Sustainable Intensification to Meet
Food Security and Environmental Objectives

MACS-G20
Technical
Workshop on
Climate Change

Korean Status and Adaptation at Agriculture on Climate Change

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Rural Development Administration in Korea

Contents

01 Background : Dynamic Korea

02 Impact Assessment on Climate Change

03 Adaptation and Carbon Neutral

04 Future against Climate Change

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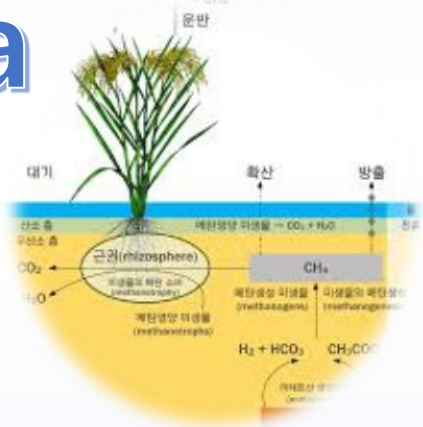
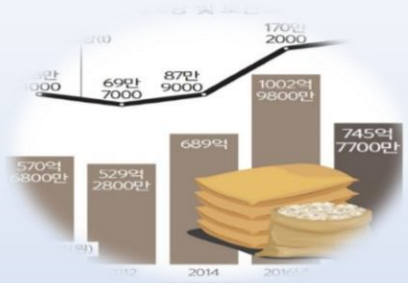
Ⅰ. Background : Dynamic Korea





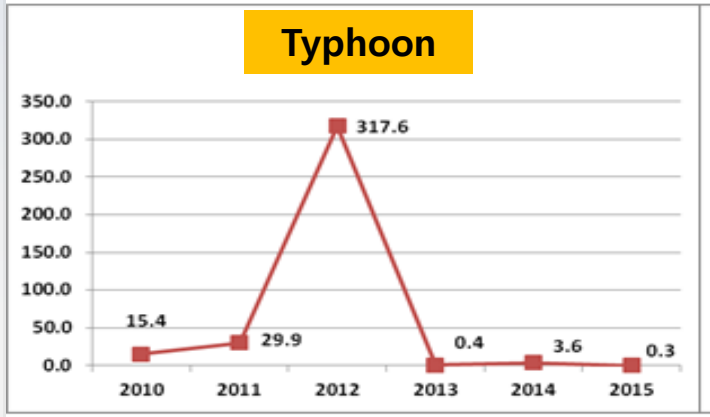
From morning calm Korea To Dynamic Korea

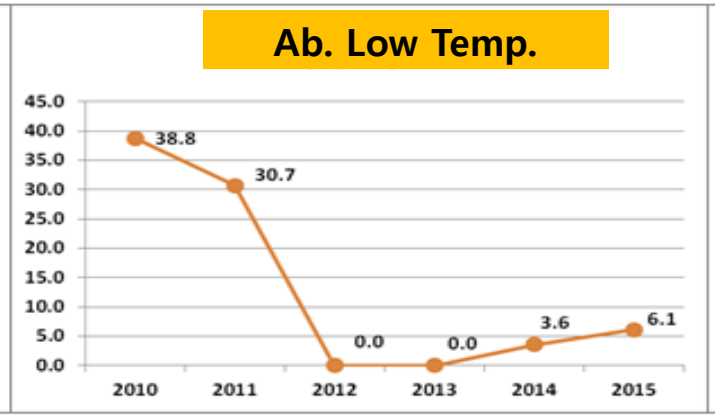
** Korea has been changed from morning calm in the Eastern small country to dynamic country now. Many kinds of fields have been developing vividly such as city, shipbuilding, semiconductor, vitality of tradition, sports. K-pop, and etc. And Korean Agriculture and climate change are seemed to become dynamic.

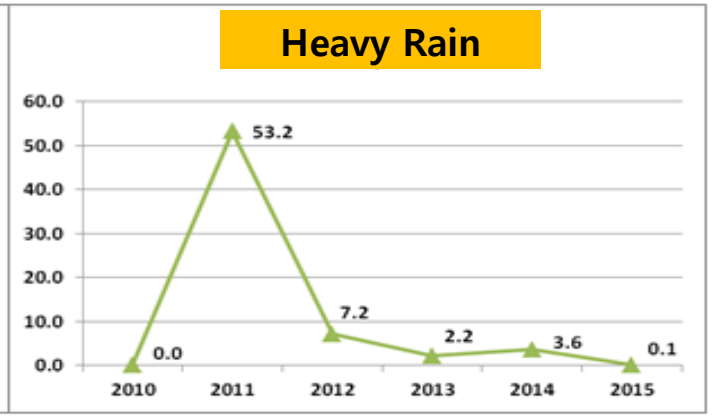
I'll show you shortly in this time.

Changes of damaged area according to kinds of climate disasters

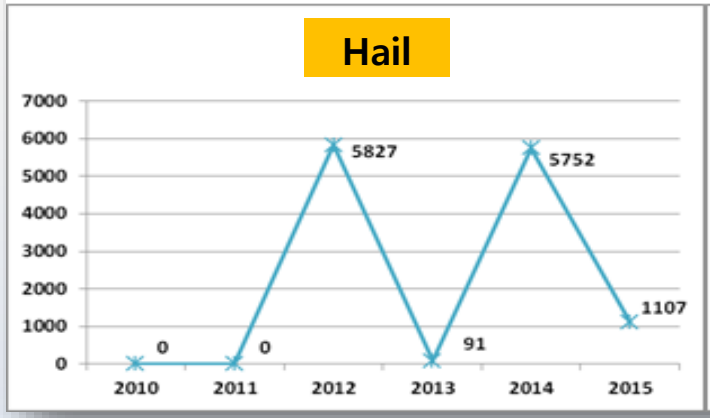
Unit : 1,000ha

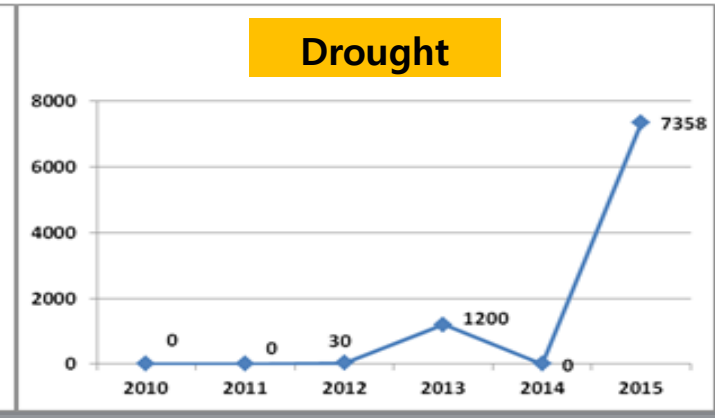


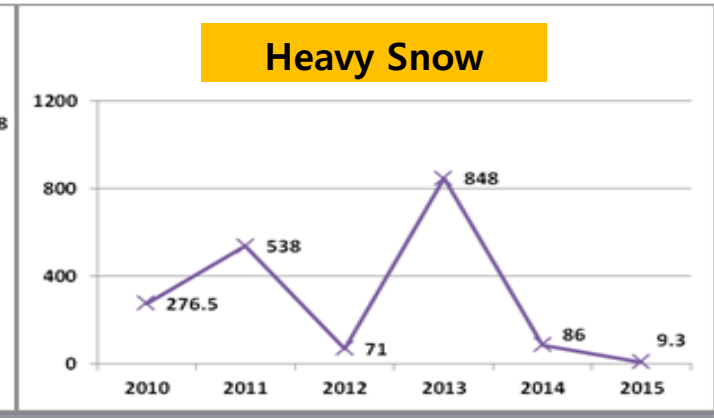




Unit : ha







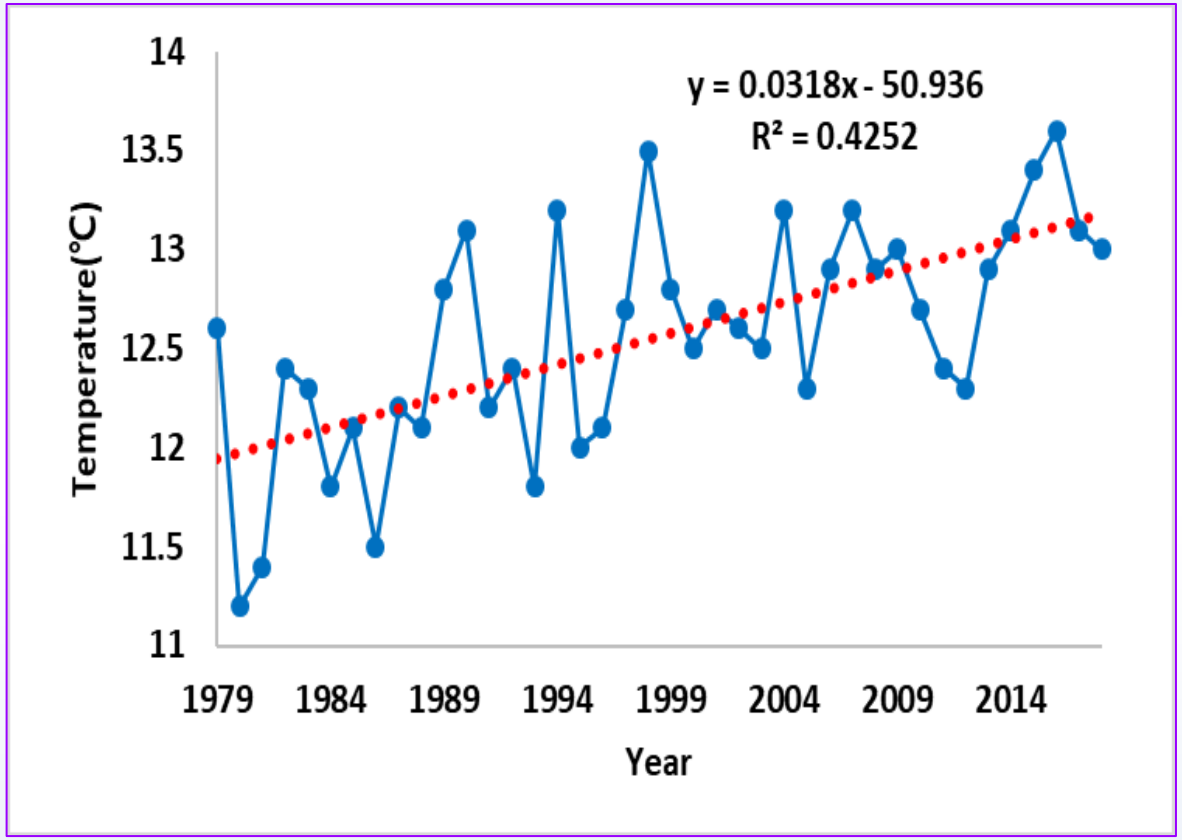
** Even though Korean peninsula has very small land area, there are many kinds of climate disasters every year that it has happened in all of the world.

