

# A Study on Tree Species and Crops of Agroforestry according to Ecological Geographic Map in North Korea



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### Abstract

This study was conducted to analyze the appropriate tree species and crops according to agroforestry target sites in North Korea based on ecological geography and site properties with the purpose of preparation of technical cooperation on agroforestry, one of the main agendas of the Inter-Korean Forest Cooperation Subcommittee. The agroforestry is one of the methods for forest restoration that satisfies both North Korea's fuel and food shortages and the restoration of deforested land and it began in 2003. To this end, the ecological geographic map (13 regions and 4 zones) of North Korea was made by using satellite images with North Korean journals. The target sites for agroforestry was classified according to 18 site conditions depending on 3 site characteristics (soil depth, relative location, slope), and divided as short-term and long-term target sites depend on agroforestry management period. And then, appropriate tree species and crops for agroforestry are selected according to them. By regions within the same zone, tree species and crops were mostly similar, but compared to each zone, they differed. This seems to be because the geographical climatic characteristics reflected in the ecological geographic map vary greatly from zone to zone. Through this, it is expected to provide information that can be more efficiently implemented through analysis of the target sites needed for application of agroforestry and needed for application of agroforestry management and the combination of suitable species and crops.

## Objective

- This study aims to identify appropriate tree species and crops for agroforestry target sites in North Korea based on ecological geography and site properties.
- To this end, an ecological geographic map (13 regions and 4 zones) of North Korea was made using satellite images and North Korean academic research articles.

# Materials and Methods

- Material : Research articles about agroforestry in North Korea
- 1. Lee, Y.H. 2017. A study on the classification method of agroforestry target sites using GIS. Forest Science 4: 11-14.
- 2. Lee, H.S. and Gil, M.C. 2016. A study on the classification of agroforestry target sites of major economic tree species. Forest Science 2: 7-15.
- 3. Ju, S.J., Kang, J.J. and Kim, Y.C. 2012. A study on ecological geographic map of North Korea. Geological and Geographical Science 2: 48-49.
- 4. Kang, J.J., Ju, S.J. and Hong, Y.I. 2015. A study on the reasonable determination of

#### Results

Tree species and crops of agroforestry considering both the site condition and ecological geography in North Korea.

