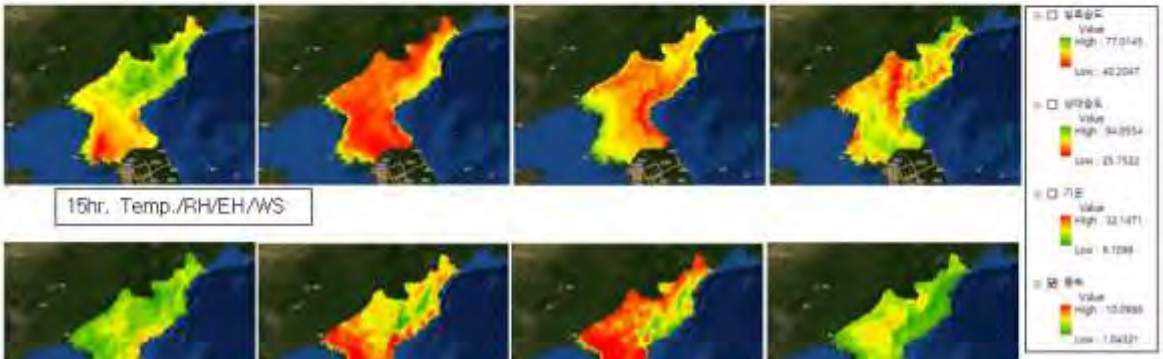
Daily Weather Index(DWI) 09hr/12hr/15hr/18hr



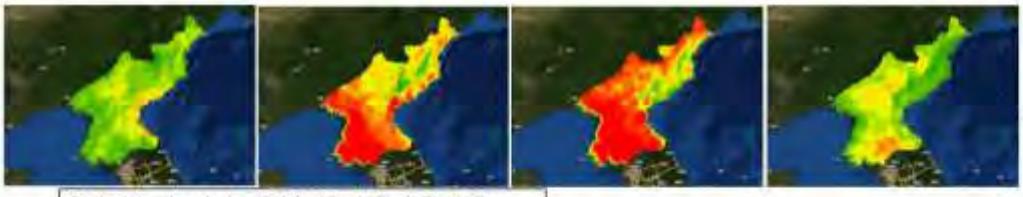
(FFDRI) 09hr/12hr/15hr/18hr

Simulation of actual FF case of statistical model (Case Study)

[April 25, 2017]



15hr, Temp./RH/EH/WS

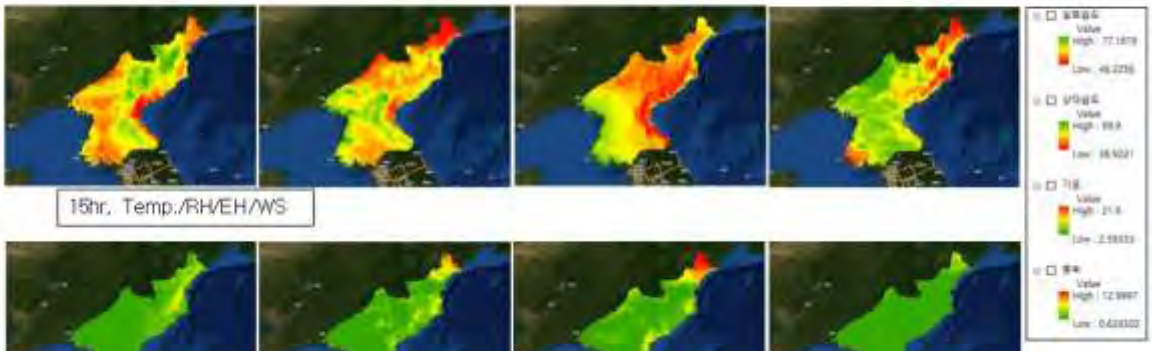


Daily Weather Index(DWI) 09hr/12hr/15hr/18hr

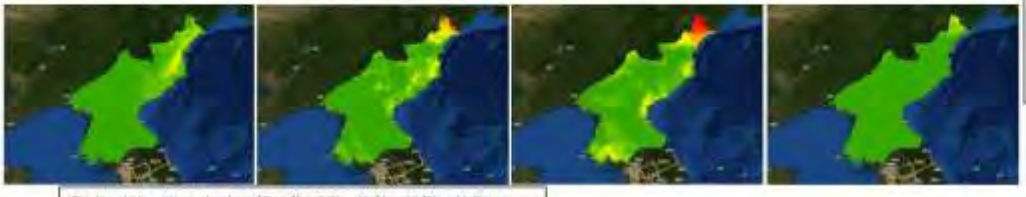
(FFDRI) 09hr/12hr/15hr/18hr

Simulation of actual FF case of statistical model (Case Study)

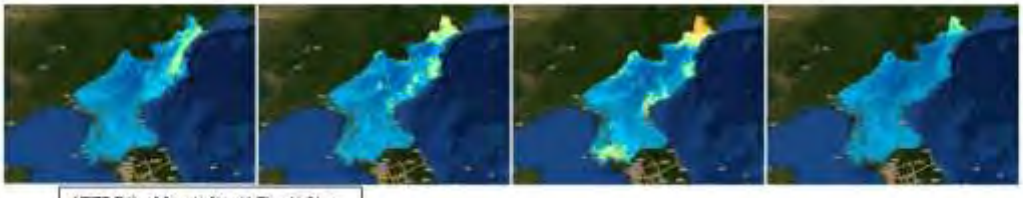
[April 27, 2017]



15hr, Temp./RH/EH/WS

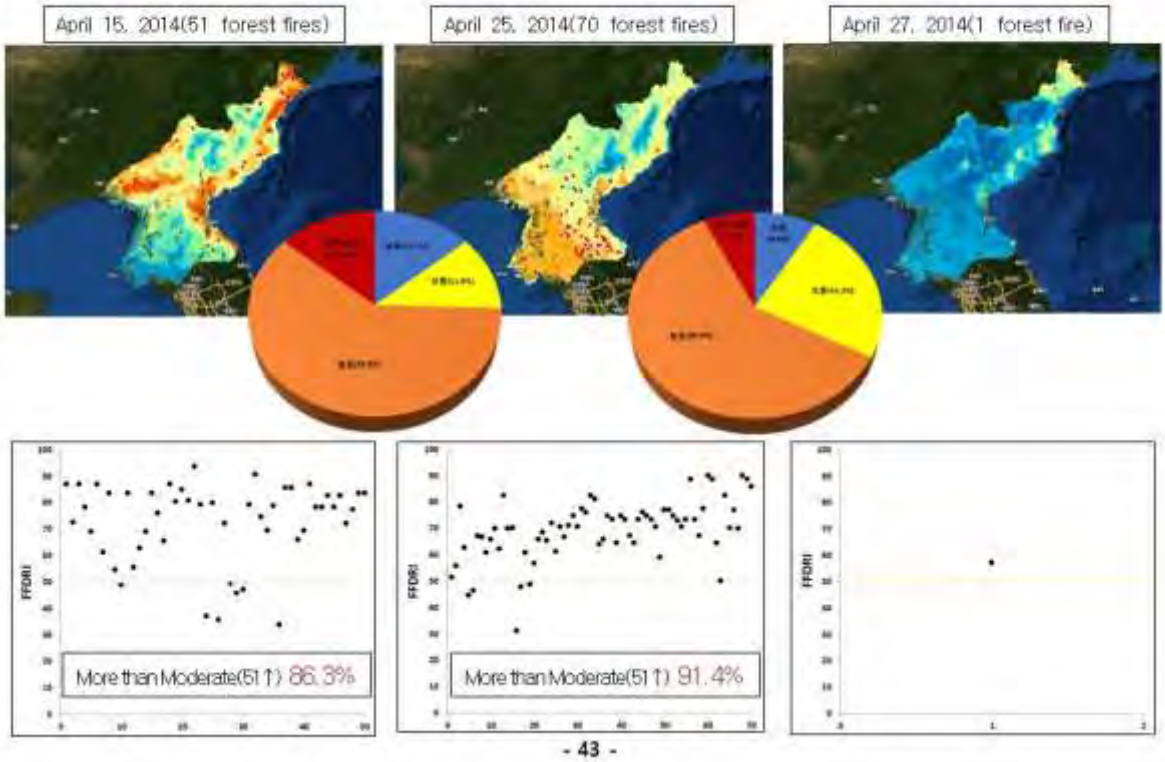


Daily Weather Index(DWI) 09hr/12hr/15hr/18hr



(FFDRI) 09hr/12hr/15hr/18hr

Simulation of actual FF case of statistical model (Case Study)



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Development of FFDRS in DPRK

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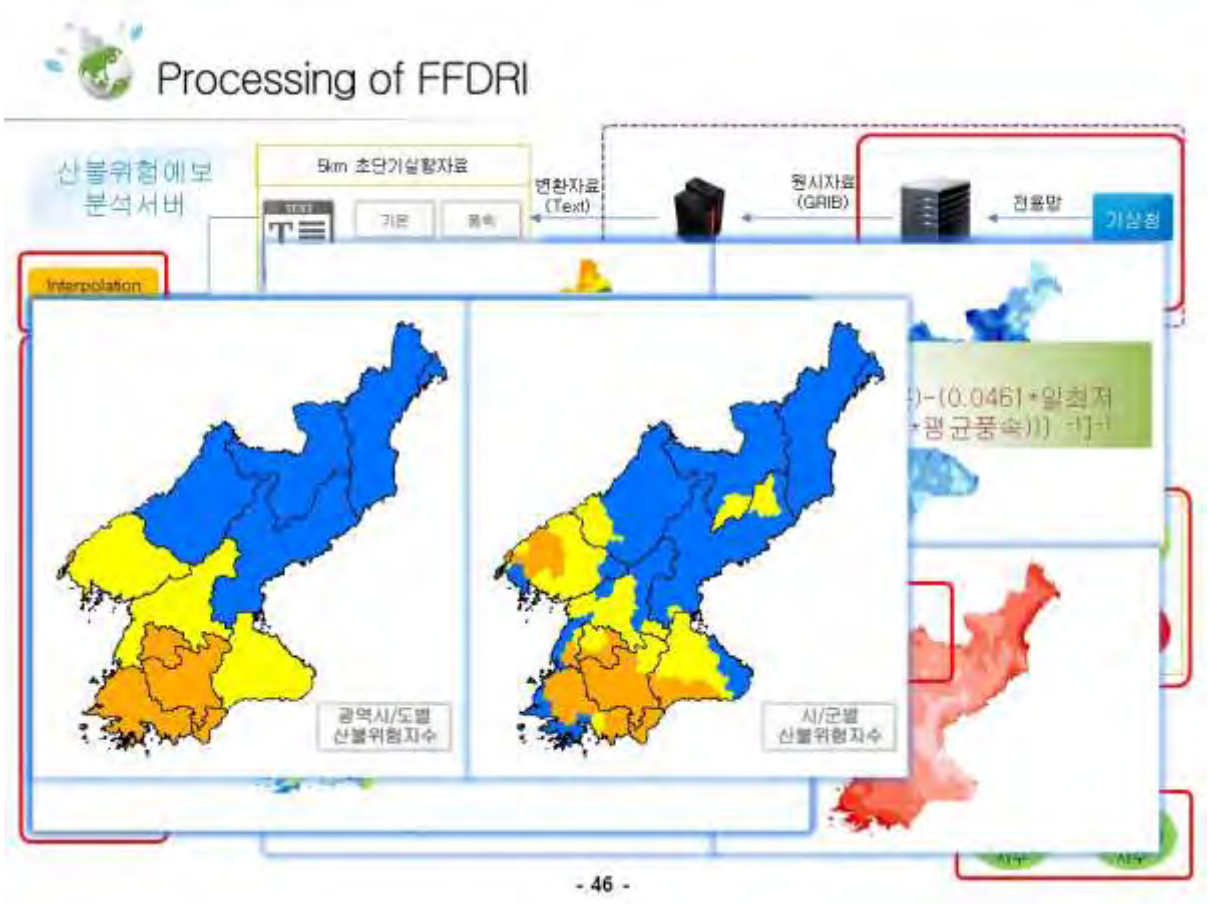
Processing of FFDRI
산불위험예보
분석서버
5km 초단기실황자료
변환자료
(Text)
원시자료
(GRIB)
전용망
기상청
Interpolation
광역시/도별
산불위험지수
시/군별
산불위험지수
- 46 -