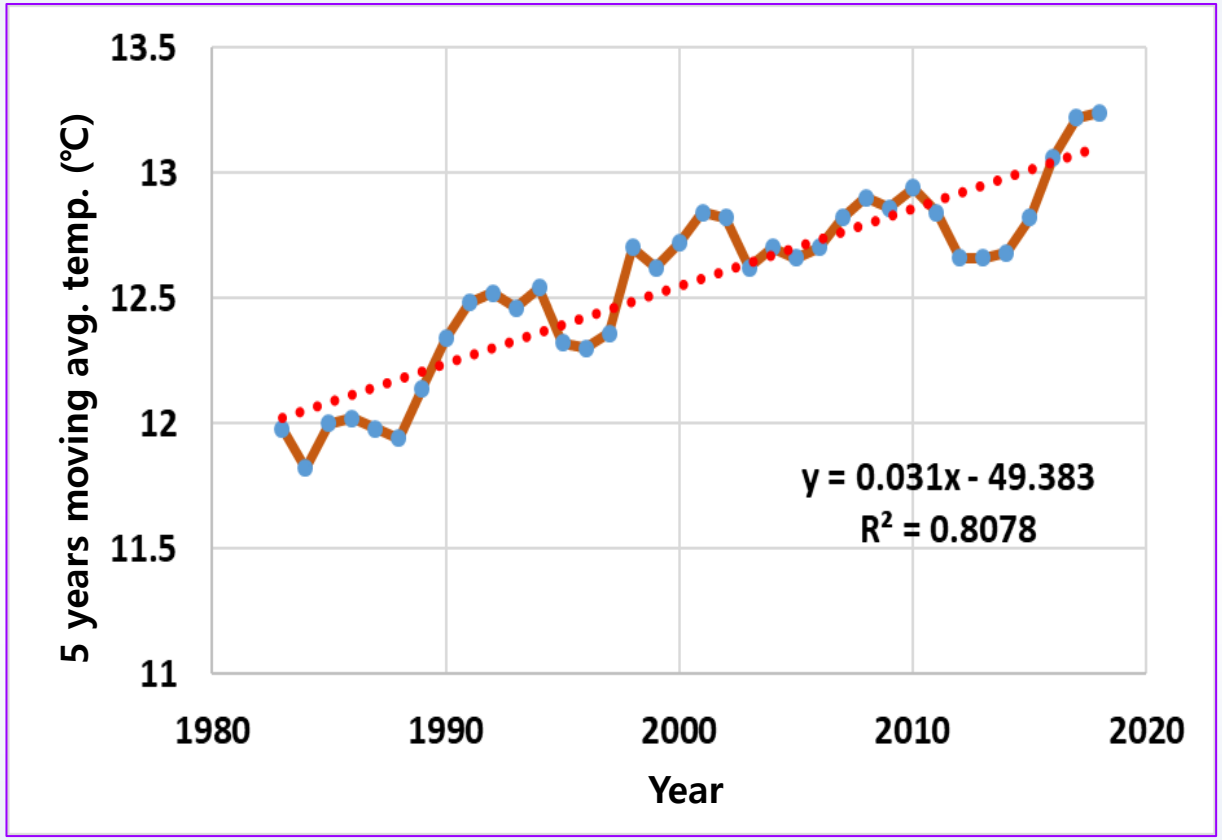
As you see the this figure, you can understand my words, there are typhoon, abnormal low temp., heavy rain, hail, drought, heavy snow and heat wave in summer.

** 지난 40년간 우리나라 평균기온이 연차별 변동이 있으나 꾸준히 상승추세를 만듬

Changes of Avg. Temp. of Korea during 40 years recently

about 0.3℃/10years





Change of average temperature

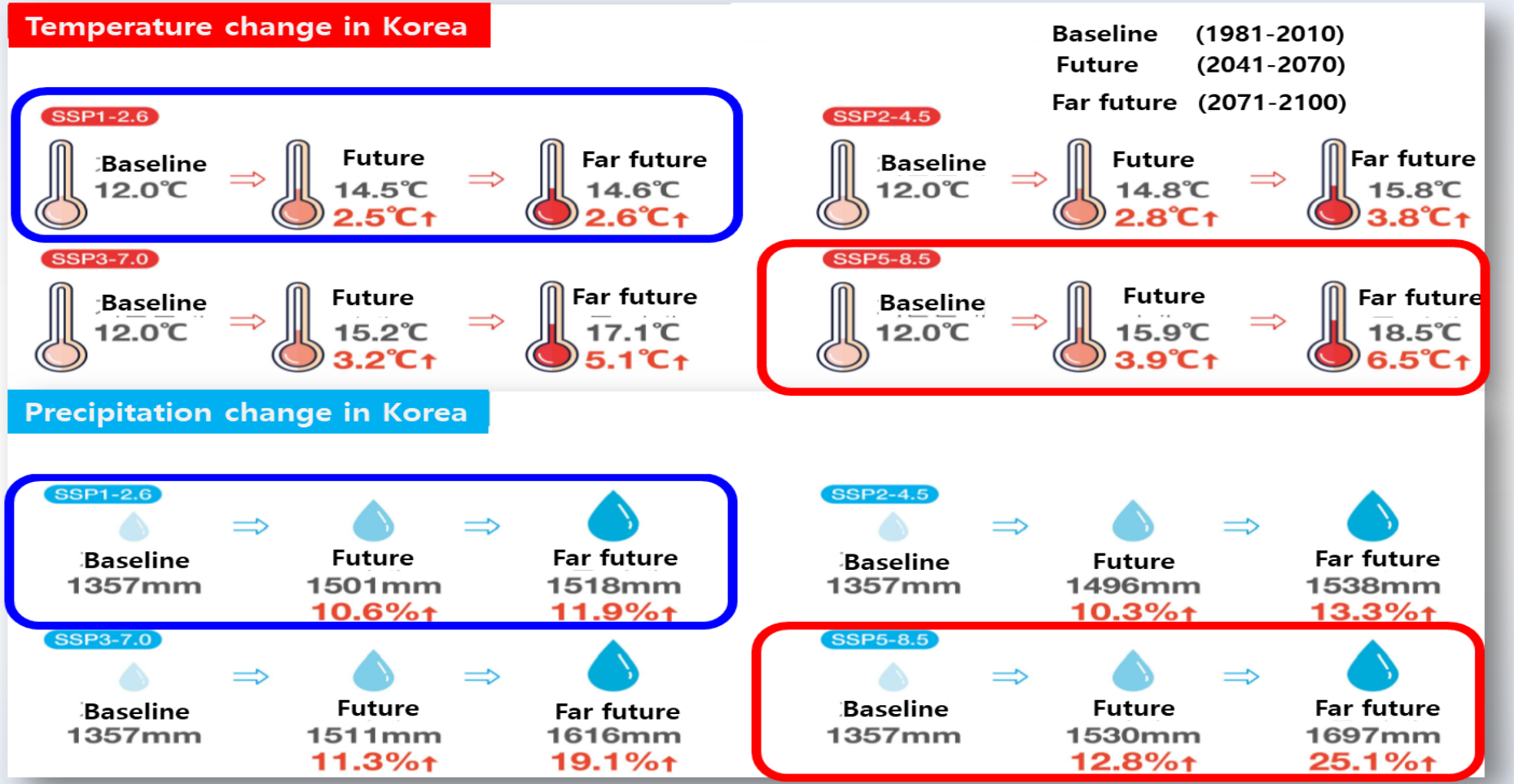
Change of moving avg. temp. by 5 years

** This shows the changes of avg. temp. of Korea last 40 years. Left one is just plot for average temp, and we know there are high fluctuation year by year.

right figure shows changes of moving average temp. by 5 years. We can more obviously understand the trend of Korean warming.

In case of Korean temp., we could have defined that Korea have being warm with rate of about 0.3℃/10 years.

Future change of Temp. and Precipitation (SSP)