#### <Table 1>

#### \*English name (North Korean name)

Zone	Region	Short-term target site		Long-term target site		
		Tree species	Crop	Tree species	Crop	
Northern highland	Baekdu highland	Siberian elm(비술나무), Korean spruce(종비나무), Dahurian larch(이갤나무),Dark-bark spruce(가문비나무), Khingan fir(분비나무), Needle fir(전나무)	potato (감자), bean(콩)	Yellow hom(기름밤나무), Ussuri pear(산돌배나무)	millet(기장), buckwheat(메밀), faba bean(보라콩),wheat(밀), barley(보리)	
	Samsu- Gabsan	Siberian elm(비술나무), Korean spruce(종비나무), Japanese larch(창성이갤나무), Dahurian larch(이갤나무), Dark-bark spruce(가문비나무), Khingan fir(분비나무), Needle fir(전나무)	potato (감자)	Yellow horn(기름밤나무), Ussuri pear(산돌배나무)	millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), faba bean(보라콩), sesame seed(참깨), barley(보리), pea(완두), italian millet(조), red bean(판)	
	Kimhyung gwon- Pungseo	Korean pine(잣나무), Siberian elm(비술나무), Korean spruce(종비나무), Japanese larch(창성이깔나무), Dahurian larch(이깔나무), Dark-bark spruce(가문비나무), Khingan fir(분비나무), Needle fir(전나무)	potato (감자)	Yellow horn(기름밤나무), Ussuri pear(산돌배나무)	millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), faba bean(보라콩), sesame seed(침깨), barley(보리), pea(완두), italian millet(조), red bean(팥)	
Inland	Jagang Mountainous	Korean pine(잣나무), Manchurian walnut(가래나무), Siberian elm(비술나무), Korean spruce(종비나무), Japanese larch(창성이갤나무), Dahurian larch(이갤나무), Dark-bark spruce(가문비나무), Khingan fir(분비나무), Needle fir(전나무)	potato (감자)	Yellow horn(기름밤나무), Ussuri pear(산돌배나무)	millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), faba bean(보라콩), sesame seed(참깨), barley(보리), pea(완두), italian millet(조), red bean(팥)	
	Bukdaebong Mountainous	Korean Evodia(수유나무), Manchurian walnut(가래나무), Korean castanea(밤나무), Siberian elm(비술나무), Black Locust(아카시아나무), Mountain hawthorn(찔광이나무), Manchurian poplar(황철나무), Manchurian alder(물오리나무), Japanese larch(창성아깔나무), Amur linden(피나무)	sweet potato (고구마), potato (감자)	Yellow horn(기름밤나무), Fragrant snowbell(쪽동백나무), Aronia(단나무), Apricot(살구나무), Ussuri pear(산돌배나무), Indigobush Amorpha(왜싸리), Paper mulberry(닥나무)	corn(강냉이), millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), kidney bean(않은당콩), climbing bean(출당콩), sesame seed(참깨), barley(보리), sorghum(수수), pea(완두), italian millet(조), red bean(팥)	
	Pyeonggang - Saepo Plateau	Korean pine(잣나무), Manchurian walnut(가래나무), Korean castanea(밤나무), Siberian elm(비술나무), Black Locust(아카시아나무), Mountain hawthorn(찔광이나무), Manchurian poplar(황철나무), Manchurian alder(물오리나무), Japanese larch(창성이깔나무), Dahurian larch(이깔나무), Amur linden(피나무)	sweet potato (고구마), potato (감자), upland nice(밭백)	Yellow hom(기름밤나무), Fragrant snowbell(쪽동백나무), Blunt-lobe spicebush(생강나무), Aronia(단나무), Apricot(살구나무), Ussuri pear(산돌배나무), IndigobushAmorpha(왜씨리), Paper mulberry(당나무)	corn(강냉이), millet(가장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), kidney bean(않은당콩), dimbing bean(줄당콩), sesame seed(참깨), barley(보리), sorghum(수수), pea(완두), italian millet(조), red bean(팥)	
West coast	Northern coast	Persian walnut(호두나무), Korean Evodia(수유나무), Heart-shape walnut(쪽가래나무), Korean pine(잣나무), Manchurian walnut(가래나무), Korean castanea(밤나무), Eucommia(두충나무), Siberian elm(비술나무), Black Locust(아카시아나무), Mountain hawthom(찔광이나무), Manchurian poplar(황철나무), Mountain hawthom(찔광이나무), Japanese larch(창성어깰나무), Amur linden(피나무), East Asian alder(오리나무)	sweet potato (고구미f), potato (김자), upland rice(밭벼)	Yellow hom(기름밤나무), Fragrant snowbell(쪽동백나무), Blunt-lobe spicebush(생강나무), Aronia(단나무), Apricot(살구나무), Ussuri pear(산돌배나무), IndigobushAmorpha(왜싸리), Paper mulberry(닥나무)	corn(강냉이), millet(가장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), kidney bean(않은당콩), dimbing bean(줄당콩), sesame seed(참깨), barley(보리), sorghum(수수), pea(완두), italian millet(조), red bean(팥)	
	Central coast	Persian walnut(호두나무), Korean Evodia(수유나무), Heart-shape walnut(쪽가래나무), Korean pine(잣나무), Manchurian walnut(가래나무), Korean castanea(밤나무), Eucommia(두충나무), Siberian elm(비술나무), Black Locust(아카시아나무), Mountain hawthorn(찔광이), Manchurian poplar(황철나무), Manchurian alder(물오리나무), Japanese larch(창성이깔나무), Princess Tree(참오동나무), Amur finden(피나무), East Asian alder(오리나무)	sweet potato (고구마), potato (감자), upland rice(밭벼)	Yellow hom(기름밤나무), Fragrant snowbell(쪽동백나무), Blunt-lobe spicebush(생강나무), Aronia(단나무),Apricot(살구나무), Ussuri pear(산돌배나무), IndigobushAmorpha(왜싸리), Paper mulberry(닥나무)	corn(강냉이), millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메일), wheat(밀), kidney bean(않은당콩), climbing bean(줄당콩), sesame seed(참깨), barley(보리), sorghum(수수), pea(완두), italian millet(조)	
	Southern coast	Persian walnut(호두나무), Korean Evodia(수유나무), Heart-shape walnut(쪽가래나무), Korean pine(잣나무), Manchurian walnut(가래나무), Korean castanea(밤나무), Eucommia(두충나무), Siberian elm(비술나무), Black Locust(아카시아나무), Mountain hawthorn(찔광이나무),	sweet potato (고구마), potato (김자),	Yellow hom(기름밤나무), Fragrant snowbell(쪽동백나무), Blunt-lobe spicebush(생강나무), Aronia(단나무), Apricot(살구나무), Ussuri pear(산동배나무)	corn(강냉이), millet(기장), mung bean(녹두), perilla seed(들깨), buckwheat(메밀), wheat(밀), kidney bean(않은당콩), climbing bean(출당콩),	

type of agroforestry. Geological and Geographical Science 3: 38-40.