Thank you for attention!

8) 중국과 조선의 산지생태계와 생태복원 및 향후 협력

Prof. Yonghuan Jin

Associate Professor, Institute of Applied Ecology, CAS

중국과 조선의 산지생태계와 생태복원 및 향후 협력

김영환
중국과학원 심양응용생태연구소
Email: jinyh@iae.ac.cn
Mb: +86-18640571232

발표순서

1. 중국과 조선의 산지와 산지생태계
2. 중, 조 양국의 산림자원
3. 중, 조 양국의 산지생태계복원의 노력
4. 결론 및 향후의 협력방향

1. 중국과 조선의 산지와 산지생태계

1.1 산지 특성과 산지생태계의 중요성

산 : 고도가 높고 경사도가 심하며 올라와 있는 3D 지형체

산지: 많은 산이 분포하는 지역, 산맥과 구분

속성:평원, 고원, 분지(구릉 포함)와 구별됨

1. 중국과 조선의 산지와 산지생태계

1.1 산지 특성과 산지생태계의 중요성

- **산지의 수직 이질성**

  급격한 환경변화과정와 고도의 이질적인 생태환경 보유

- **산지환경의 취약성**

  사면 환경의 약한 저항력, 쉽게 파괴됨

  산의 오르막과 내리막, 저지는 모두 외부에 대한 저항력이 약함

- **생태적 지위의 불포화성**

  산지 생태환경의 다양성으로 인한 생물생장 제한성, 일부는 불가능

산지-- 생물다양성이 높고, 특유생물종 분포
지구상의 생물다양성연구의 장소 및 보호 중점지역 분포

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1. 중국과 조선의 산지와 산지생태계

1. 중국과 조선의 산지와 산지생태계

1.2 중국의 산지 특성

- 면적비율: **2/3**차지
  (산지,구릉,고원포함)
  - 산지**33%**고원**26%**,
  - 구릉**10%**, 분지**29%**,
  - 평원**10%**
- 분포방향:
  - 동서방향
  - 남북방향
  - 북동-서남방향
  - 기타방향
- 생물종다양성:
  - 피자식물**3**만여종
  - 척추동물**6300**여종
  - 고유생물종 풍부

1. 중국과 조선의 산지와 산지생태계

1.3 조선반도의 산지특성

조선반도의 산지면적비율: **2/3**이상

조선반도의 산맥(산줄기)

- 남북방향: 백두산맥, 낭림산맥, 태백산맥, 경산산맥, 북수산맥, 연화산맥, 주월산맥
- 북동-남서방향: 광주산맥, 차령산맥, 소백산맥, 노령산맥,
- 북동북-서남서방향: 강남산맥, 적유령산맥, 부전령산맥, 언진산맥, 멸악산맥
- 북북동-남남서방향: 북대봉산맥, 아호비령 산맥, 마식령산맥,

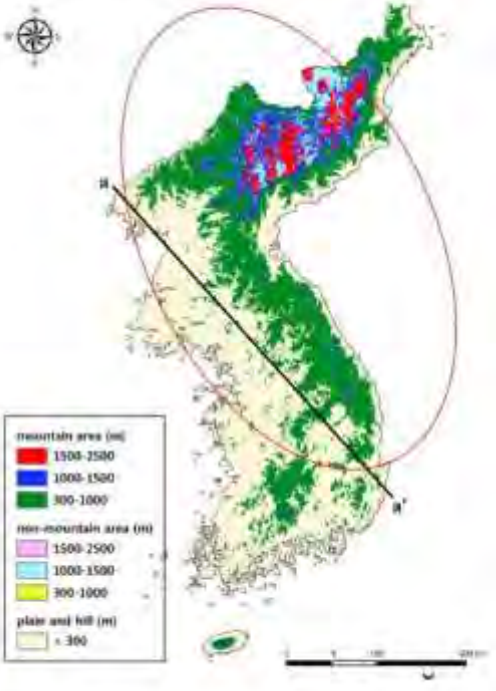
(공우석, 2006)

1. 중국과 조선의 산지와 산지생태계

1.3 조선반도의 산지특성

- 해발 **300m**이미만 평야와 구릉
  면적**120,899**km², 비율 **53%**
- 산지 **(Mt. region)**(기준: **300-2500m**)
  (경사와 고도자료에 근거**)**
  - 면적은 **95,416**km², 비율은 **42%**
  - **NK 51%, SK 31%**
- 산지의 분포:
  - 북동쪽**63%**, 남서쪽**16%**

(탁과 김, 2013**)**



1. 중국과 조선의 산지와 산림생태계

1.3 조선반도의 산지특성

- 반도의 지형분류
  - 산지 : 49%
  - 구릉 : 32%
  - 평야 : 19%

- 지형의 변화특성
  높은 산지는 북쪽과 동쪽에 서
  서쪽과 남쪽으로 가면서 낮아지는
  경향

(탁과 김, 2017)

조선반도의 지형분류도
(탁과 김, 2017)

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1. 중국과 조선의 산지와 산림생태계

1.3 조선반도의 산지 특성

북측지역

1) **개마고원,** 동부산악지대의 대부분 차지, 해발고도 1000m이상 준평원을 형성.

2) **동북지역,** 해발고도1500m이상산지의 90%가 분포.

3) 높은 산줄기는 남북으로 연결
   →**농경지**는 주로 서부지역에 분포
   →**동부지역** 경사 급함, 수력발전에 유리

4) 평균해발고도 400m이상지역은 52%

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1. 중국과 조선의 산지와 산림생태계

1.4 산지의 생태적 복원의 중요성과 필요성

- 생태계 구조의 파괴나 훼손
  - 생산자–식물과 임목수량 감소,
  - 소비자–야생동물 수량 감소,
  - 분해자–미생물 종류와 수량의 감소 및 기능부족,
  - 환경의 변화(광, 수분, 영양분, 공기, 토양 등)
- 생태계기능의 약화, 열악
  - 먹이사슬 약화, 물질순환과정 파괴, 안정성 저하

산사태나 홍수 등 자연재해 증가, **생산량** 감소

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1. 중국과 조선의 산지와 산림생태계

1.4 산지의 생태적 복원의 중요성과 필요성

훼손된 산지생태계의 생태복원

- 생태기능의 회복과 제고
- 생물다양성 증가
- 산지의 경제적수익 제고
- 산지주민의 안정된 생활공간

산지주민의 락원조성
지속가능한 발전유지
쾌락한 생활환경형성

2. 중, 조 양국의 산림자원

2.1 중국의 산림자원의 변화과정

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2. 중, 조 양국의 산림자원

2.2 중국의 산림자원과 산림생태계기능

중국의 산림자원

- 산림면적 : 2.08억ha
- 산림축적 : 151.37억m^3
- 산림피복율 : 21.63%
- 단위면적 축적 : 89.79m^3
- 산림생장량 : 4.23m^3/ha/년

중국의 산림생태계기능

- 산림식생의 탄소축적량 : 84.27억t
- 산림생태계 수자원함량 : 5807.09억m^3/년
- 산림생태계 토사고정량 : 81.91억t/년
- 산림생태계 오염물질 흡수량 : 0.38억t/년
- 산림생태계의 먼지제거기능 : 58.45억t/년

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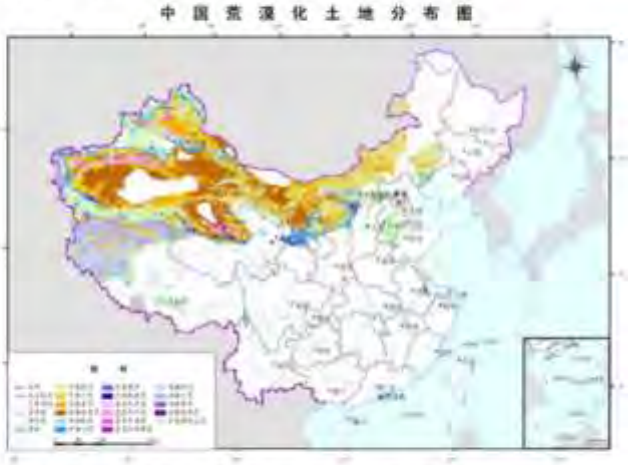
2. 중, 조 양국의 산림자원

2.3 중국의 산림자원과 황막화토지 분포

산림자원 분포도
(국가산림조사설계원, 2013)



황막사토지분포도(李育材, 2014)
(261.16만km², 국토면적비율27.2%)
(국가임가국, 2015)

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2. 중, 조 양국의 산림자원

2.4 조선 산림면적의 변화과정과 현황

- 1970년대 조선의 산림면적 985만ha
- 1997년 산림면적 755만ha(FAO)
- 2000년, 산림면적 821만ha(FAO)
- 1998년, 산림면적 753만ha(조선의 농업회복과 환경보호에 관한 원탁회의, 1998)
- 2006년 5월 국토환경성의 UNCCD제출보고서
  1990년 산림면적은 820만ha,
  2000-2005년, 893만ha

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2. 중, 조 양국의 산림자원

2.4 조선의 산림면적의 변화과정

1990년대 대비 2010년 산림감소비율(FAO, 2010)