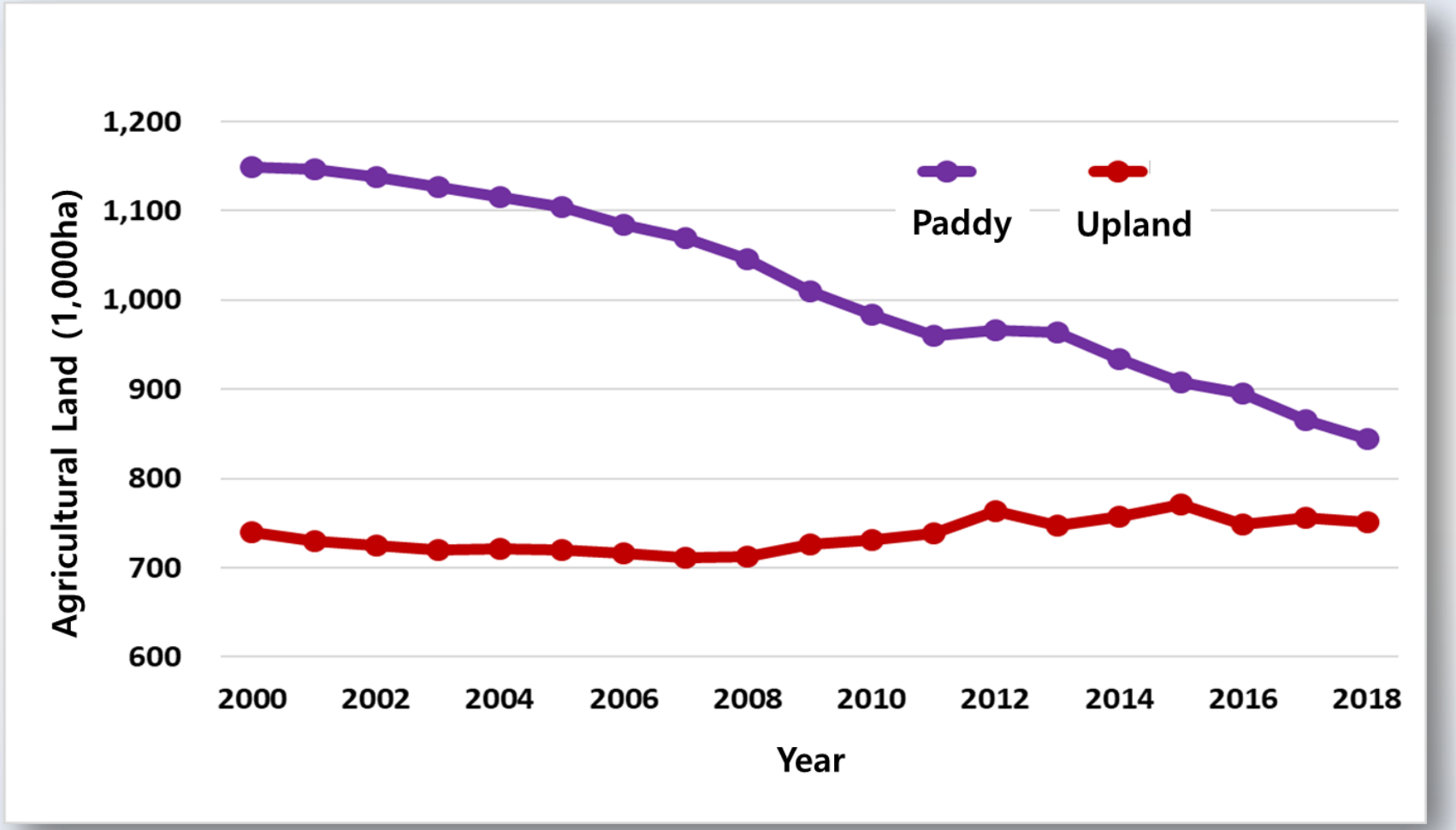


** The prediction for future is not so blight as you see this figure.

Temp. in far future will be rise about 6.5 °C, and precipitation be about 25.1 % according to SSP scenario if Korea will being last circumstance with present emission.

Changes of agricultural land

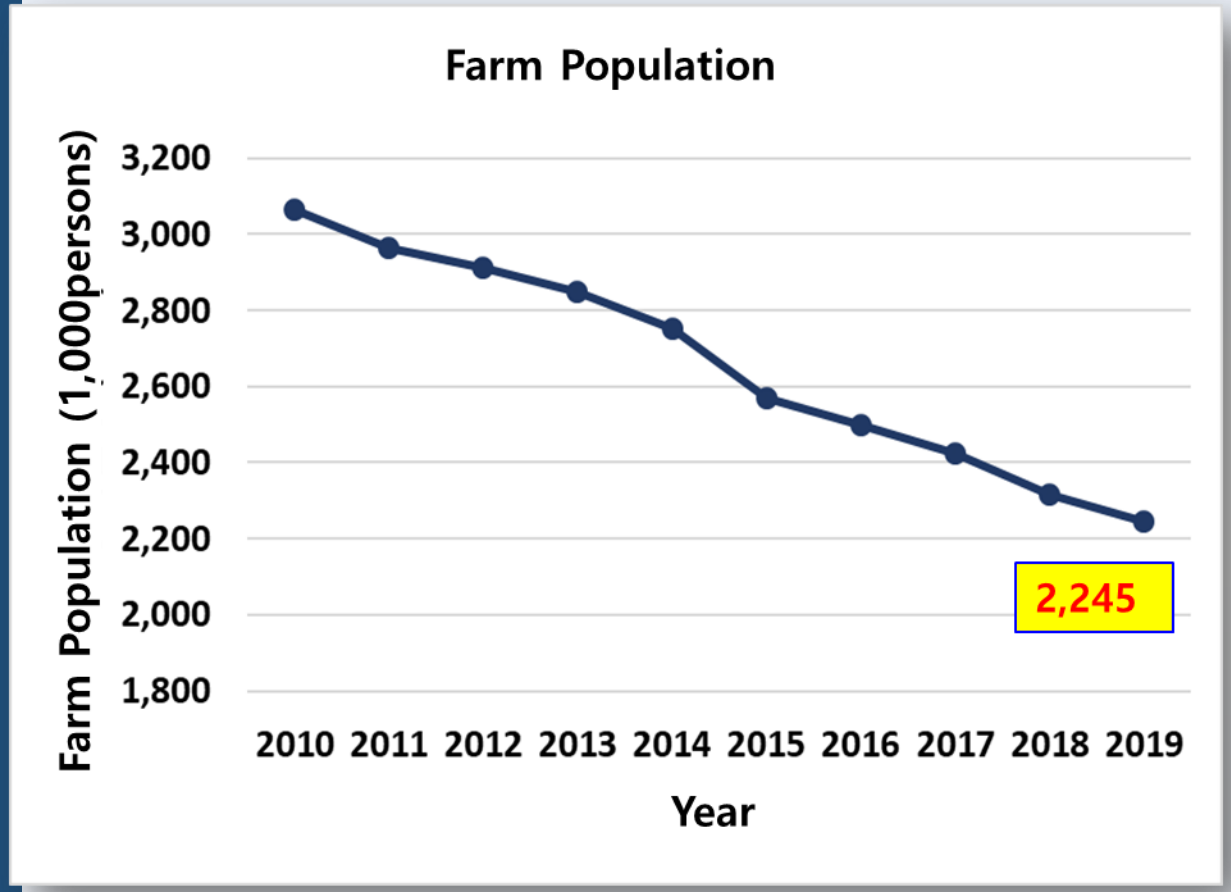
* 밭은 정체 상태인데 비하여 논은 급격히 감소하는 추세임

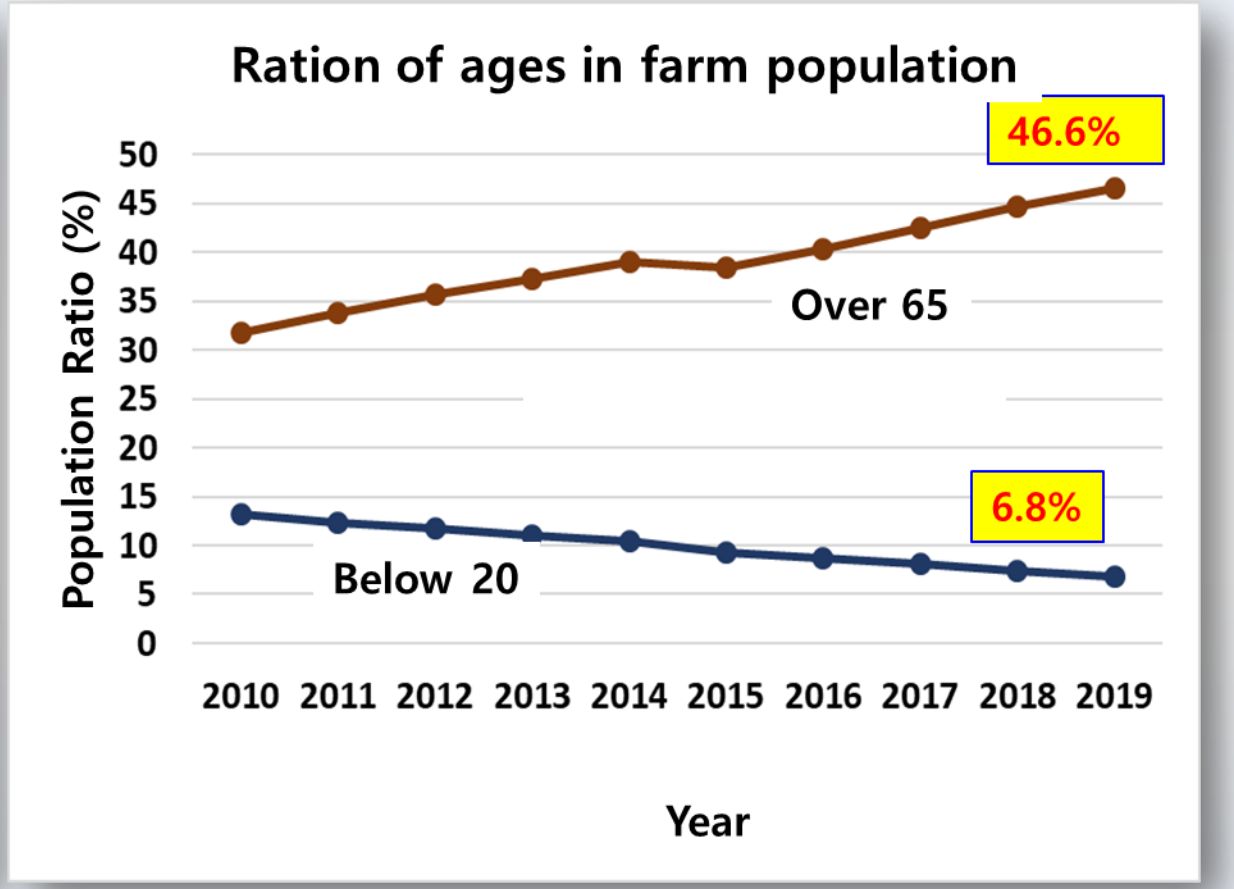


** Status in agricultural sector is not easy to cope with dimate change.

As you see this figure, changes of agricultural land, the land area have been rapidly decreased, especially paddy fields. We has to consider food security seriously.

