

## New emerging sector : Korea NFI program

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KFRI

### The Enhanced National Forest Inventory of Korea -Country experience-



Friendship and Strengthening Multi-purpose National Forest Inventory Systems in the Asia-Pacific Region. In cooperation with: Chonju, Chungcheong, Korea, 22-23 February 2008

Sung-Ho Kim  
Korea Forest Research Institute



### Forests of Korea


- ※ Total land area : 10 million ha
- Forest land : 6.4 million ha (64%)
- Growing stock : 103 m<sup>3</sup>/ha(2008)




### Forest Type Distribution

- ❖ Coniferous forests = 42%
- ❖ Broad-leaved forests = 26%
- ❖ Mixed forests = 29%
- ❖ Others = 3%

※ Plantation : 20% of the total forest



### History of Korean NFI



- The 1<sup>st</sup> NFI (1972 - 1975 [4 years])
- The 2<sup>nd</sup> NFI (1978 - 1980 [3 years])
- The 3<sup>rd</sup> NFI (1986 - 1992 [7 years])
- The 4<sup>th</sup> NFI (1996 - 2005 [10 years])
- The 5<sup>th</sup> NFI (2006 - 2010 [5 years])

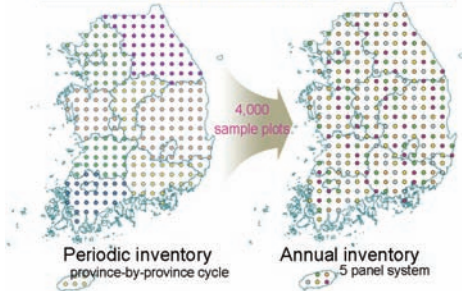
**Previous NFIs – How they worked**

- Periodic inventory on 3~10 year intervals to know the status of forest resources
- Focused only on timber-related information
- Unable to monitor and assess forest changes over time
- Could not address the evolving information needs.

**Summary of core changes in NFI 5**

- Five-year inventory cycle with panel system
- New sampling and ground plot design
- More measurement variables
  - biomass, carbon stock, biodiversity, forest health, etc.
- Interagency collaboration
  - Forest Service, Forest Research Institute, and National Forest Cooperatives Federation (NFCF)
- Annual budget : US\$ 2.5million for plot survey

**How to measure sample plots**



**The 5th NFI (2006-2010)**



**Rationale for change from the 5th NFI**

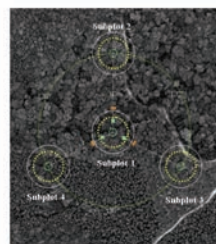
- To meet increasing demands on reliable forest resources information
- To satisfy international reporting requirements ; SFM, UNFCCC/KP, FAO/FRA, etc.

**Sampling Design**

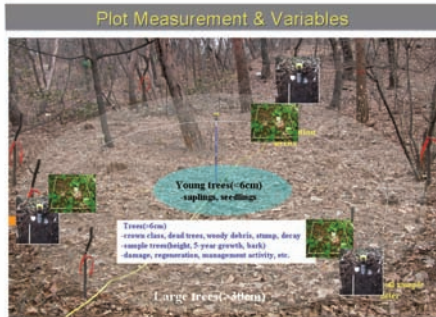
- Systematic design on 4 x 4 km national grid
- Identify plot locations on digital orthophoto map
- Total forested plots : 4,000
- sampling intensity : 0.01%
- Five panel system
- one panel : 800plots



**Ground Plot Configuration**



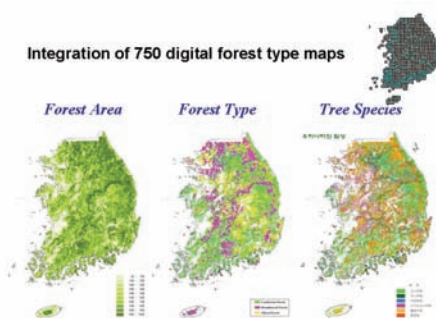
- Permanent Sample Plot**
- A cluster consisting of 4 subplots.
  - Subplot : a tri-areal plot
    - . large tree plot(16m, 0.04ha)
    - . basic tree plot(11.3m, 0.04ha)
    - . young tree plot(3m, 0.003ha)
  - Microplots in 25% of the total
    - . vegetation plot(1m x 1m)
    - . soil plot(0.3m x 0.3m)
- ☞ only in subplot 1(center subplot)



### Forest Type Map

❖ Aerial photo interpretation in tree species, dbh, age, and crown to make digital forest type maps (750 sheets at a scale of 1/25)

### Forest Type Mapping Sys



### What information from NFI

- Forest area (forest type mapping)
- Growing stock (NFI plots)
- Biomass (above/below-ground, deadwood)
- Carbon stock – five carbon pools
- Stand/tree growth
- Biodiversity – species, stand structure, etc.
- Forest damages, management activities, etc.

### NFI Results & Issues

#### Growing stock

• The 5th NFI for 2006-2008  
:  $123.8\text{m}^3/\text{ha}$

✓ How to clarify it

✓ Statistical analysis method

- how to combine panel data.
- how to recalculate the previous statistics.
- how to estimate GS for small area (Gun).

### (1) How to combine panel data

-Moving average

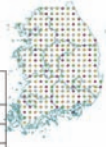
Year	Panel	No. of Plot	Growing Stock/ha	GS $\text{m}^3/\text{year}$
2006	P1	800	120.8	
2007	P2	800	125.4	
2008	P3	800	123.8	
2009	P4	800	12*	
2010	P5	800	12*	12* $\text{m}^3/\text{ha}$
2011	P1	800		$\text{m}^3/\text{ha}$
2012	P2	800		$\text{m}^3/\text{ha}$
2013	P3	800		$\text{m}^3/\text{ha}$
2014	P4	800		$\text{m}^3/\text{ha}$
2015	P5	800	13*	13* $\text{m}^3/\text{ha}$

Annual inventory  
- One panel will be measured every year.  
- New panel data will replace the old

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2012	P2	800	m <sup>3</sup>	m <sup>3</sup> /ha
2013	P3	800	m <sup>3</sup>	m <sup>3</sup> /ha
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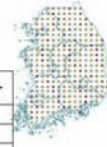


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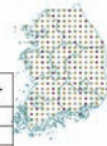


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**(2) Recalculation of the previous GS**

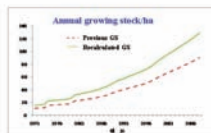
- New GS : 123.8m<sup>3</sup>/ha
- Old GS : 103 m<sup>3</sup>/ha

Overlapping method suggested by IPCC GPG

$$y = \text{new GS}$$

$$x = \text{previous GS}$$

$$y_o = x_o \times \frac{\sum_{i=m}^n y_i}{\sum_{i=m}^n x_i}$$



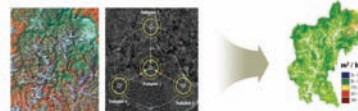
**(3) Growing stock for small area(Gun)**

- Sampling intensity : 0.01%

✓ Super county(Gun)  
: combining with neighboring counties



✓ k-nn method  
: satellite image + NFI data



#### Other challenging issues

- Sampling design : cost-effective or not?
- Quality Assurance/Quality Control (QA/QC)
- Field manual improvement
- Database management and analysis system
- Statistical analysis procedure
- Re-measurement strategy
- Lack of human resources : field crew, statistician,

#### What to do for the future