3. 중, 조 양국의 산지생태계복원의 노력

3.1 중국의 노력

중국정부에서 추진하는 6대 중점 생태공정

- 천연림자원보호공정
- 퇴경환림환초공정
- "3북"북풍림 및 장강유역 등 중점방풍림체계 추진사업
- 북경천진 황사발생원 방지공정
- 야생동식물보호 및 자연보호구 건설공정
- 중점지역 속성용재림단지 조성사업

3. 중, 조 양국의 산지생태계복원의 노력

IAE

3.1 중국의 노력

중국의 천연림보호공정

단기목표(2000) 천연림내 임목벌채감소와 생태공익림사업추진등

중기목표(2010) 생태공익림사업추진과 천연림경영목표의 변화추진 등

장기목표(2050) 천연림자원의 회복과 주로 인공림을 통한 임목공급 등

목적:

천연림자원보호와 회복을 중심으로

(1) 천연림의 생태기능 제고 (2) 산간지역경제 발전 추진

추진과정에서

천연림의 목재생산 → 산림자원 보육

보호와 동시 + 임내 자원의 합리적인 이용

산림경영과 관리체제의 개혁

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3. 중, 조 양국의 산지생태계복원의 노력

IAE

중국의 천연림보호공정

추진범위

서남, 서북,
동북지역 및
해남성, 하남성
포함한 18개 성

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3. 중, 조 양국의 산지생태계복원의 노력

IAE

중국의 퇴경환림환초공정

- 1999년, 사천성, 섬서성, 감숙성 3개 성에서 시범 추진
- 2003년, 국무원 "퇴경환림조례" 실시, 사업의 전면 추진
  사업의 범위 : 25개 성과 신강건설변둔, 1987개 현
- **2010년까지 퇴경환림 조림1467만ha, 황산황무지조림1733만ha**
- 퇴경환림후의 도급경영 기한 : 산림회복후 70년까지 연장이 가능
- 2012년, 계속 실시하기로 결정(지역에 따라 실시상황이 다름)
- 2014-2016년, 사업 실시한 면적 3010만무(200만ha정도)
- 2017년의 사업 임무, 1230만무(82만ha)를 대상으로 실시
- **2017년 결정, 2기 퇴경환림의 총 면적 8000만무(520만ha)로 확대**

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3. 중, 조 양국의 산지생태계복원의 노력

IAE

중국의 퇴경환림환초공정

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3. 중, 조 양국의 산지생태계복원의 노력

3.2 조선의 노력

산림 조성계획의 수립과 행동

- ✓ 산림 조성 10년 계획(2001~2010) 수립
- ✓ 김정은 국방위원회 위원장은 당, 국가경제기관, 근로단체 책임일꾼들과의 담회에서 10년 안에 벌거숭이 산을 모두 수림화 하겠다는 의지를 천명('12.5.9)
- ✓ 토지관리와 보호사업, 간석지 개간, 토지정리사업, 산림조성과 보호관리사업을 통한 수림화·원림화, 물관리사업, 도로의 현대화·중량화·고속화, 수산자원 보호사업, 환경보호 및 자연보호 관리사업 등을 강조
- ✓ 2023년까지 656억그루 조림계획 수립

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3. 중, 조 양국의 산지생태계복원의 노력

3.2 조선의 노력

산림 조성계획의 수립과 행동

- **김정일 국방위원장의 특별지시, 전국의 수림화, 원림화**
- **김정은 국방위원장, 나무심기행동 참가**
  - ✓ 김정은 국방위원장, 기념식수를 위해 미리 구덩이를 파 놓은 것을 보고 나무심기를 제대로 하기 위해서는 구덩이 파는 것부터 해야 한다고 하며 직접 구덩이를 파고 나무를 심었음.

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3. 중, 조 양국의 산지생태계복원의 노력

3.2 조선의 노력

주체101(2012)년 5월 6일 로동신문

김정은, 4. 27, 2012. "로동신문"

김 정 은

사회주의강성국가건설의 요구에 맞게 국토관리
사업에서 혁명적전환을 가져올데 대하여

당,국가경제기관,근로단체 책임일군들과 한 담화

주체101(2012)년 4월 27일

그런데 지금 산림조성과 보호관리사업이 제대로 진행되지 못하고있습니다. 해마다 봄, 가을철에 나무를 많이 심고있지만 나라의 산림실태는 결코 개선되지 않고있습니다. 지금 우리 나라에는 벌거숭이가 된 산들이 많습니다. 지방들에 나가보면 《산림애호》, 《청년림》, 《소년단림》이라고 새로운 산들가운데도 나무가 거의 없는 산들이 적지 않습니다. 나무를 많이 심고 산림을 보호하기 위한 전당적, 전국가적인 대책을 세워야 합니다.

산림조성과 보호관리사업을 근본적으로 혁신하여 10 년안으로 벌거숭이산들을 모두 수림화하여야 하겠습니다. 이것은 우리 당의 확고한 결심이며 의지입니다.

3. 중, 조 양국의 산지생태계복원의 노력

3.2 조선의 노력

김정은위원장의 로작

1) 10년안으로 벌거숭이산들을 수림화-당의 확고한 결심이며 의지

2) 산림조성사업은 장기성을 띠는 사업인것만큼 전망성있게 계획적으로 조직진행하여야 한다

3) 산림조성사업은 산림의 현실태와 지대적특성, 현실적조건을 과학적으로 타산한데 기초하여 년차별계획과 전망계획을 명백히 세우고 어김없이 집행

4) 산림조성사업은 경제건설과 인민생활향상에 쓸모있는 나무들로 목재림, 기름나무림, 산과실림, 밤나무림, 팔프 및 종이원료림을 조성하는 방법으로 하여야 한다

3. 중, 조 양국의 산지생태계복원의 노력

3.2 조선의 노력

김정은위원장의 로작

5) 중앙과 지방들에서 양묘장들을 잘 꾸리고 나무모생산을 과학화, 공업화, 집약화하여야 한다

6) 스트로브스소나무와 창성이깔나무 등 속성수 묘목을 많이 생산

7) 적지적수의 원칙에서 나무심기를 하고, 바늘잎나무와 넓은잎나무를 배합하여 심어야 한다

8) 나무심기를 질적으로 하고 심은 나무에 대한 비배관리를 잘하여 나무의 사름률을 결정적으로 제고해야 한다

9) 산림조성과 함께 산림보호관리사업에 큰 힘을 넣어야 한다

10) 인민들의 땔감문제를 결정적으로 해결하여야 한다

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

나선지역으로 낙엽송묘목지원
묘목 운반을위한준비작업
(2003.4.20)(1차)

나선시 산지에 식재된낙엽송 묘목
(2004.4.)

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

2차로 나선시 지역에 지원, 운송된 낙엽송묘목 (2004.4)

나선시 지역에서 낙엽송묘목을 식재하는 과정 (2004.4)

낙엽송 묘목의 원산지(중국 연변)
라선시에서 일군을 동원하여 묘목을 식재 (2004.4)

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

중국과학원 심양생태연구소에서 지원한 4배체아카시아림 (2004년 지원)

4배체아카시아
(2005. 9)

4배체아카시아
(2006. 9)

중-조 과학원
친선림 (2014.6)

3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

중국과학원 심양생태연구소에서 지원한 자동기상관측장비

조선국가과학원 식물학연구소 상원시험장에
설치된 자동기상 관측장비
(meteorological instruments)
(2009년에 지원)

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

국제학술회의와 상호방문 등 다양한 형식을 통한 교류

회의주제: International Symposium on Ecological Conservation and Sustainable Development of Forest Resources in Northeast Asia

주최: 중국과학원
심양응용생태연구소

장소: 중국 연길
날자 : 2005.8. 24-27

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3. 중, 조 양국의 산지생태계복원의 노력

국제학술회의와 상호방문 등 다양한 형식을 통한 교류

회의주제 :

동북아시아 훼손된 산림생태계 복원과 지속가능한 산림경영 심포지엄

주최: 중국과학원 심양응용생태연구소, IUFRO

날자 : 2007.11.18-21

장소: 중국 심양

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3. 중, 조 양국의 산지생태계복원의 노력

공동주제 학술세미나

훼손된 산지생태계의 생태적 복원에 관한 중-조 공동세미나 개최

주최 : 중국과학원심양응용생태연구소

날자 : 2012.11.12-11.27 장소 : 중국 심양

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3. 중, 조 양국의 산지생태계복원의 노력

공동주제 학술세미나

훼손된 산지생태계의 생태적 복원에 관한 중-조 공동세미나

공동세미나 의제

- 산지생태계의 복잡성과 생물다양성
- 산지 산림생태계의 건강과 지속가능한경영
- 조림과 산지생태계 복원
- 산지 훼손 임지의 복구와 생물다양성보호
- 양묘장 구축과 훼손된 산지의 생태적 복구

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

조선의 학자들을 심양(IAE)으로 초청, 교류

심양응용생태연구소에서 초청한 조선과학원 식물학연구소의 연구자 (2006, 5)

조선과학원 대표단, 중국과학원의 초청으로 심양방문(2011, 11)

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3. 중, 조 양국의 산지생태계복원의 노력

3.3 중, 조 양국의 협력과 실천

중국과학원대표단의 조선방문과 교류

중국과학원 대표단, 조선국가과학원의 초청으로 평양방문(2010, 7)

중국과학원 대표단, 조선국가과학원의 초청으로 평양방문(2014, 6)

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3. 중, 조 양국의 산지생태계복원의 노력

조선 국토성, 임업분야 연수단 중국으로 파견

2011.11. 국토성 종자, 양묘, 양묘장 등 분야 "조선의 조림과 묘포장 연수단", 중국 심양 방문, 및 7일간의 관련 분야 연수

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3. 중, 조 양국의 산지생태계복원의 노력

심양응용생태연구소(IAE)에서 Northeast Asia Eco-Forum 개최

조선의 관련분야 학자들을 초청, 중국의 국내외학자들과 학술교류

생태포럼 주제

- The 1st forum: Ecosystem health and regional sustainable development (2009, Shenyang),
- The 2nd forum: Low carbon society (2010, Shenyang)
- The 3rd forum: Sustainable development and regional ecological security (2011, Shenyang)

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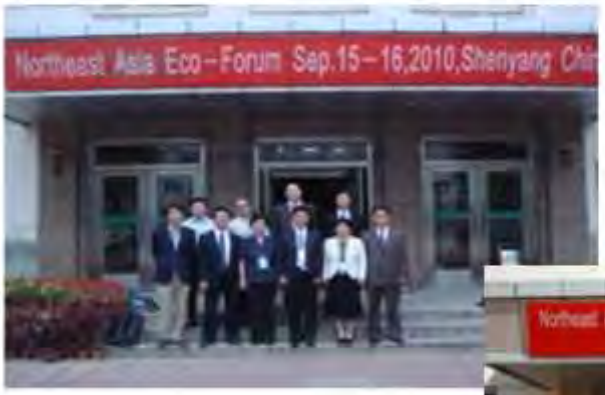
3. 중, 조 양국의 산지생태계복원의 노력