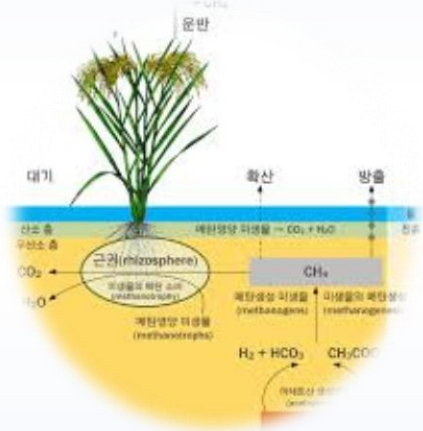
Changes of farm population and ratio of ages

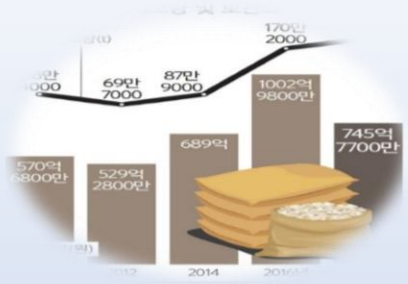




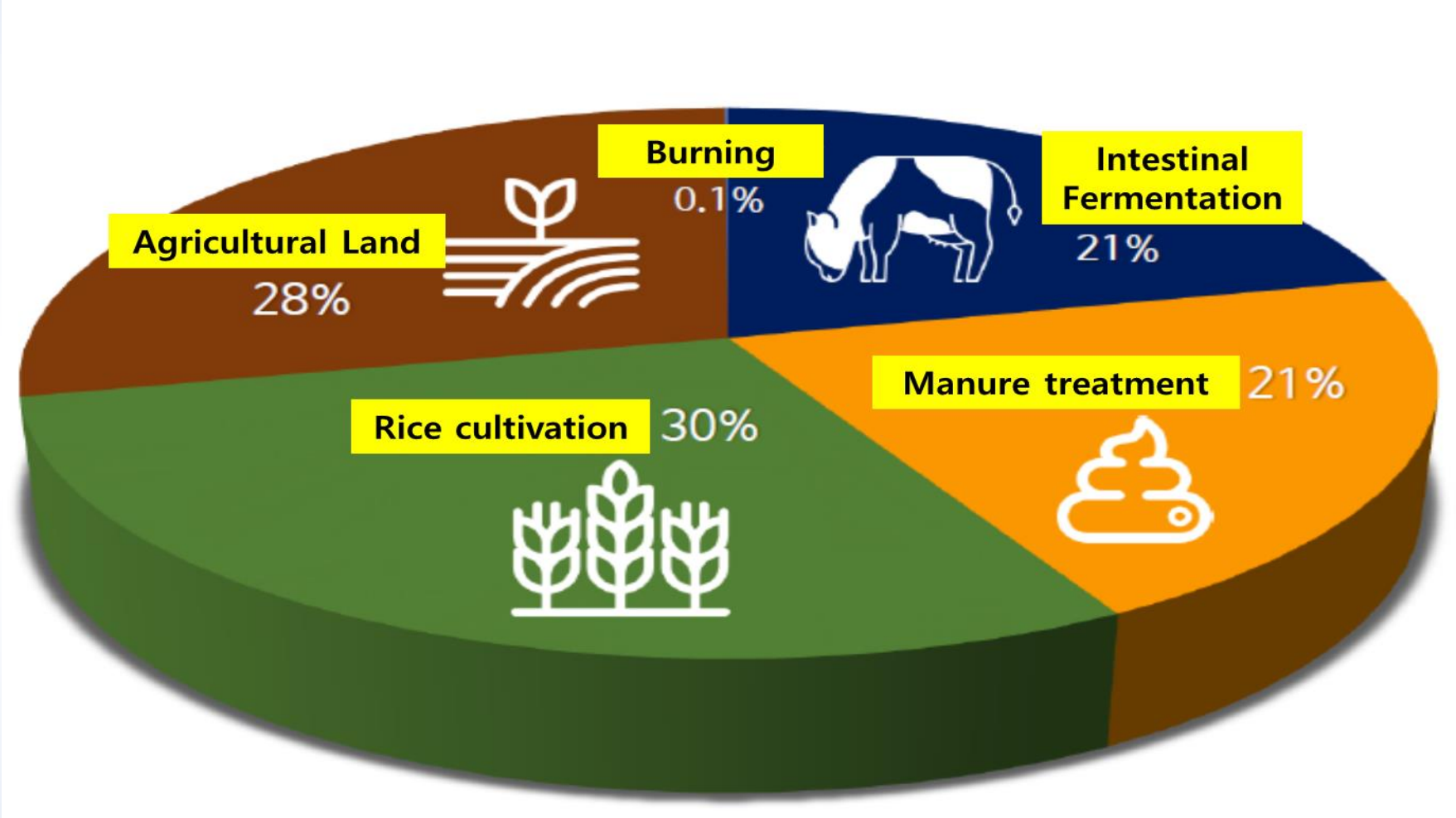
** Another important issues in agricultural sector are decrease of farm population and, especially, very fast population ageing as you see.
half of people in rural area is over 65. So I'm 55, looks young, but I'm called as the youth in rural area.

Ⅱ. Impact Assessment on Climate Change





Ratio of green house gas emission in agricultural sector



** The ratio of GHG emission in agricultural sector has been only charged about 2.9% among total emission in Korea.

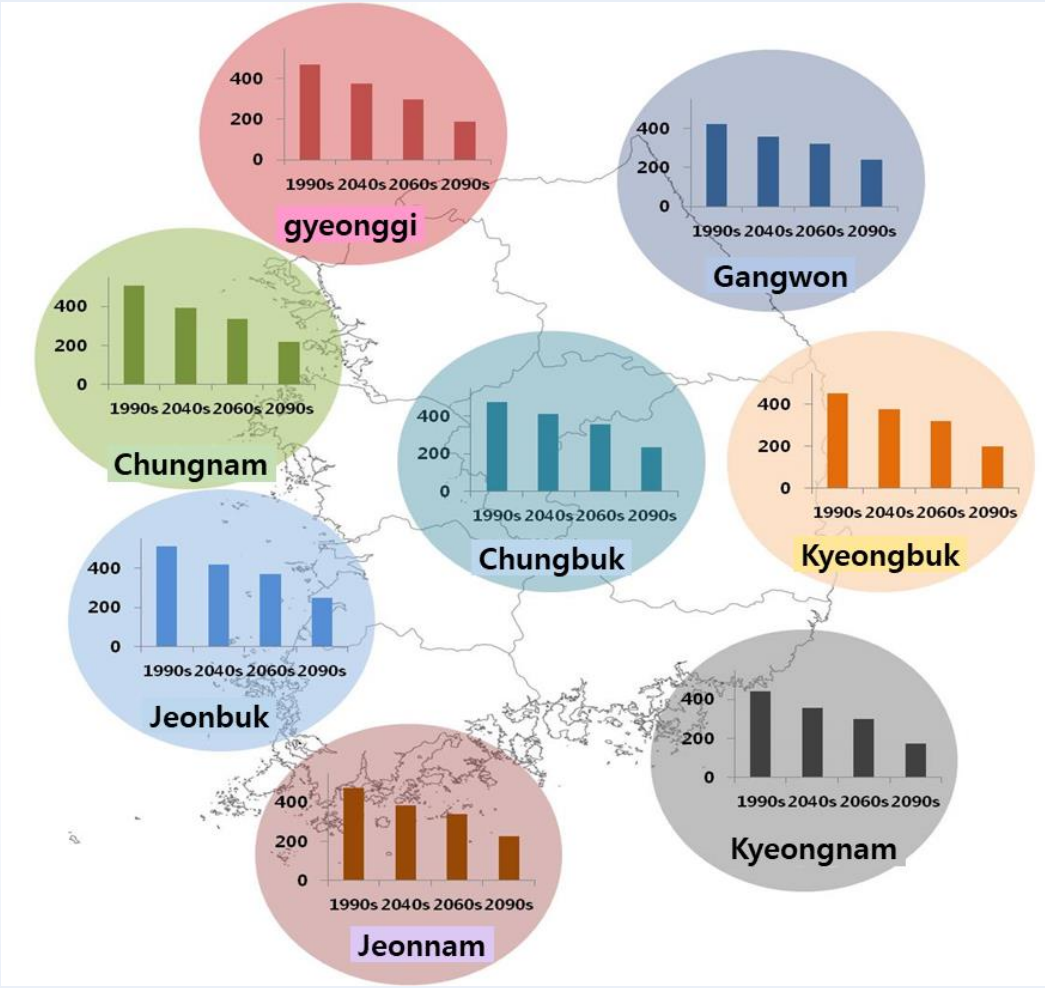
source of emission could be classified four categories such as agricultural land, rice cultivation at cultivation area, intestinal fermentation, manure treatment in livestock.

Especially, methane emission at rice cultivation and intestinal fermentation has been issued in Korea.

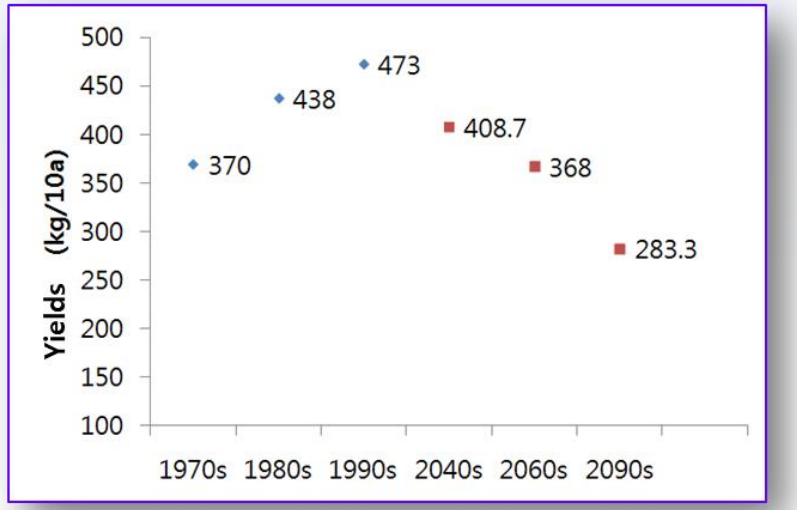
** 현재 품종, 재배기술이 적용되었을 때 2040년대부터는 전국적으로 수량 감소가 전망됨