 Method : Analyzing the suitable tree species and crops for agroforestry of 2 categories in 4 zones 13 regions according to site condition, management period, and ecological geography in North Korea

Tree species and crops according to ecological geographic map		Tree species and crops according to the management period		Tree species and crops of		
Ecological geographic map (natural/artificial factors) (Kang et al., 2015)	+	Site properties (soil depth, slope, and location) (Lee, 2017)		agroforestry target sites for each region of		
Same zone, Forest zone of North Korea, Recommended species for reforestation by region		Management period (short-term/long-term) (Lee and Gil, 2016)		ecological geographic map		

<figure< th=""><th>1&gt;</th><th>Method</th><th>for</th><th>selecting</th><th>g tree</th><th>species</th><th>and</th><th>crop</th><th>accord</th><th>ling to</th></figure<>	1>	Method	for	selecting	g tree	species	and	crop	accord	ling to
		manage	mer	nt period	of ea	ch ecolo	gica	geog	<b>Jraphic</b>	area.

① The 2 categories of trees and crops were selected considering

18 site conditions and 2 management periods

X Category 1 (12 site conditions) and Category 2 (6 site conditions)

- Tree species and crops were selected considering ecological geography in 4 zones and 13 regions
- ③ Finally, analysis of the suitable tree species and crops for agroforestry of 2 categories in 4 zones and 13 regions through data integration

#### n poplar(황철나무), Manchunan alder(물오리나구), upland IndigobushAmorpha(왜싸리), pea(완두), italian millet(조) Japanese larch(창성이깔나무), Princess Tree(참오동나무), rice(밭벼) Paper mulberry(닥나무) Amur linden(피나무), East Asian alder(오리나무) Korean pine(잣나무), Manchurian walnut(가래나무), corn(강냉이), millet(기장), mung bean(녹두), sweet Siberian elm(비술나무), Korean spruce(총비나무), potato perilla seed(들깨), buckwheat(메밀), wheat(밀), Yellow hom(기름밤나무). Manchurian alder(물오리나무), Japanese larch(창성이깔나무), (고구마), kidney bean(앉은당콩), climbing bean(줄당콩), Aronia(단나무), Apricot(살구나무), Northeast Dahurian larch(이깔나무), Amur linden(피나무), sesame seed(참깨), barley(보리), sorghum(수수) potato Ussuri pear(산돌배나무) (감자) Dark-bark spruce(가문비나무), Khingan fir(분비나무), Needle fir(전나무) pea(완두), italian millet(조), red bean(팥) corn(강냉이), millet(기장), mung bean(녹두), sweet Yellow horn(기름밤나무), Manchurian walnut(가래나무), Siberian elm(비술나무), ootato perilla seed(들깨), buckwheat(메밀), wheat(밀) 고구마) Black Locust(아카시아나무), Manchurian poplar(황철나무), Dancheon-Aronia(단나무), Apricot(살구나무), kidney bean(앉은당콩), dimbing bean(줄당콩), Manchurian alder(물오리나무), Japanese larch(창성이깔나무), Ussuri pear(산돌배나무), (김자) Bukcheong sesame seed(참깨), barley(보리), sorghum(수수) upland Indigobush Amorpha(왜싸리) Amur linden(피나무) East pea(완두), italian millet(조), red bean(팥) ice(발바 corn(강냉이), millet(기장), mung bean(녹두), Manchurian walnut(가래나무), Siberian elm(비술나무), Yellow horn(기름밤나무), coast potato perilla seed(들깨), buckwheat(메밀), wheat(밀) Black Locust(아카시아나무), Manchurian poplar(황철나무), (고구마) Hamheung Aronia(단나무), Apricot(살구나무) kidney bean(앉은당콩), climbing bean(출당콩), Manchurian alder(물오리나무), Japanese larch(창성이깔나무), Ussuri pear(산돌배나무), Geumva sesame seed(참깨), barley(보리), sorghum(수수) Indigobush Amorpha(왜씨리) Amur linden(피나무) upland pea(완두), italian millet(조), red bean(팥) nce(밑버 corn(강냉이), millet(기장), mung bean(녹두), Yellow horn(기름밤나무). Korean pine(잣나무), Manchurian walnut(가래나무), Manchurian poplar(황철나무), Manchurian alder(물오리나무) perilla seed(들깨), buckwheat(메밀), wheat(밀), Wonsan-고구마) Aronia(댄나무), Apricot(살구나무), kidney bean(앉은당콩), climbing bean(줄당콩), potato Ussuri pear(산돌배나무), Goseong Japanese larch(창성이깔나무), Amur linden(피나무) (김자) barley(보리), sorghum(수수), pea(완두), Indigobush Amorpha(왜싸리) upland italian millet(조), red bean(팔) nce(빝버

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