제2회 동북아생태포럼(2010),
조선과학원 대표단 4명참석,
3명발표

제3회 동북아생태포럼(2011),
조선과학원 대표단 6명참석,
4명발표

4. 결론 및 향후의 협력방향

1. 지금까지 추진한 다양한 협력과정을 소중히 여기고 앞으로도 지속적인 협력, 교류가 중요

2. 향후 양국, 다국간의 국제적인 다양한 협력과 교류의 확대 필요

3. 협력을 통해 상호간의 경험을 교류, 성과의 공유를 추진

4. 훼손된 산지생태계 생태복원시범지 조성사업의 중요성

- 시범지를 조성하고 장기적인 생태환경 모니터링을 구축
- 장기적인 모니터링결과를 통해 연구성과 도출
- 생태복원 시범지 성과의 보급

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금수강산은 황금보배산

황금보배산도 수요하지만 금수강산이 더더욱 중요하고 필요합니다

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9) Forest Restoration Campaign in DPR Korea

Mr. Kwang Nam Hwang

Senior Officer of Science and Technology Department,
General Bureau of Forestry, MoLEP

1. Understanding of forest restoration campaign

1) Importance

— Covered forest in about 80% of whole territory

— Precious resource and properties to be handed over to next generation

— Key role in development of economy and livelihood

— Contribution to climate change mitigation and supply clan ecoenvironment

3) Concept of forest restoration campaign

To transform all the mountains into "treasure mountains", into "gold mountains" within ten years as the President Kim Il Sung and the Chairman Kim Jong Il had intented

2. Forest status before starting the restoration campaign

Due to overcutting non-wood land was increased into 20% from 1990s to 2010 compared with one in 1970s

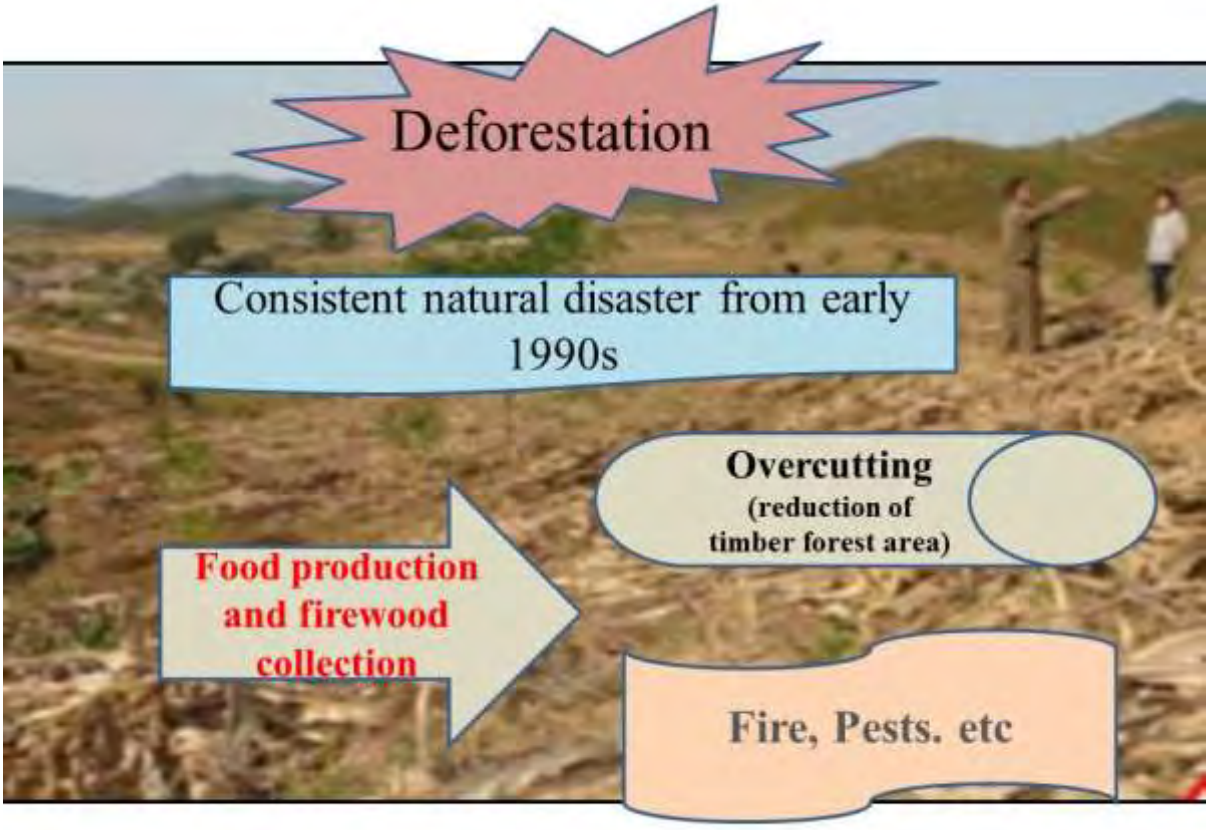
Increased

20%

— Lowering water storage function

— Increasing soil loss

Comparing to 1970s, loss of water source was increased by 7 times when having 1000mm of annual mean precipitation, and severe soil loss is also apparent.



2) Impact

- **Inflicted to economic development and livelihood improvement including coal and paper production firewood supply and others.**
- **Washed away soil and sand from forest land to low land including rivers and streams, reservoir, railway and road, community and arable land in rainy season , and damage from flood and landslide.**
- **Embedded arable land due to flood and landslide to reduce the farming area**
- **Dried up river and inflicted to economic construction and livelihood improvement through electric production, irrigation.**

3. Forest Restoration Campaign

1) Necceesity

— To make all the mountains into green

— To protect forest from different damage

To restore degraded sloping land in a short period

— To prevent climate change and response to risk of natural disaster

2) Objectives

- **To transform all mountains in the country into "treasure mountains", into "gold mountains"**

Forest restoration campaign is a war to ameliorate nature.

All the people mobilize in forest restoration campaign.

3) Long term plan and stepwise plan

Long-term plan: (2015~2024)

To improve forest in a sustainable way by restoring degraded forest immediately and transforming into "treasure" and "gold"ones.

Stepwise plan:

To prepare material base for economic and people's livelihood development by conducting afforestation to make all the mountains into green and conservation work of already planted forests.

Stepwise tasks

— 1st step task (2015~2017)

To strengthen seedling production capacity and finish tree planting in bared mountains of important area

— 2nd step task(2018~2024)

To make all the mountains into green by maintaining survival rate of planted trees into over 90% and preventing forest fire and pest while reducing level of timber consumption.

Further vision

All mountains into "treasure" and "gold" ones


Thank You!

10) Introducing Status and Prospect of Agroforestry Management in DPRK

Mr. Song Hwan Ryom

Senior Officer of Afforestation Department,
General Bureau of Forestry, MoLEP

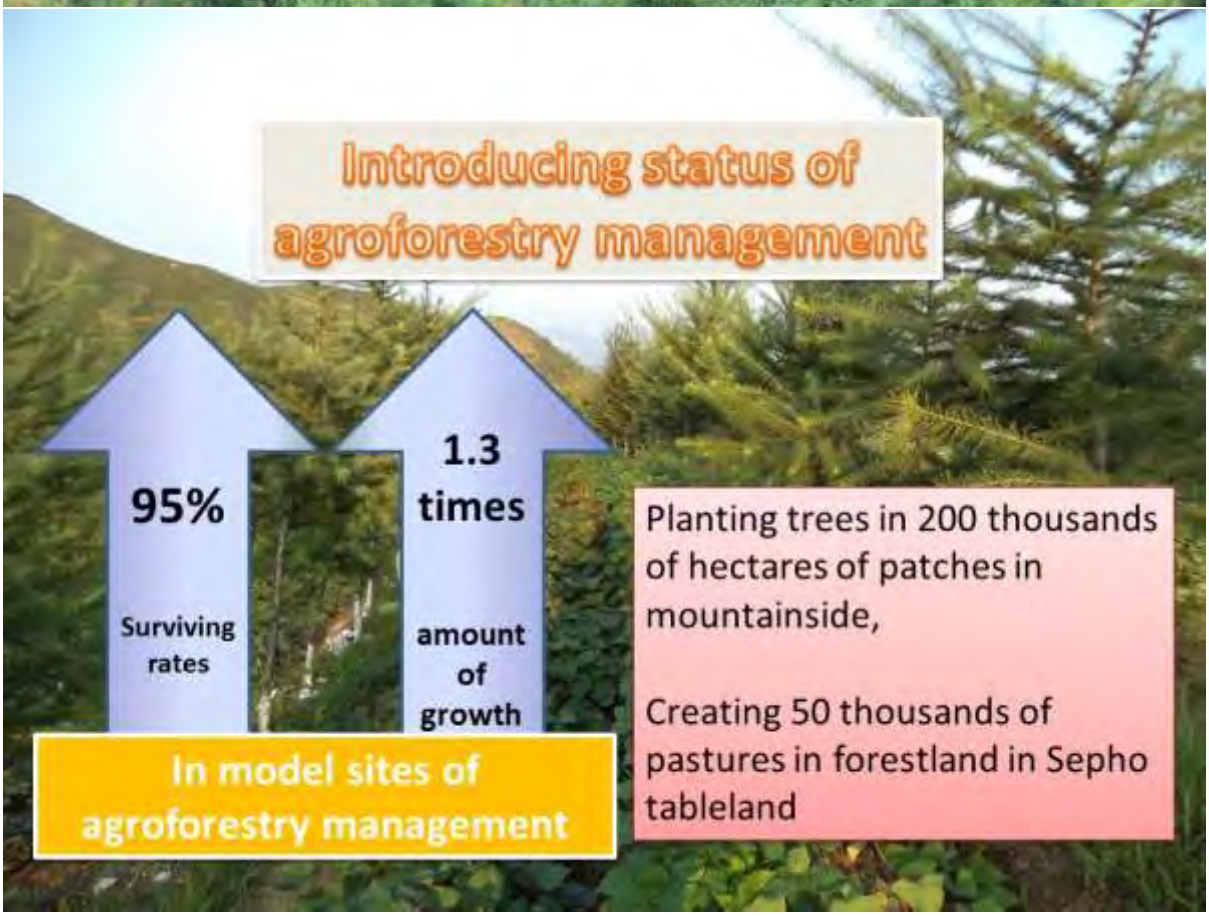

Introducing status and prospect of agroforestry management in DPRK
Jungsan County,
South Phyongan Province
Suan County
North Hwanghae Province
Yonthan County
North Hwanghae Province