Prediction of rice production according to RCP8.5 scenario

'16, NICS



ORYZA2000, RCP8.5 scenario

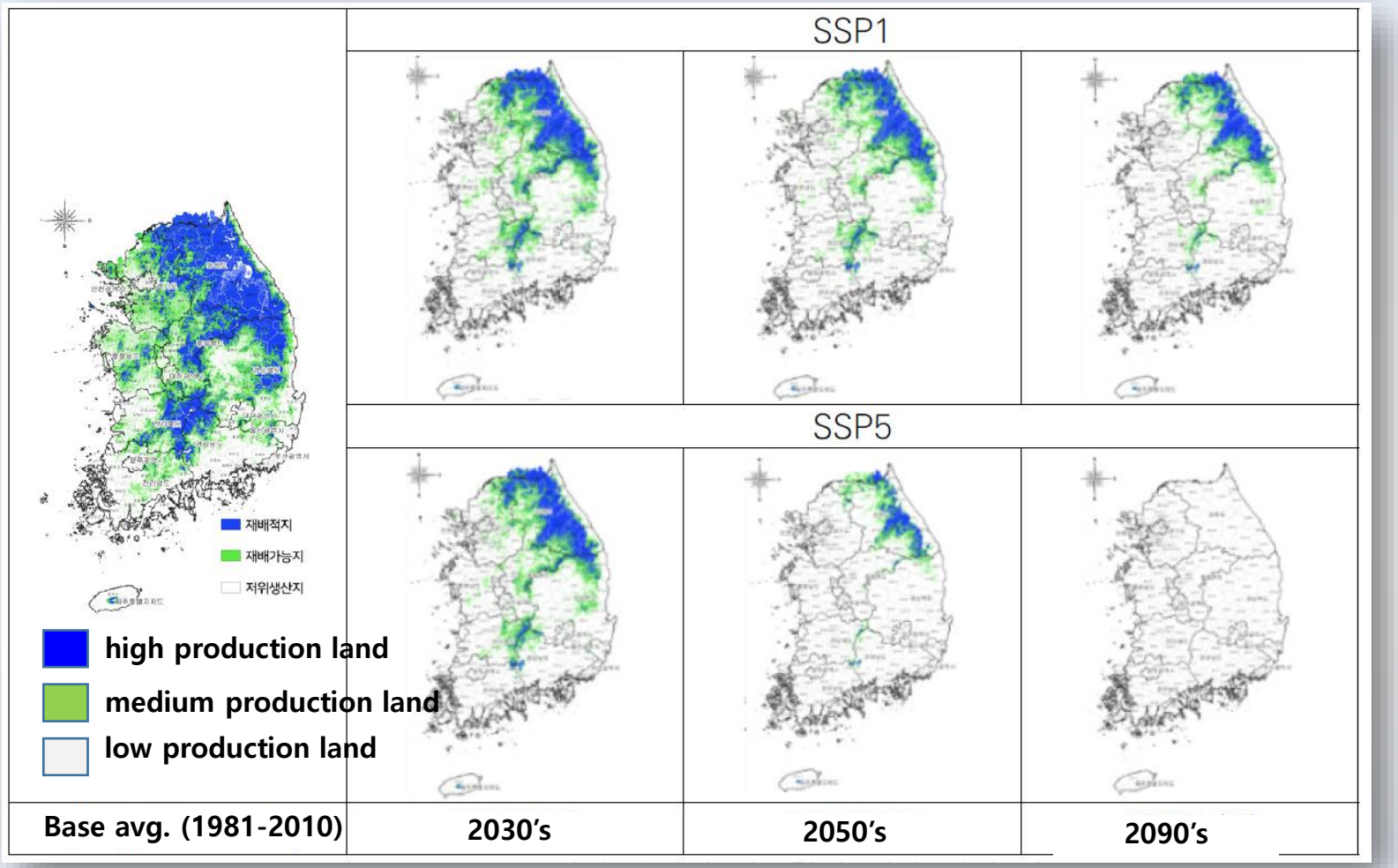


** When we cultivate rice with present varieties and same practice, it is projected there will decrease rice production form 2040's and become expand their loss as time goes.

As you see this slide figure, all of province in Korea shows very similar trends of decrease.

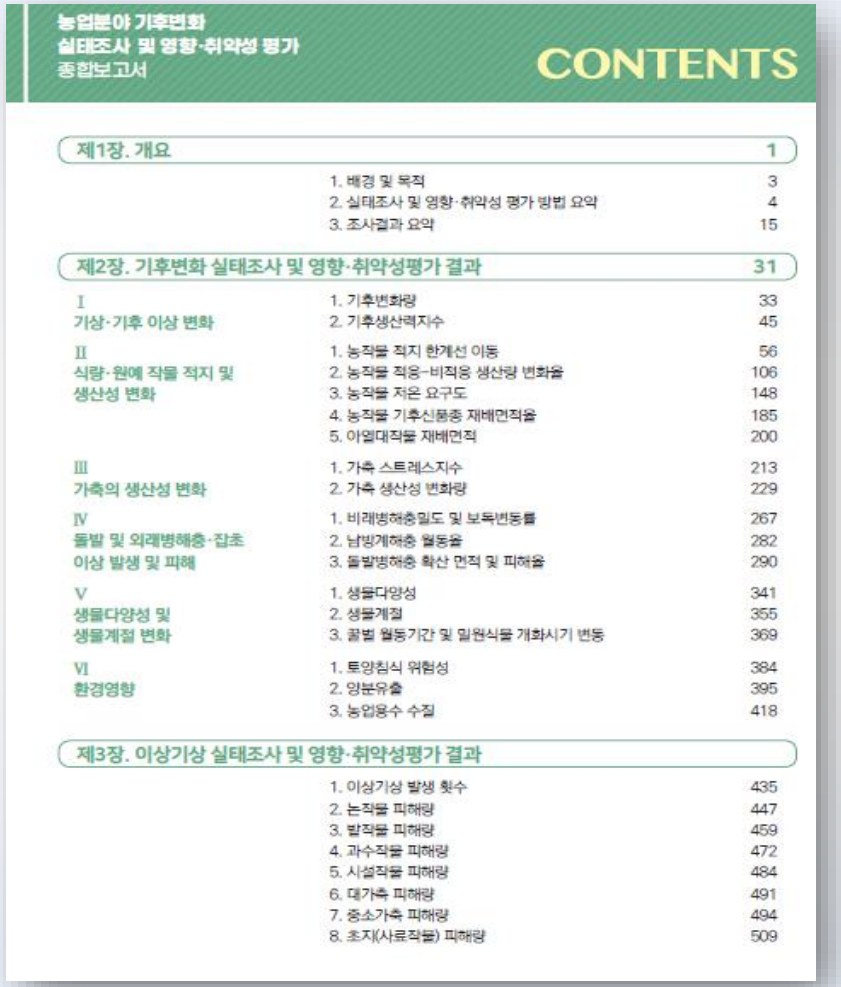
** 2000년대 후반기에는 강원 내륙으로 기후학적 재배적지 면적이 축소, 현재 추세로는 사과 재배지 소멸 전망

Changes of apple production land based on SSP scenario



** critical changes have been predicted in proper production area of apple in the base of SSP scenario. When we see results of cultivation area of apple in the SSP5 scenario in 2090's, no area couldn't proper to cultivate apples in Korea.

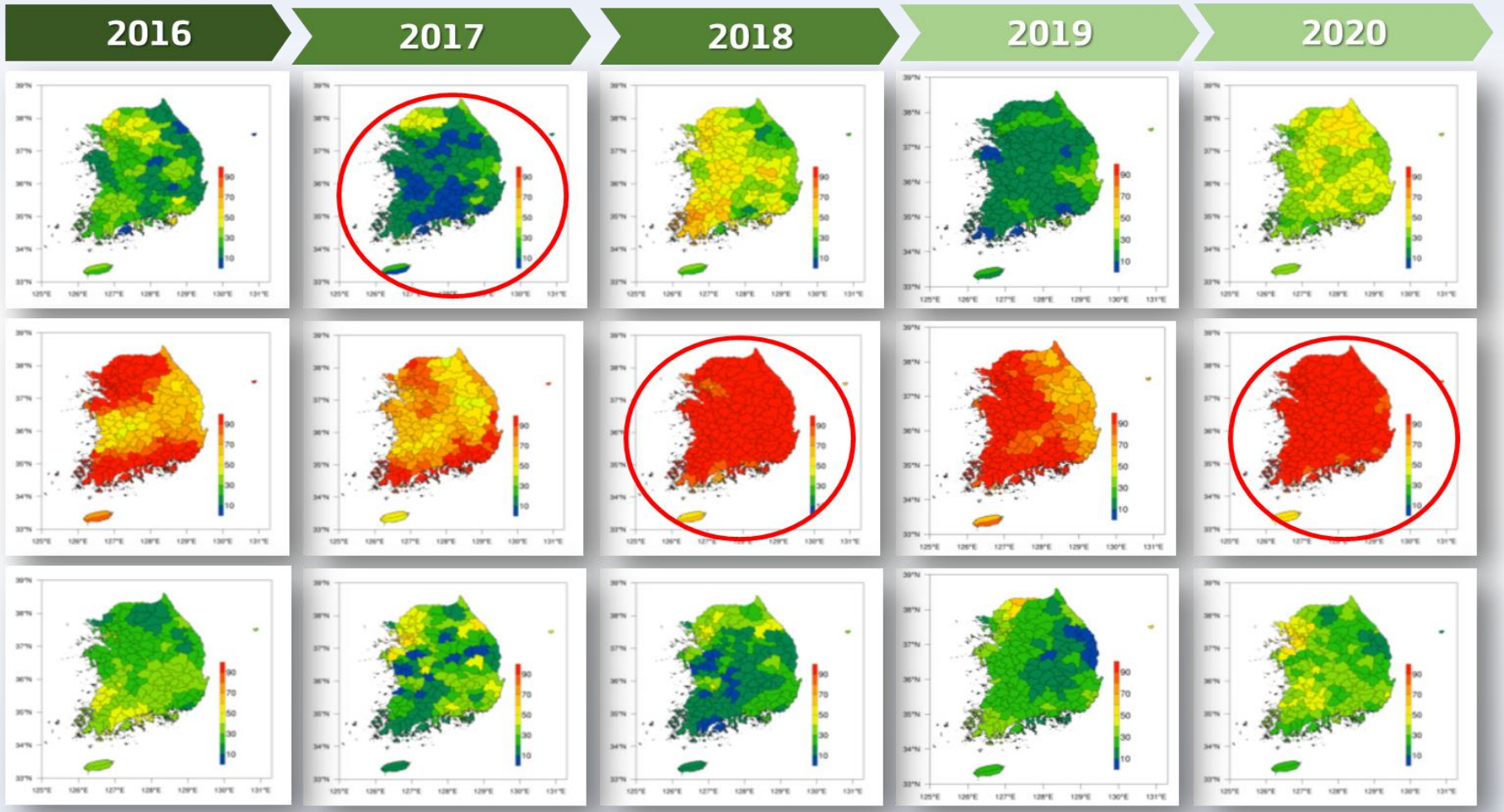
Report on survey of climate change and vulnerability assessment



** For coping with climate change in Korea, we have been established law relation to survey, assessment and evaluation of vulnerability in agricultural sector.