Needs of introducing agroforestry
Decrease of agricultural yield by abnormal climate change
Limited arable land
the least area in worldwide: 280phyong
180 phyong in DPRK
Destruction of forest ecosystem by fire and interference
needs
20 ~40˚steep area:
400 thousands of hectares of patches in mountainside,
50~60㎥/㏊,yr
5~6mm/㏊,yr
Decrease of production of medicinal and edible herbs
Since 1990s


Actively introducing as economic strategy since 2013
Governmental measures
《DPRK Law on Forest》 revised and enlarged, April 2013
《Rules of Agroforestry Management》 adopted, May 2013
Organization of Non-permanent central agroforestry management committee, March 2013
Begin of lectures on agroforestry management in agricultural universities in nationwide since 2013
Organization of special research unit in academy of forestry and also academy of agriculture in 2014
Organization of Korean agroforestry management technical association under the general union of Korean sci-tech

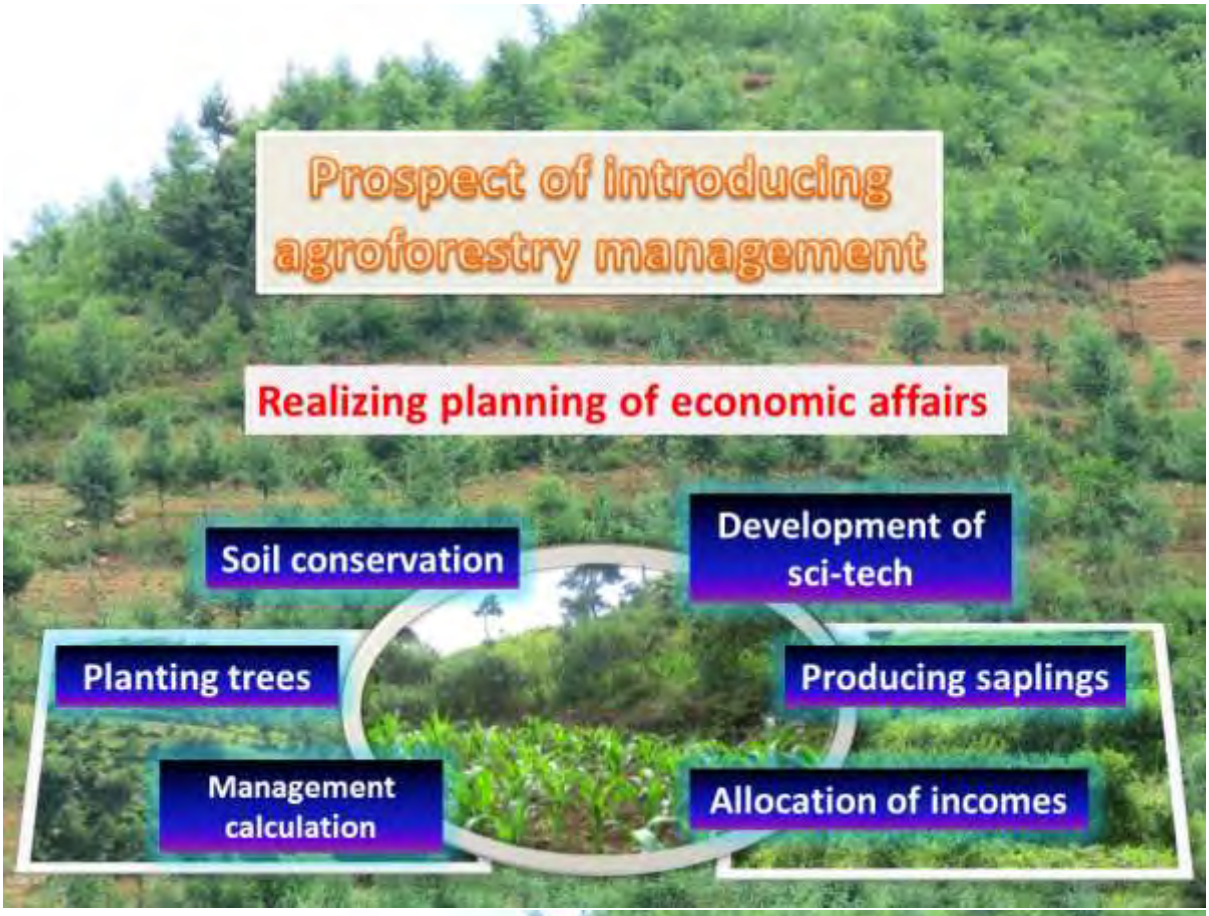

Methods of agroforestry
tree + crops(corn, bean, sweet potato…)
tree + herb(medicinal & edible herb, fodder…)
tree + tree(shrubs, fruit…)
Improvement of ecological environment,
Solving food, raw material for industry & foodstuffs

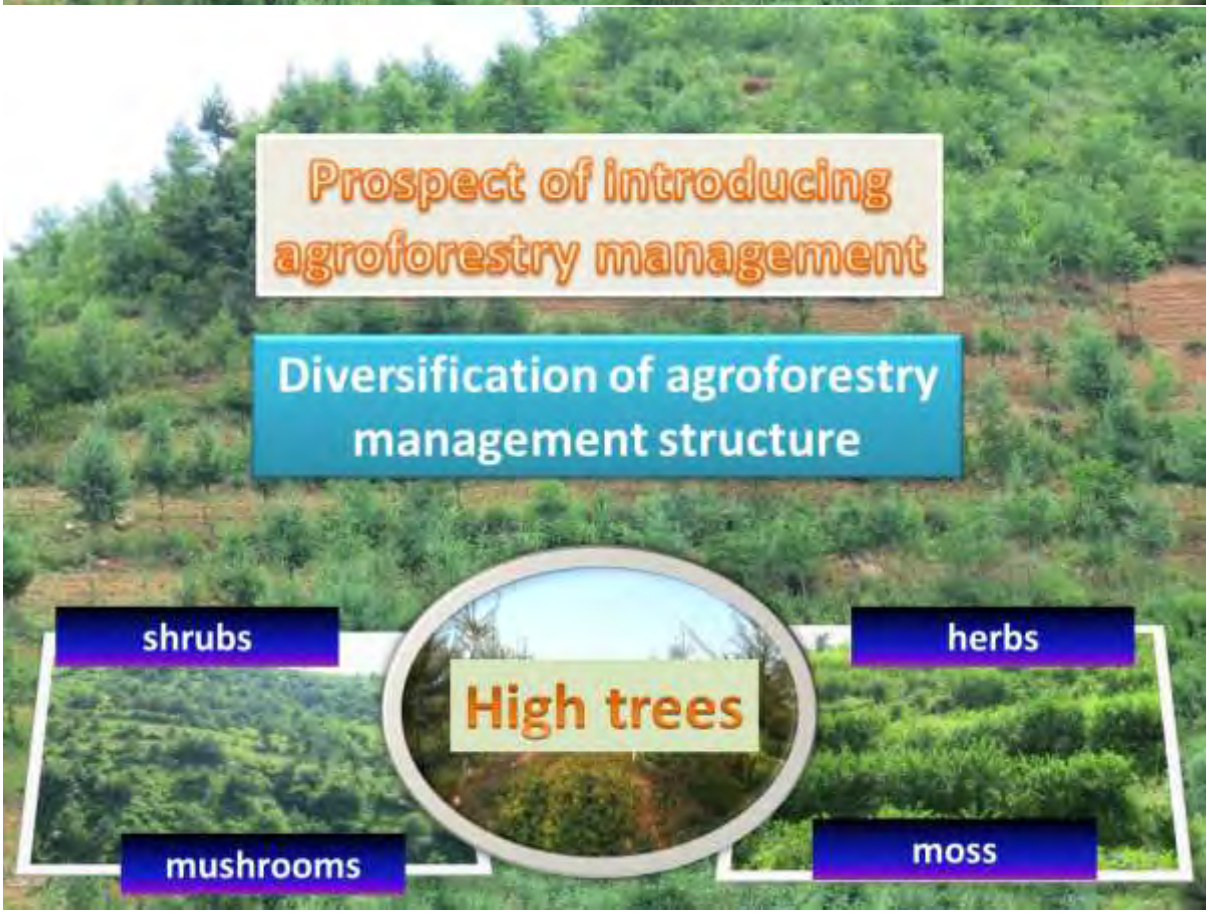

Introducing status of agroforestry management
Agroforestry sites: about 200 thousand
Suan County North Hwanghae Province
Yonthan County North Hwanghae Province
Sunchon City South Phyongan Province
Create model units
Generalization in nationwide


Introducing status of agroforestry management
95%
Surviving rates
1.3 times
amount of growth
In model sites of agroforestry management
Planting trees in 200 thousands of hectares of patches in mountainside,
Creating 50 thousands of pastures in forestland in Sepho tableland


Cooperation and exchanges
FAO
SDC
Other international organizations
Management of agroforestry, integrative watershed, natural disaster risk
Mitigation of climate change, sustainable management of lands and forests


Experiences and lessons
Capacity building of technicians and experts
Strengthening of scientific research
Providing seeds and saplings
Conservation of lands and soil
Establishing of monitoring and assessment system for development of agroforestry


Prospect of introducing agroforestry management
Realizing planning of economic affairs
Soil conservation
Development of sci-tech
Planting trees
Producing saplings
Management calculation
Allocation of incomes


Prospect of introducing agroforestry management
Diversification of agroforestry management structure
shrubs
herbs
High trees
mushrooms
moss

Prospect of introducing agroforestry management

- Providing protection of eco-environment and sustainability
- Development and use of organic manure, bio-pest/herbcides and microbe corresponding with the forest ecosystem
- Elevation of recycle speed of nutritive substance & efficiency
- Formation of perfect biodiversity structure

Prospect of introducing agroforestry management

Strengthening of sci-tech for agroforestry methods
Improvement and strengthening of governmental guidance and management
Enhancement of producers ' creativity
Governmental provides

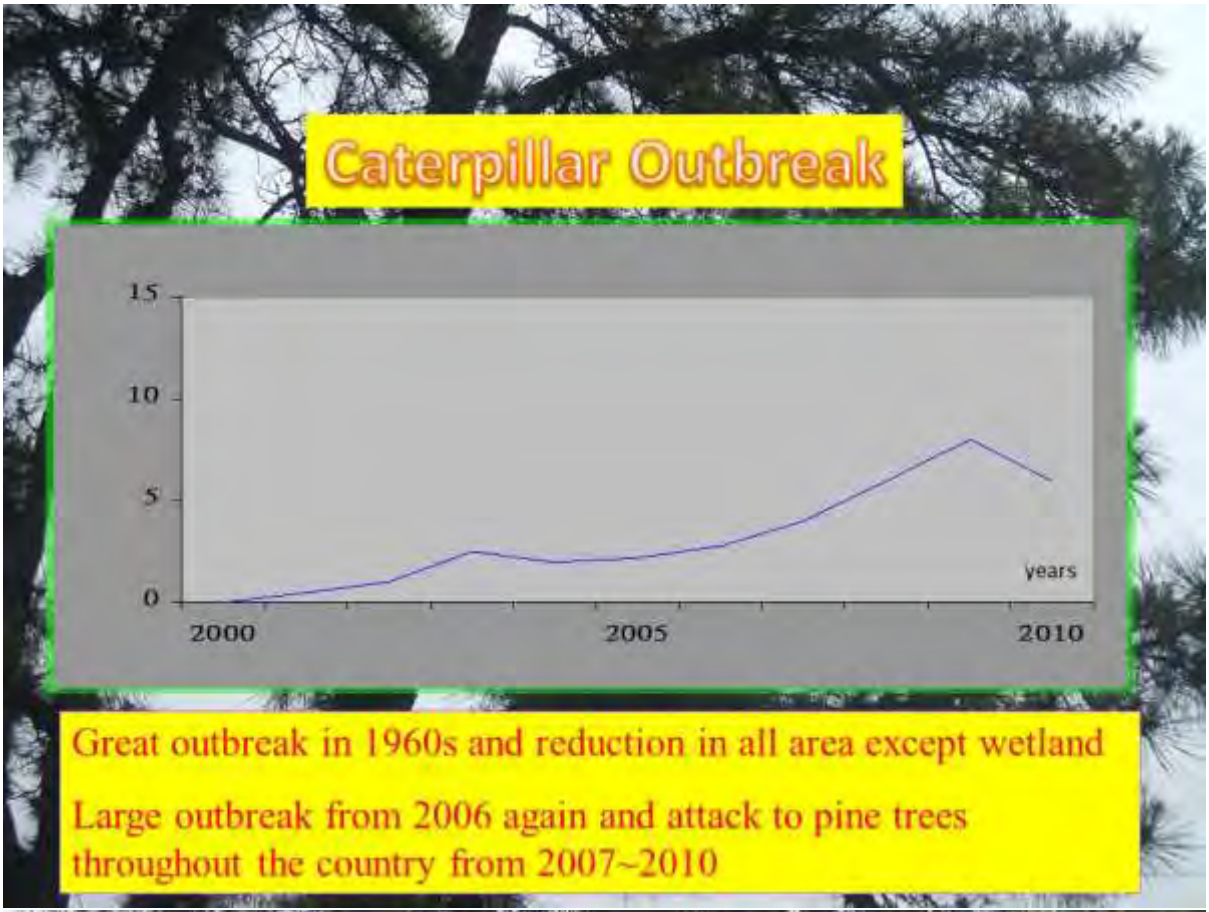
Realizing greening & gardening, Preservation of ecological environment, Sustainable development of economy

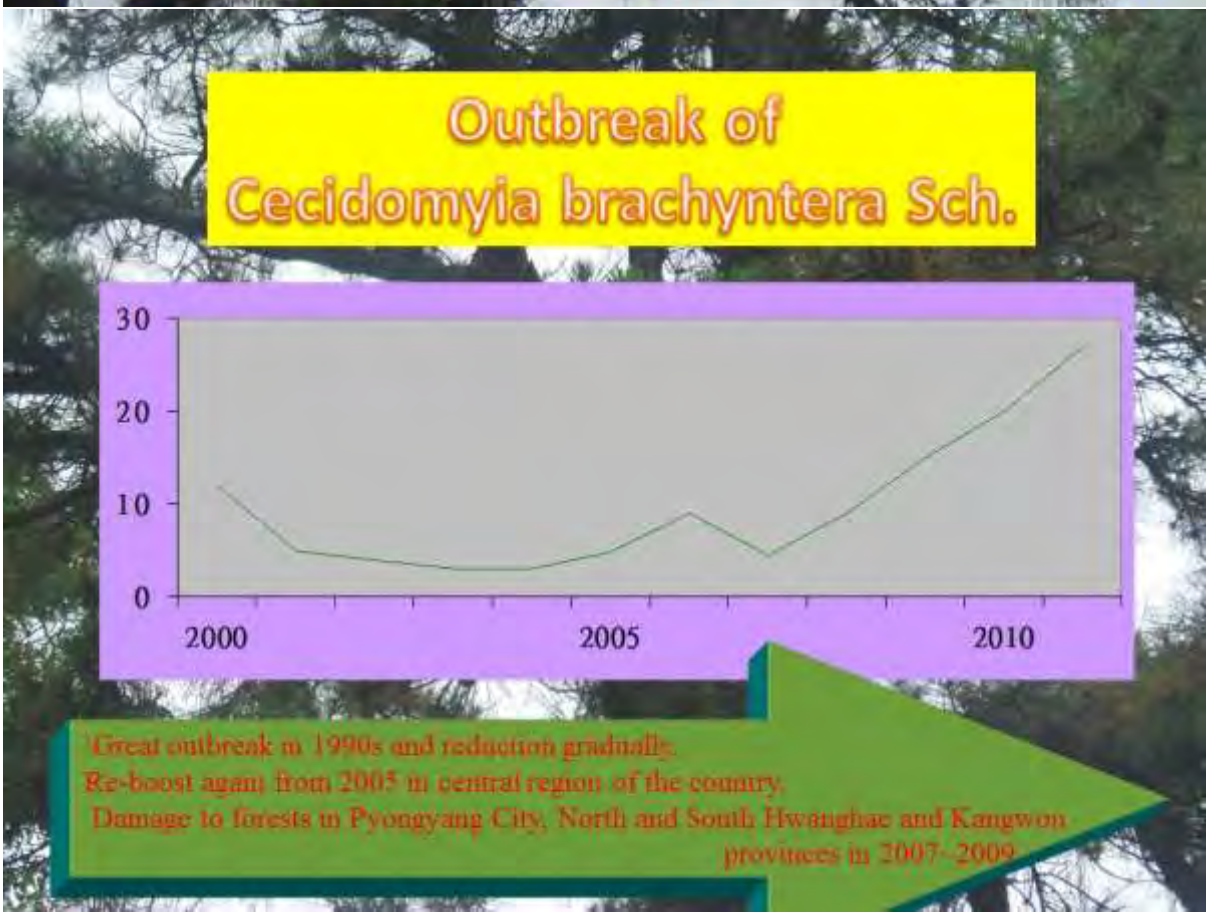
11) Main Forest Pests and Control Measures in DPR Korea

Mr. Yong Il Pak

Director of Forest Breeding Research Institute,
Academy of Forest Sciences

Main forest pests and control measures in DPR Korea


Caterpillar Outbreak
15
10
5
0
years
2000
2005
2010
Great outbreak in 1960s and reduction in all area except wetland
Large outbreak from 2006 again and attack to pine trees throughout the country from 2007~2010


Outbreak of Cecidomyia brachyntera Sch.
30
20
10
0
2000
2005
2010
Great outbreak in 1990s and reduction gradually.
Re-boost again from 2005 in central region of the country.
Damage to forests in Pyongyang City, North and South Hwanghae and Kangwon provinces in 2007~2009

Outbreak of pine Lecerya purchasi Maskell

Outbreak in Amnok River area of N. Phyongan Province for 10 years from 2000 and continue in long term

Outbreak of larch woolly-bear

Outbreak from 2010 in the area of Mt. Paektu of Ryanggang Province

Damage to Larix olgeinsis, Picea koraiences, Abies nephlorepis, Picea jezoensis

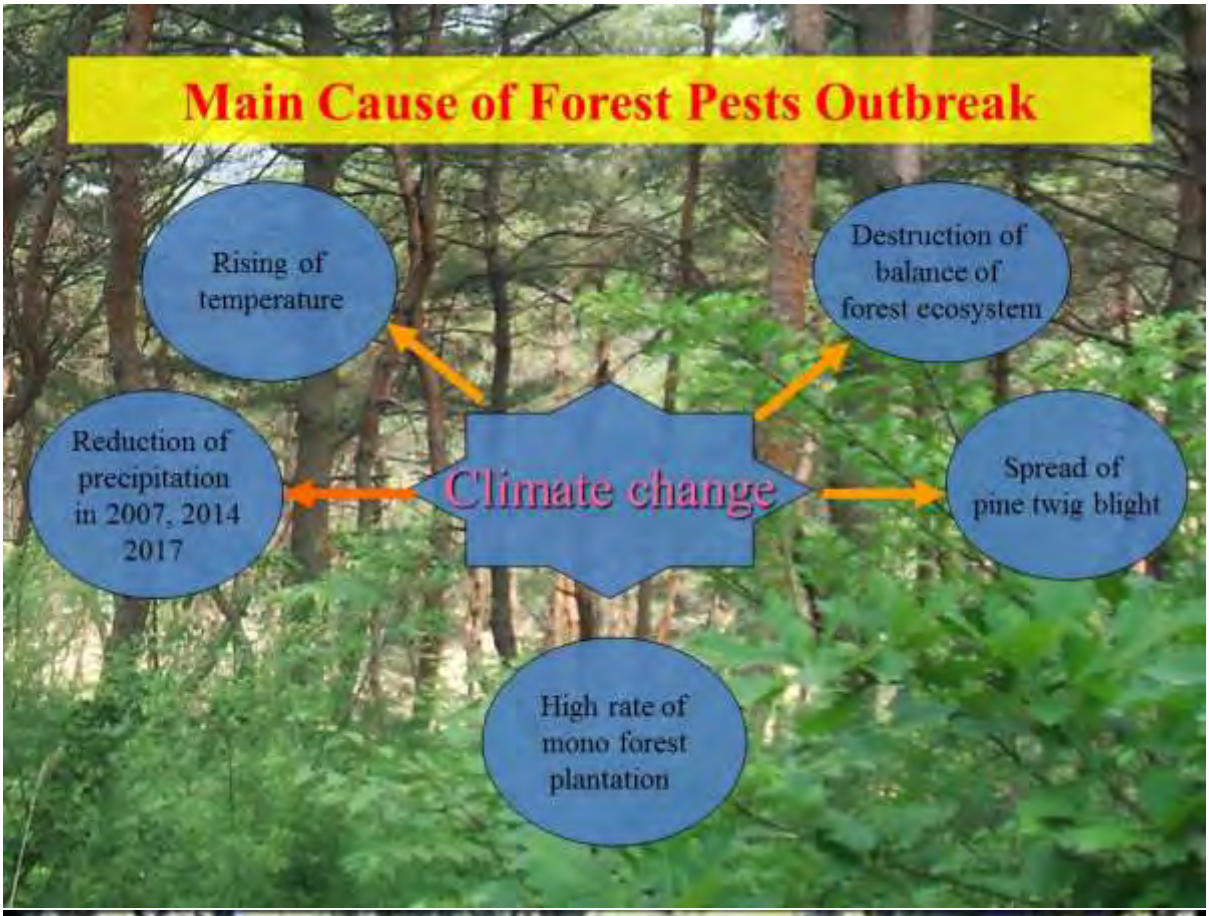
Great outbreak in 2012 and big damage to 2015

Outbreak of Acantholyda Sp.