So after 5 years for law implementation, their results about climate change survey had been published last year. In Korean. This figures are cover and contents pages.

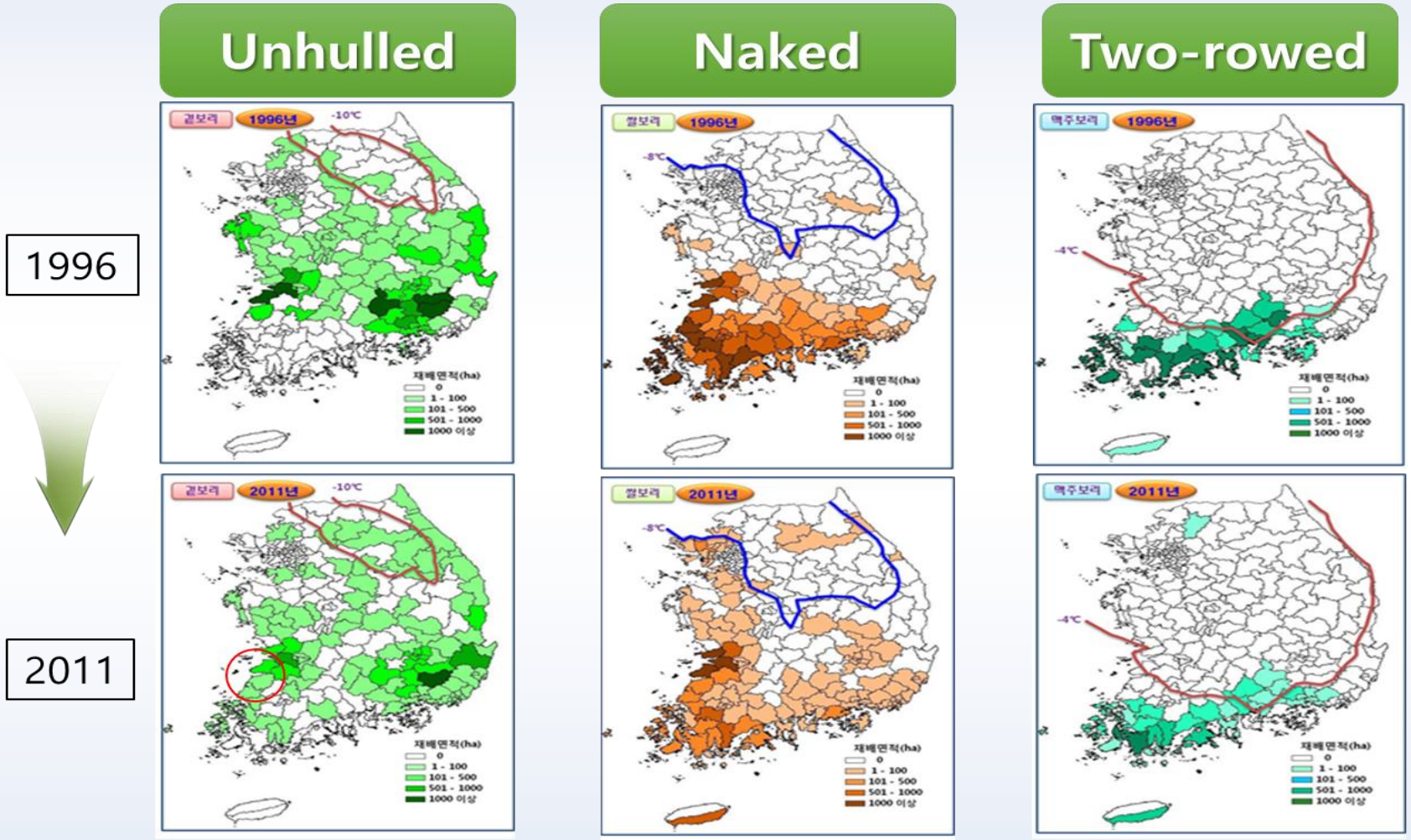
Distribution of times of abnormal climate occurances



** As I said previously, there are many abnormal climate. We have monitoring weather and climate data locally and in detail against temp.. Prep, sunshine, and etc.

The trends of ab. Temp, ab. Prep., and disaster in every year have been differently expressed according to local regions.

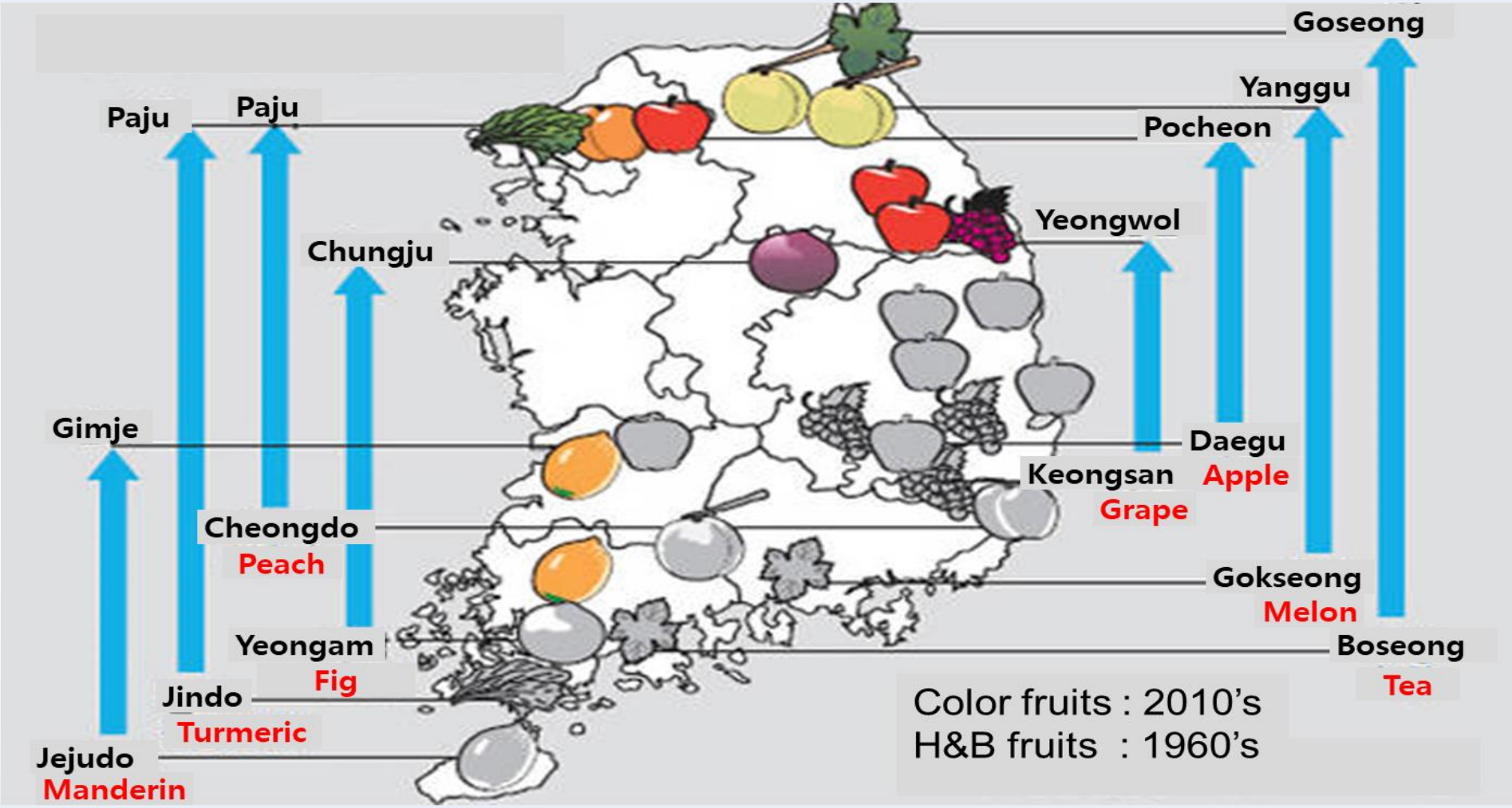
Changes of cultivated area of kinds of barely



** Since we have monitored area cultivated barley in 1996, some kinds of barley moved to north as this map. It is obvious that Korean peninsular has been warming rapidly.

So we are paying attention fast warming at winter season because this trend might be give us new opportunity.