Outbreak in south area of central region from 2005,
Spread in S. Hamgyong and N. Phyongan provinces

Main forest disease

Outbreak from 2007
Spread gradually in all forests of pine and pine nut trees of south area in 2015
Outbreak of 소나무락엽병, 잣나무창포병 in 2010


Main Cause of Forest Pests Outbreak
Rising of temperature
Destruction of balance of forest ecosystem
Reduction of precipitation in 2007, 2014 2017
Climate change
Spread of pine twig blight
High rate of mono forest plantation


Control of Main Forest Pest
Use of natural enemy
Ichneumonid, Trichogramma, predatory natural enemy
Micro pesticide such as BT, Beauveria
Plant pesticide such as celandine

Control of Main Forest Pest

Physical and mechanical measures

Light trap, attractive plant, mobile break band

Control of Main Forest Pest

Rational use of chemical pesticide

Insecticide including delta, phospham

Fungicide including mancozeb, lime bordeaux


Further action for forest pest control
- Strengthening monitoring system of forest pest
• Data base of scientific information on outbreak and damage of forest pest,
• Appropriate application of ways and means for pest control
- Eco-environment protection based control strategy in a sustainable and safe way
• Improvement of function and role of forest ecosystem ,
• Application of comprehensive measures and proper control system
- Development of forest management technology for pest management
- Development and use of biological control measures
Introduction of IPM !


Thank You!

12) Breeding and Use of 1st Generation Hybrid of Key Species for Reforestation in DPR Korea

Mr. Yong Hun Ri

Researcher of Afforestation Research Institute,
Academy of Forest Sciences

Breeding targets of first filial generation of key reforestation species

1. Species of high survival rate and fast growing capacity even on poor soil conditions
2. New genotype of strong resistence to winter damage and high productive property
3. Fruit and medicinal species to be contributed to human health care

Pinus 1

Fast growing at young age and straight growth. Strong resistance to winter damage and dry soil.

Pinus 2

Slow growing at young age and crooked growth. Normal resistance to winter damage and heavy pest damage.

Populus1

Fast growing and high soil requirement, floccus-stressing and weak resistance to winter damage

Populus2

Grow in mountainous land and strong persistence to winter damage, floccus staminate tree

Schizandra . chinensis

Grow well in humid land and not high soil requirement and winter-hardy plant

P. Koreansis

15 year-old 1st generation hybrid in Pinus is usually 1.5m high, and it's lower as about 20% and also 3 times of pine cones when compare with the other stocks (7.4m),

Castanea 1

Early maturity and high yield. Weight of one chestnut is 15~17g and strong persistence to winter damage

Castanea 2

Early maturity and high yield. Weight of one chestnut is 14~15g and strong persistence to winter damage

Larix 1

Very strong persistence to winter damage and low soil requirement. Grow slowing and bear lots of seeds

Larix 2

Normal persistence to winter damage and high soil requirement. Bear small amount of seed and grow fast. Native species from northern area

Larix 3

Normal persistence to winter damage and high soil requirement. Bear small amount of seeds and grow fast. Native species from central area

Pinus bungeana

Normal persistence to winter damage and soil requirement. 3~4m high, 3 leaves and grow branches from bottom, and bear small amount of seeds

T1. Growing category of first filial generation in Pinus

Description	5year old tree-H (m)		5year old tree- root neck -D (cm)		25year old tree- uprightness-C	
	♀	♂	♀	♂	♀	♂
Mother tree	2.49 ±0.021	2.13 ±0.19	5.4 ±0.03	4.6 ±0.02	0.98 ±0.002	0.71 ±0.14
1st generation hybrid-I	2.95±0.22		6.3±0.5		0.96±0.03	
Comparison (%)	118.7	138.5	116.7	136.9	98.0	135.2

$$K = \frac{a(F_1 \pm MP)}{P_1 - P_2}$$ K(H)=3.15, K(D)=1.85, K(C)=2.20

K - hybrid force, F_1 - cell of 1st generation hybrid
P_1 - mother cell
P_2 - father cell, MP - mother and father cells

T2. Survey of pest damaged 1st filial generation in Pinus

	Species	No of surveyed trees	No of affected trees	Damage rate(%)
Mother and father	Pinus 1(♀)	36	6	16.7
	Pinus 2(♂)	48	17	35.5
F_1	(I)	59	2	3.4

Heights per kinds of stocks of 15 year-old tree and productivities

T3.

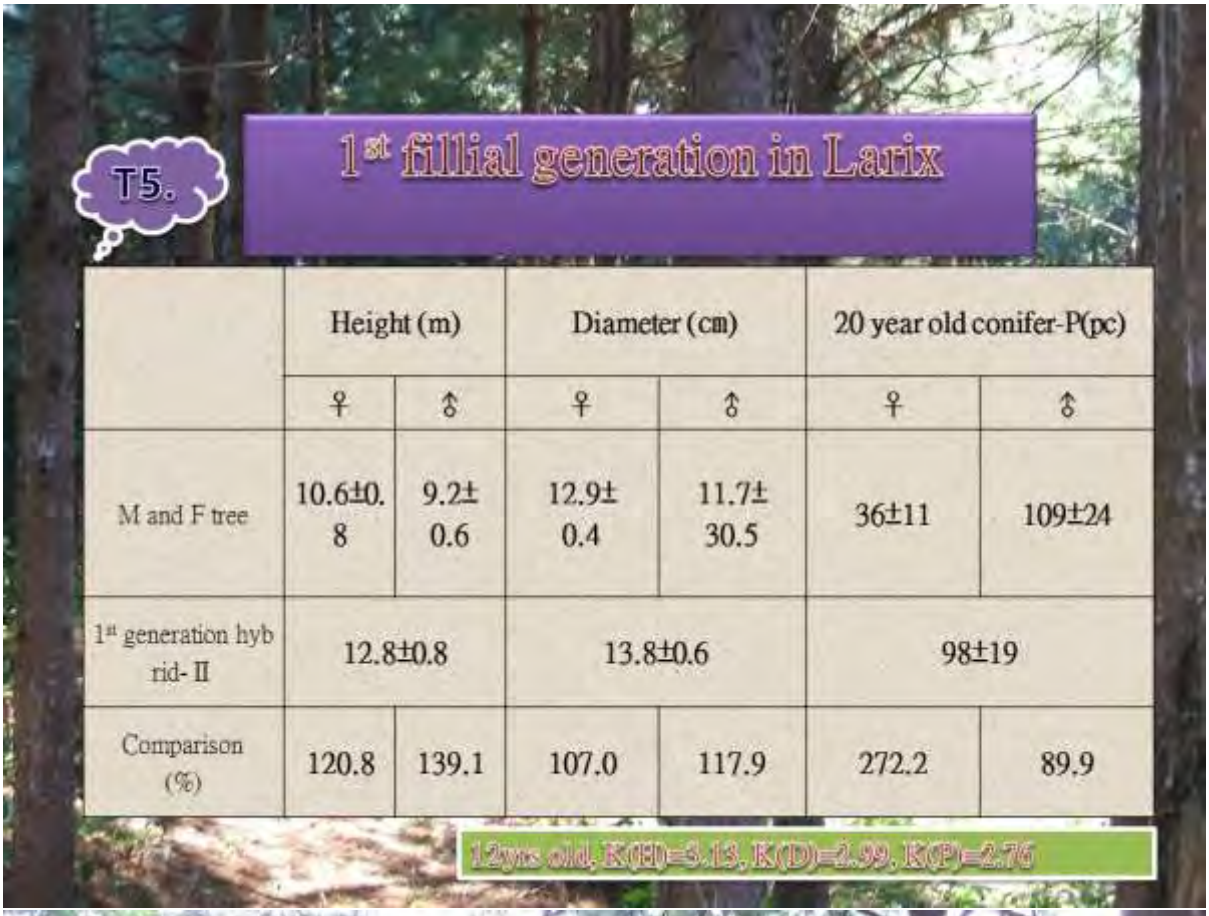
Kinds of stocks	Tree height (m)	Number of pine cones (pc/tree)
Pinus 1	7.4±0.9	4.6±1.8
Pinus F_1(Ⅰ)	6.2±0.8	5.9±1.6
Pinus F_1(Ⅱ)	1.5±0.6	14.8±2.5
Pinus 2	6.6±0.5	4.8±1.5
Pinus 3	7.1±0.4	5.2±1.1

1st fillial generation of Populus

T 4.

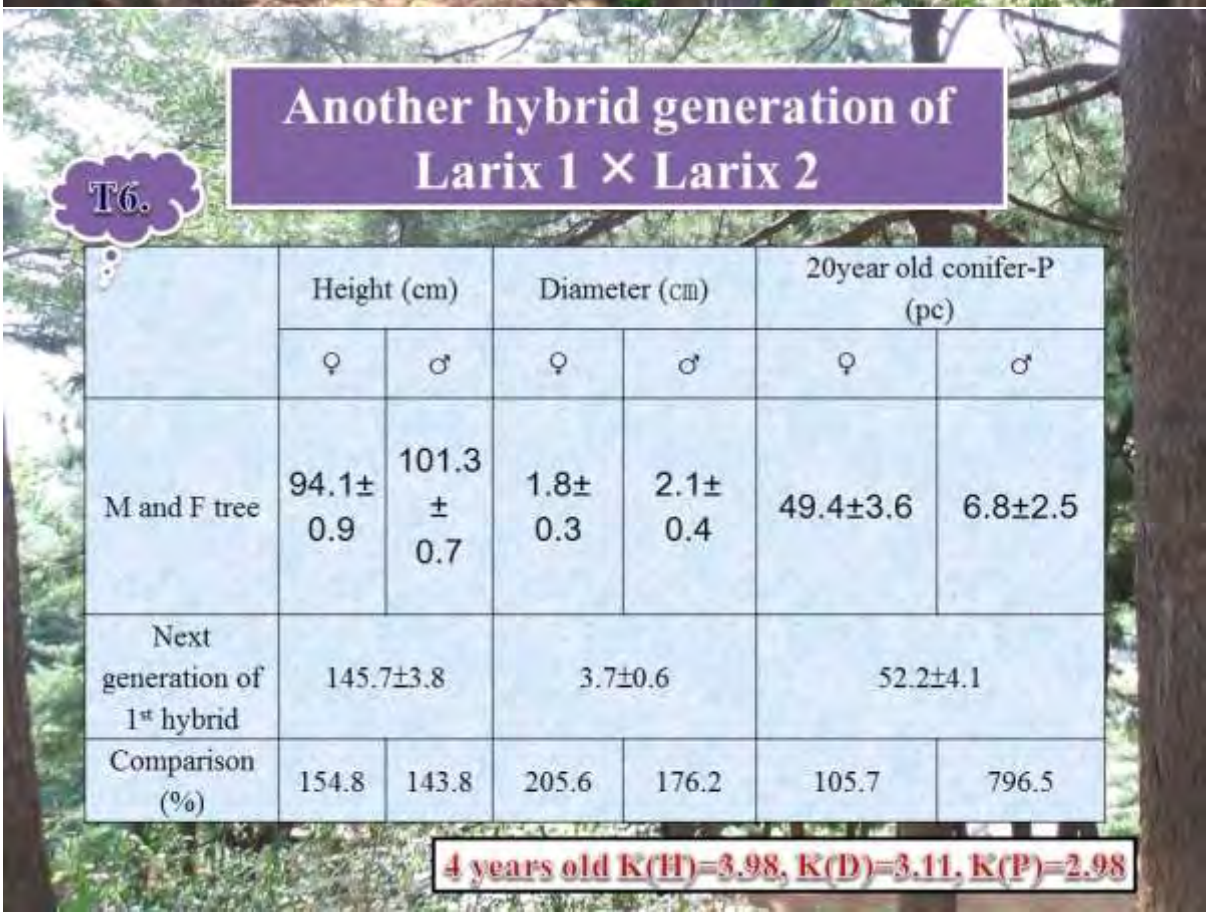
	Height (m)		Diameter (cm)		Annual mean temperature (℃)	
	♀	♂	♀	♂	♀	♂
M and F tree	12.2±1.8	14.7±2.6	18.6±2.8	20.4±3.3	8~9	3~5
1st generation hybrid-Ⅱ	16.8±1.9		23.6±2.3		6~7	
Comparison (%)	137.7	114.3	126.9	115.7		