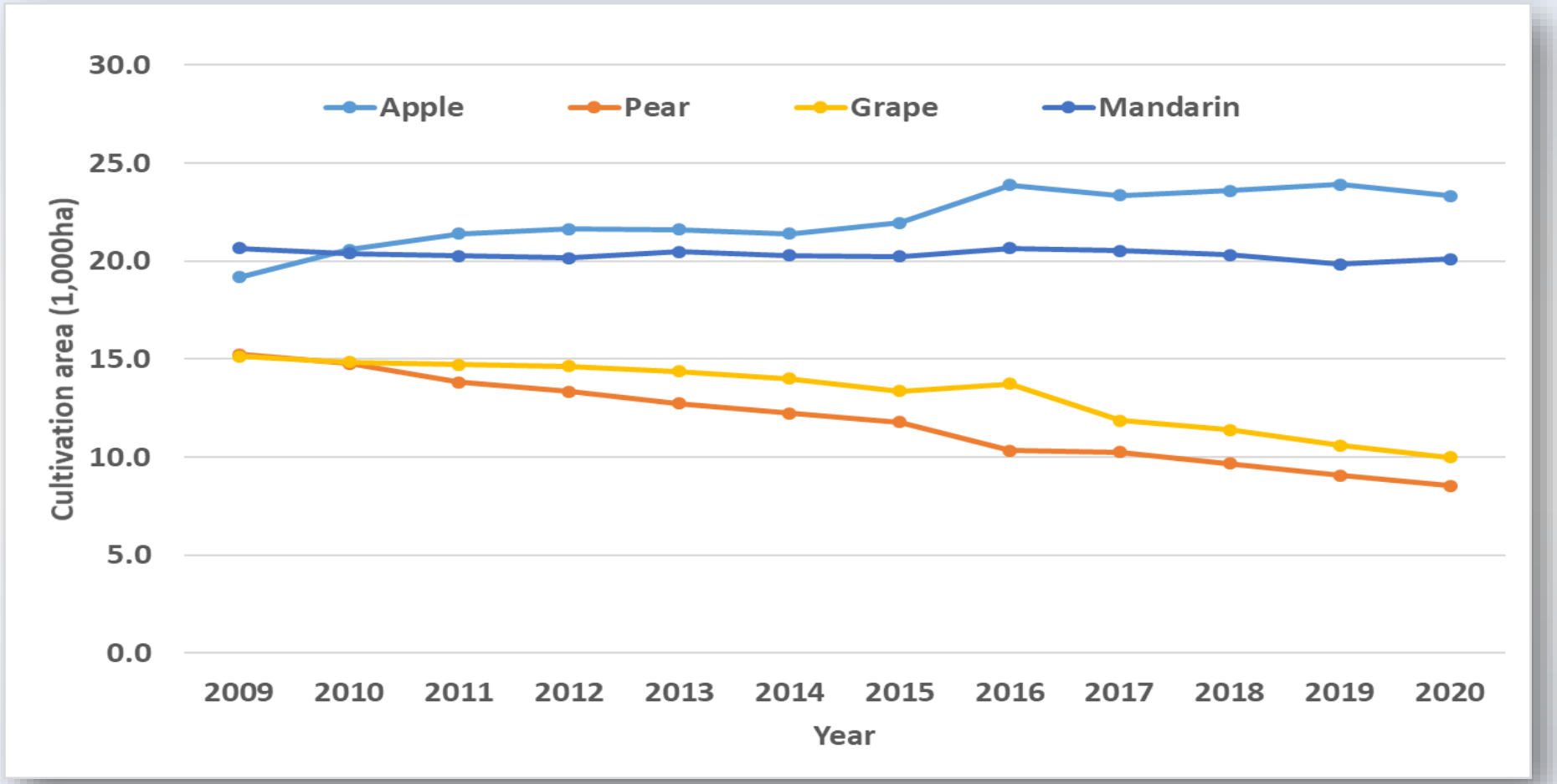
Changes of cultivated area for major kinds of fruits



** Most of fruit including apple, grape, peach, mandarin and etc.. has been moved toward north area as this figure shows.

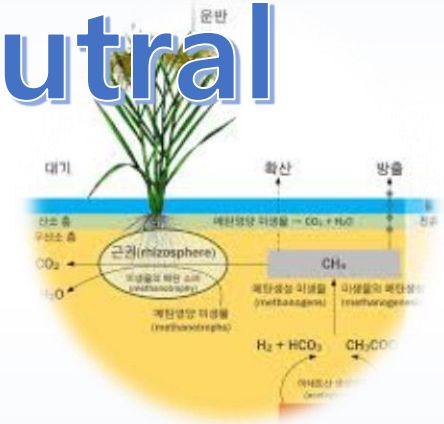
We have to prepare adaptation technology in fields of breeding, cultivation, cropping system in north area.

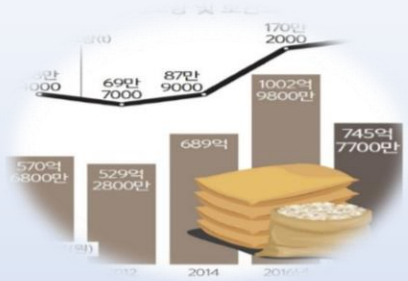
Changes in cultivated area in 2020 compared to 2020



** Except dimatic factor, there are another factors to contribute production variability in agricultural production. Representative examples are here. Since in 2009, the area grape and pear has been decrease continuously but apple and mandarin sustained or increased a little. We evaluated that grape was affected by FTA in agricultural sector, and pear was changed customer preference. So we has to consider all of factors for copping with dimate change in agricultural sector.