※ Age: 12yr old, K(H)=2.94, K(D)=2.22



	Height (m)		Diameter (cm)		20 year old conifer-P(pc)	
	♀	♂	♀	♂	♀	♂
M and F tree	10.6±0.8	9.2±0.6	12.9±0.4	11.7±30.5	36±11	109±24
1st generation hybrid- II	12.8±0.8		13.8±0.6		98±19	
Comparison (%)	120.8	139.1	107.0	117.9	272.2	89.9

12yrs old, K(H)=3.13, K(D)=2.99, K(P)=2.76



	Height (cm)		Diameter (cm)		20year old conifer-P (pc)	
	♀	♂	♀	♂	♀	♂
M and F tree	94.1±0.9	101.3±0.7	1.8±0.3	2.1±0.4	49.4±3.6	6.8±2.5
Next generation of 1st hybrid	145.7±3.8		3.7±0.6		52.2±4.1	
Comparison (%)	154.8	143.8	205.6	176.2	105.7	796.5

4 years old K(H)=3.98, K(D)=3.11, K(P)=2.98

1st fillial generation in Castania

17.

	Mean temperature (℃)		Maturing season		Cancer-causing agent(g)	
	♀	♂	♀	♂	♀	♂
M and F tree	7≦	6≦	Late Aug	Early Sep	16±1.0	15±1.0
1st generation hybrid	4≦		Early Sep		16±1.0	
Comparison (%)	57.1	66.7	112.5	100.0	100.0	106.7

Conclusion

1. 1st fillial generation between Pinus 1 and Pinus 2 grow fast in early days and upright and high rersistance to pest damage. In particular, Pinus F_1 (Ⅱ) has great availability of using grafting branch of short pine nut.
2. 1st fillial generation in Populus grow well in mountainous area and floccusless so as to improve socio and economic value.
3. 1st fillial generation between Larix 1 and Larix 2 grow fast and is strong persistence to winter damage and high seed production yield..
4. 1st fillial generation in Castanea is very strong persistence to winter damage and applicable to non-cultivated area as a prematurity and winter-hardy species.
5. Breeding for increasment of the economic value of the medicinal fruit trees such as Crataegus, Evold, Schizandra, White nut, should be considered.


Thank you!

13) Outlook on Propagation, Cultivation and Prospection for Introduction of Vitamin Tree No.4 at the Northern Areas of Ryanggang Province in DPR Korea

Mr. Kwang Il Pok

Officer of External Economic Cooperation Department, MoLEP

Outlook on propagation, cultivation and prospection for introduction of Vitamin tree No.4 at the northern areas of Ryanggang Province in DPR Korea

The Korean name(비타미나무/Vitamin tree) of seabuckthorn (*Hippophaea rhamnoides)*) with high economic value was given by the President **Kim Il Sung** on 4th April, 1992.

As the fruits and leaves of sea buck thorn contain plenty of various vitamins like A, B, C, D, E, P etc. amino acids and minor elements, they have a great significance in wellbeing of people and development of foodstuff industry.

We summarized the outlook of a new sea buck thorn(vitamin tree No. 4 from now) cultivar to propagate and introduce into production in northern area of Ryanggang Province.

1) Propagation of "Vitamin tree No.4"

① Propagation by hardwood cutting

Growth amount and rooting rate of hardwood(old) cuttings with different age of vitamin tree Table 1

Age of scion, year	Number of scion	Number of rooted scion	Rooting rate,%	Growth amount	
				height, cm	Diameter of root collar, mm
1	1 000	774	77.4	55.4	0.6
2	1 000	369	36.9	46.7	0.6

* Main substance of cutting bed: sand. Length of cuttings:12 ~ 15cm. Diameter:0.5cm≦

② Propagation by greenwood cutting

Growth amount and rooting rate of greenwood cutting with different age of vitamin tree. Table 2

Kind of scion	Number of scion	Rooted scion	Rooting rate,%	Growth amount	
				height, cm	Diameter of root collar,mm
lignified	1 000	447	44.7	21.5	0.5
Semi-lignified	1 000	894	83.4	22.5	0.5
Non-lignified	1 000	113	11.3	20.9	0.4

2)Introduction of sea buck thorn cultivar

① Soil condition of pilot site

Table3

site	Soil condition				landscape		
	Soil Condition	Humidity	Humus content, %	Soil depth,cm	Relative location	Slope grade, °	azimuth
Hyesan	clay loamy	Arid	2～3	50<	Hill side	11.0	sunny
Taehongdan	Volcanic soil	moderate	3<	40～50	Hill side	9.0	Semi sunny
Samjiyon	Volcanic soil	arid	2～3	20～30	Top of hill	10.0	sunny
Unhung	loamy	moderate	2～3	50<	Foot of hilll	10.0	sunny

② Wintering rate of cultivar in pilot sites

Table4

site	Age of tree, year	Minimum temperature, ℃	Length of shoot,cm	Length of frozen branch, cm	Wintering rate,%
Hyesan	9	-31.0	20.4±2.1	0	100.0
Taehongdan	12	-32.5	18.5±1.4	0	100.0
Samjiyon	2	-36.9	30.6±2.5	0	100.0
Unhung	4	-31.5	44.5±2.7	0	100.0

③ Growing category of cultivar in pilot site

Tabe5

site	Age of tree, year	Height,m	Diameter of stump, mm	Diameter of crown,m	Length of young branch, cm
Hyesan	9	2.4±0.2	9.8±0.6	1.5±0.2	20.4±2.1
Taehongdan	12	2.6±0.2	13.2±1.3	1.5±0.2	18.5±1.4
Samjiyon	2	0.8±0.1	1,8±0.3	0.6±0.1	30.6±2.5
Unhung	4	1.5±0.1	5.1±0.3	1.1±0.1	44.5±2.7

④ Fruition property of cultivar in pilot sites

Table6

site	cultivar	mass,g		Yield amount		
		1fruit	100fruit	Kg/1tree	t/ha	Control, times
Hyesan	Vitamin tree No.4	0.68	62.0	7.7	9.8	1.3
	Origin Vitamin tree	0.65	60.0	5.9	7.7	1.0
Taehongdan	1	0.68	63.0	8.0	10.4	1.3
	2	0.65	60.0	6.2	8.0	1.0

* Origin Vitamin tree: called as "Vitamin tree No.1"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Conclusion

① Our cultivar can be propagated by green wood and hard wood cutting.

- Survival rate of hardwood cutting is 77.4% at 1 year old slip and 36.5% at 2 years old one so it's prefer to use 1 year old one.
- The survival rate of green wood cutting is the highest at semi-lignified branch as 83.4% and it is too low at non-lignified branch as 11.3% to 44.7% so it's prefer to use green wood as slip cutting.

② Wintering ability of Vitamin tree No. 4 is so perfective that growing and fruiting rates are very reasonable in Hyesan, Taehongdan, Unhung and Samjiyon, Northern area of our country.

- At the pilot sites in northern areas of Ryanggang Province, the growth characteristics is good exceptionally.
- The fruit yield through our trial cultivation is about 1.3 times more than control one in comparing with control one as the one fruit mass of ours is 0.68g, fruit yield amount of per hectare is 9.8~10.4kg at 8 years old tree but it is 7.7 ~ 8.0 t in case of control one.

THANK YOU!

III. Photos

Opening & Presentation Session

10-11 April 2018, Beijing


International Workshop on Forest Landscape Restoration
and Resilience to Climate Change in Northeast Asia


FLR Mechanism:
Achievements & w
Internationa
and Resil
APAFRI
Organized


FOREST AND LANDSCAPE RESTORATION (FLR)
2011-2020
2014-2030
Internationa
and Resili
APAFRI


3. Improved provincial enabling institutional environment, and mainstreamed IEM into provincial long-term development plan
54 formulated
17 revised
Law of the PRC on Water and Soil Conservation
Provincial Strategy and Action plans for LDC


Forest Restoration Campaign in DPR Korea


Internationa
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Organized


I. Introduction
Internationa
and Resil


Successful
Internation
and Res


KFFDRS Database
Internationa
and Resili


Internationa
and Resil
APAFRI
Organized


Internationa
and Resil
APAFRI
Organized
Mean temperature (℃)
Maturing season
♀
♂
♀
♂
M and F tree
7≦
6≦
Late Aug
Early Sep
1st generation hybrid
4≦
Early Sep
Comparison (%)
57.1
66.7
112.5
100.0


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Internationa
and Resili

Field Trip

12 April 2018, Ordos

Organizer Contact

Dr. Ho Sang Kang
Deputy Coordinator, IUFRO Working Party 1.01.13
Research Professor, NICEM, Seoul National University, Republic of Korea

Tel: +82-2-880-4880 Fax: +82-2-880-4952
Email: silvi@chol.com

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Organizer Contact

Dr. Ho Sang Kang
Deputy Coordinator, IUFRO Working Party 1.01.13
Research Professor, NICEM, Seoul National University, Republic of Korea

Tel: +82-2-880-4880 Fax: +82-2-880-4952
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