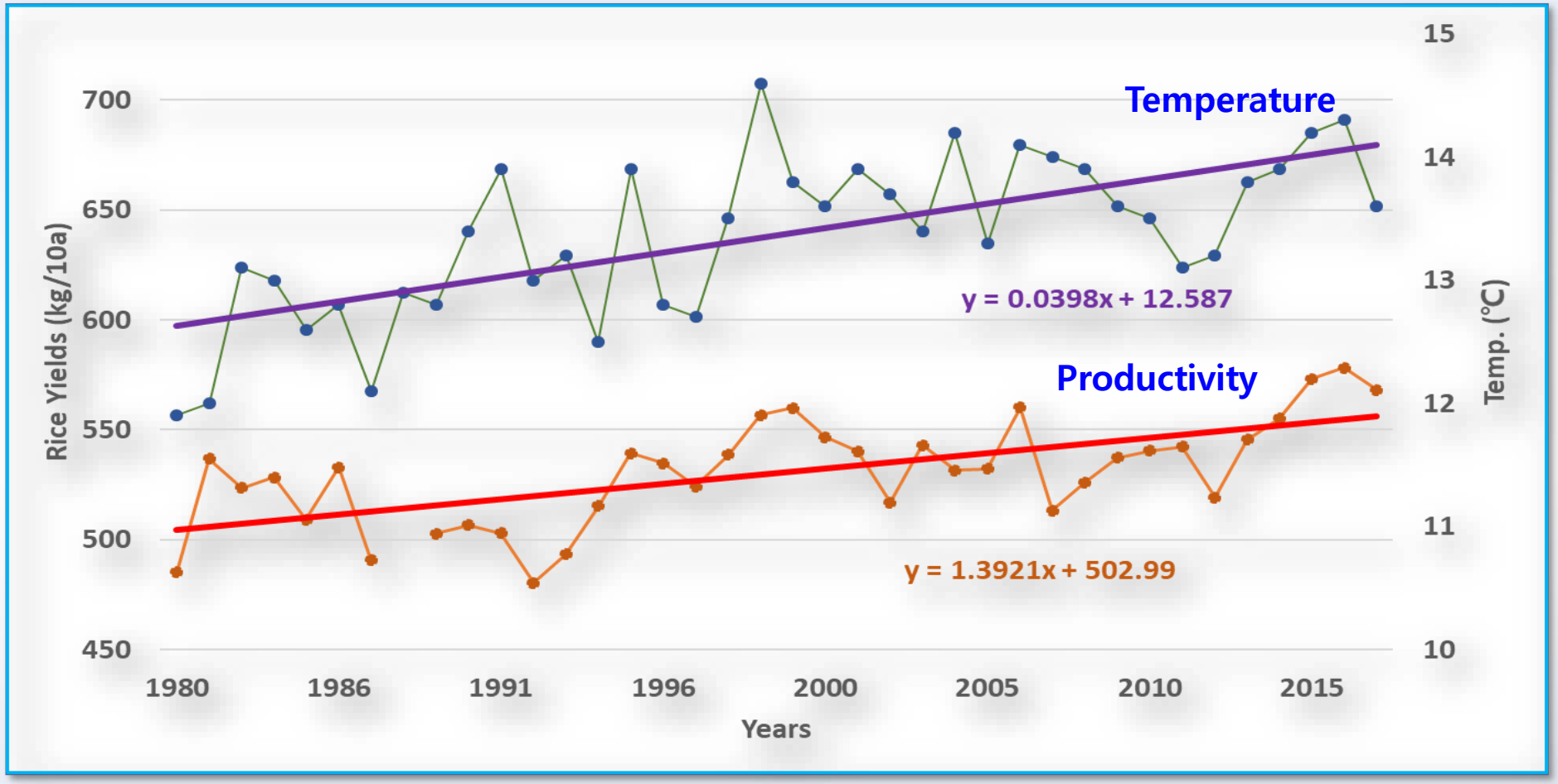
Ⅲ. Adaptation and Carbon Neutral





** 1980 이후 밥쌀용 품종개발은 온도 증가에 대응하여 지속적으로 이루어지고 있으며 수량성도 개선되고

Development of rice varieties according to Temp. increase

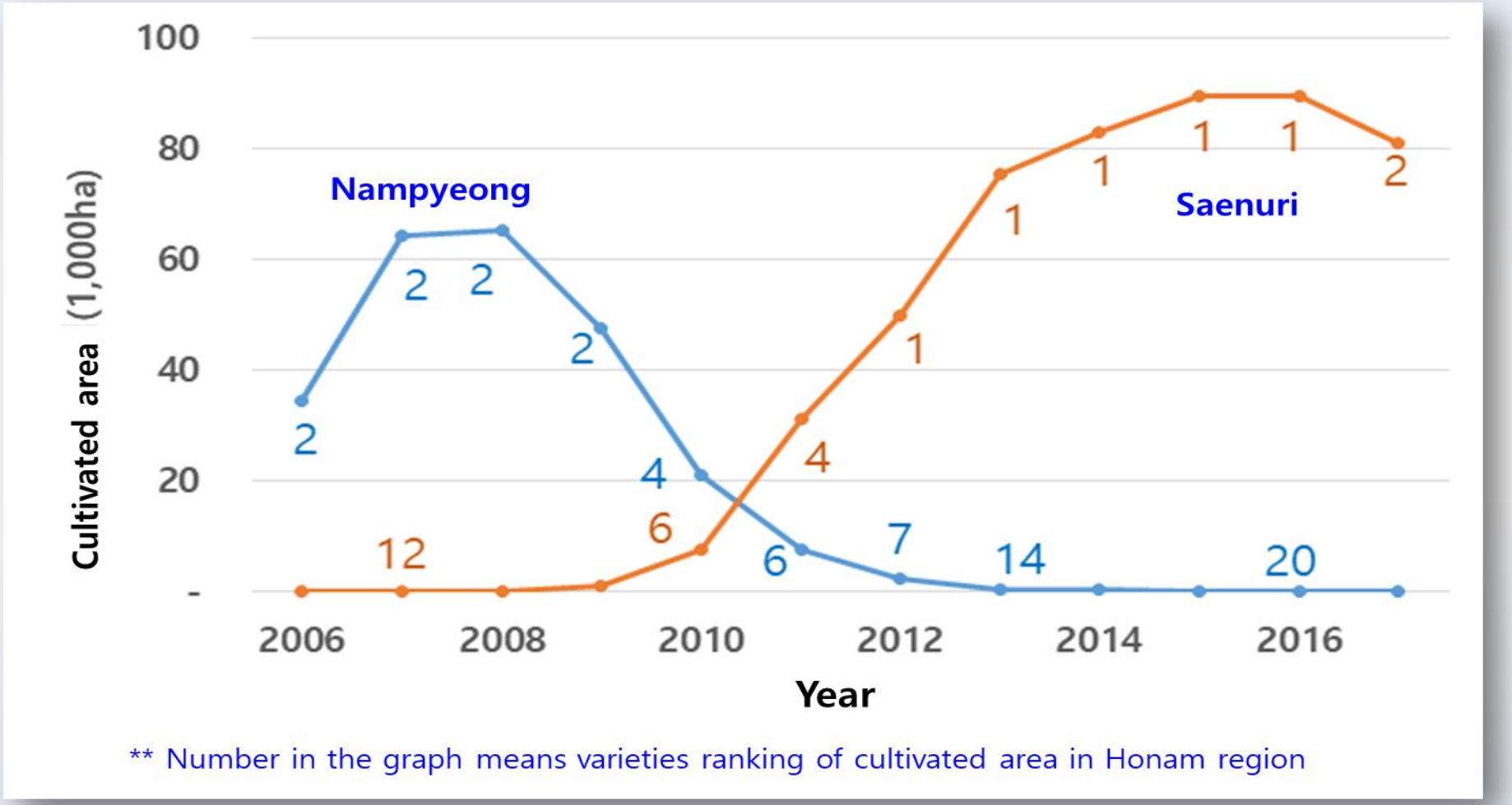


** Rice is most important crop in Korea. So we continuously tried to develop new rice varieties in point of view productivities and qualities.

This figure shows changes of average temp. and average productivities of edible rice varieties developed. It seems that slopes of two curves are very similar.

It means that rice production against climate change has been adapted as productivity slightly and continuously increase.

Change of farm rice varieties according to disease, bacterial blight



** Here's adaptation example as rice variety has replaced due to emergence new race of bacterial blight.
New variety Saenuri which have new resistance gene against bacterial blight has rapidly replaced old variety Nampyeong which is sensitivity to new race, since new race of bacterial blight has been spread out at Honam area.

** 중부지방(수원)에서 옥수수 2기작이 가능하며 2번째 재배의 경우 봄재배 대비 재배일수가 약 15일 단축

Development of double cropping cultivation of corn

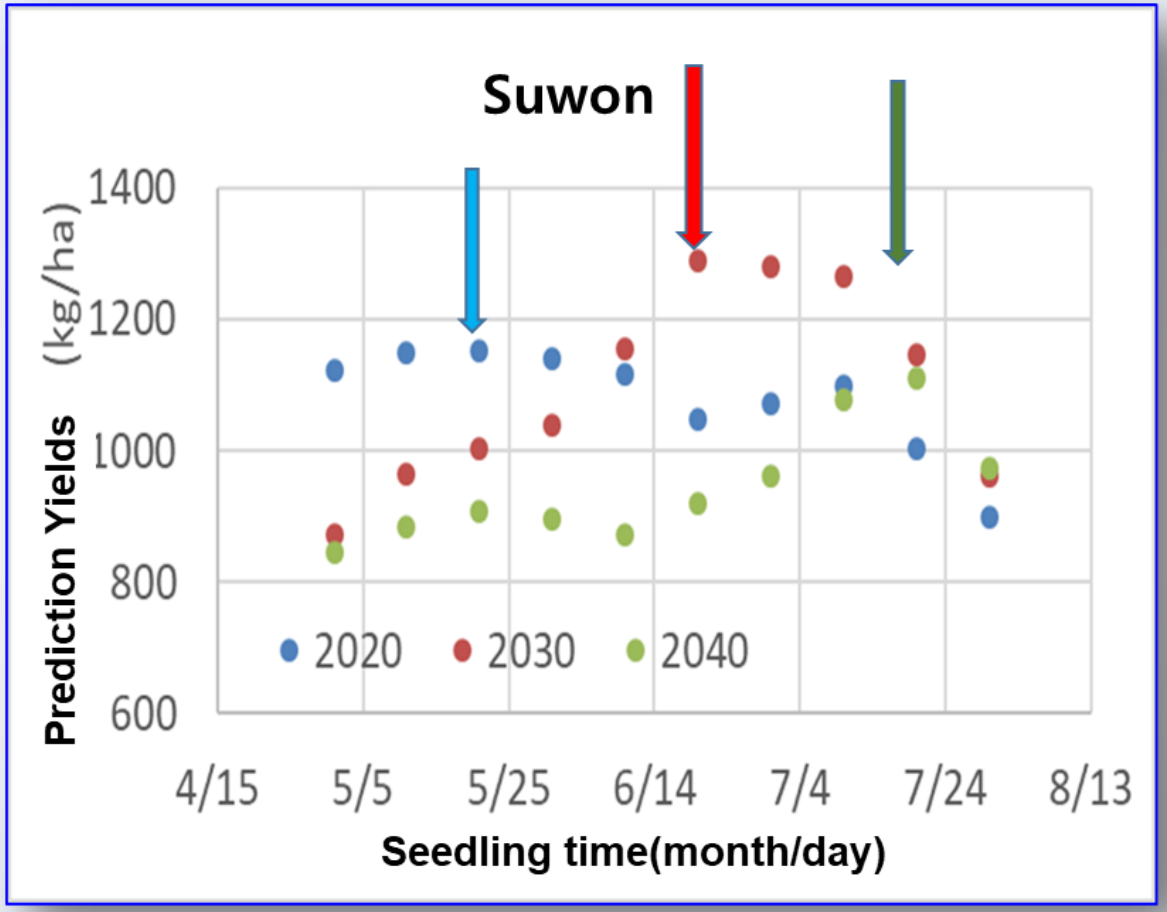
('16, NICS)

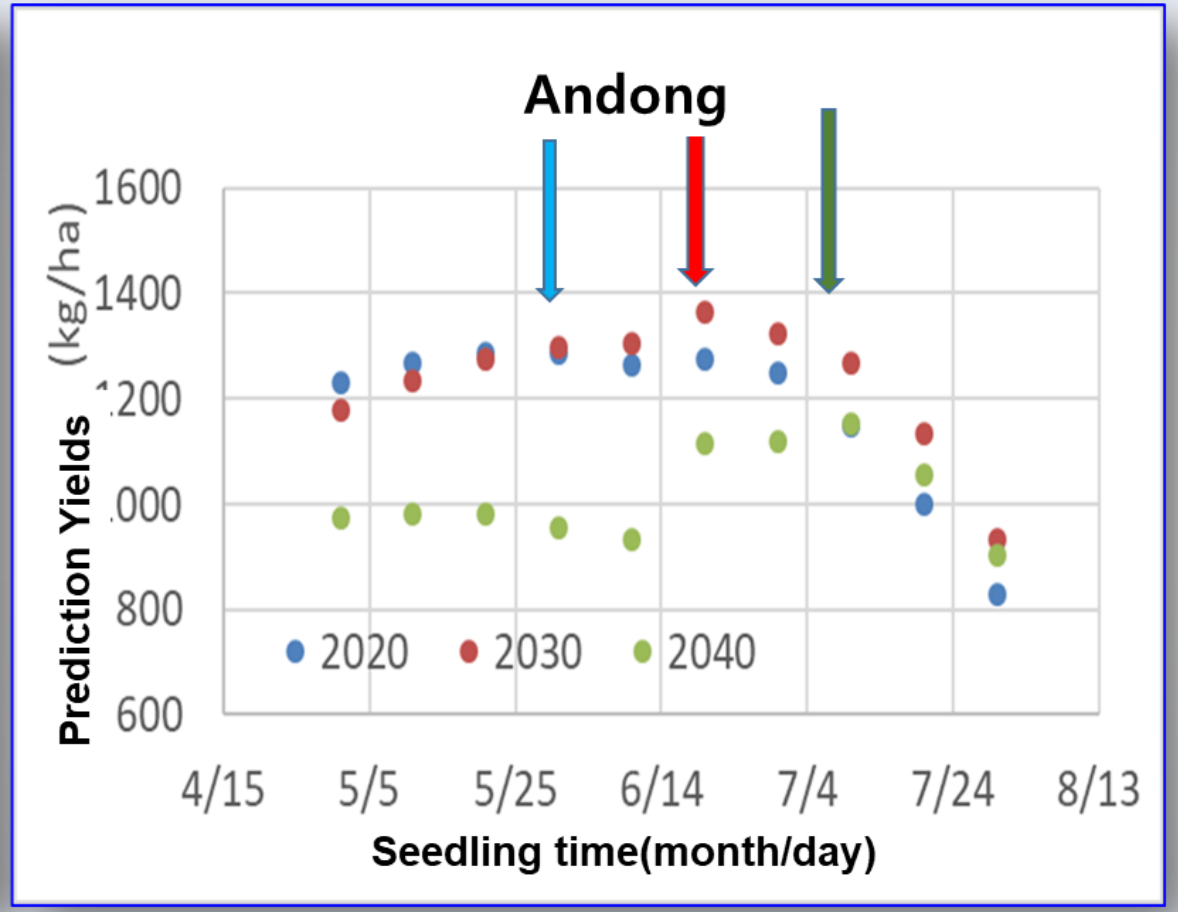
Methods	Periods od edible corn cultivation	Seedling-harvest (Days)
Spring Cultivation	Seedling (4.10) → Emerging ear (6.25~30) → Harvest (7.20~25)	100~105
Autumn Cultivation	Seedling (7.20~25) → Emerging ear (9.10~15) → Harvest (10.20~25)	85~90

** We also developed double cropping cultivation technology of corn in middle-north region as you see this slide. Spring cultivation is general cultivation. But autumn cultivation is not recommended due to periods of growth and its low productivity. As warming continues, it is possible to product about 90 to 95% of yields and decrease periods of growth when new technology is applied.

** 수원, 안동 지역의 경우 2030년대에는 6월 하순 파종이 유리할 것으로 전망, 2040년대에는 7월이후 파종이 접함

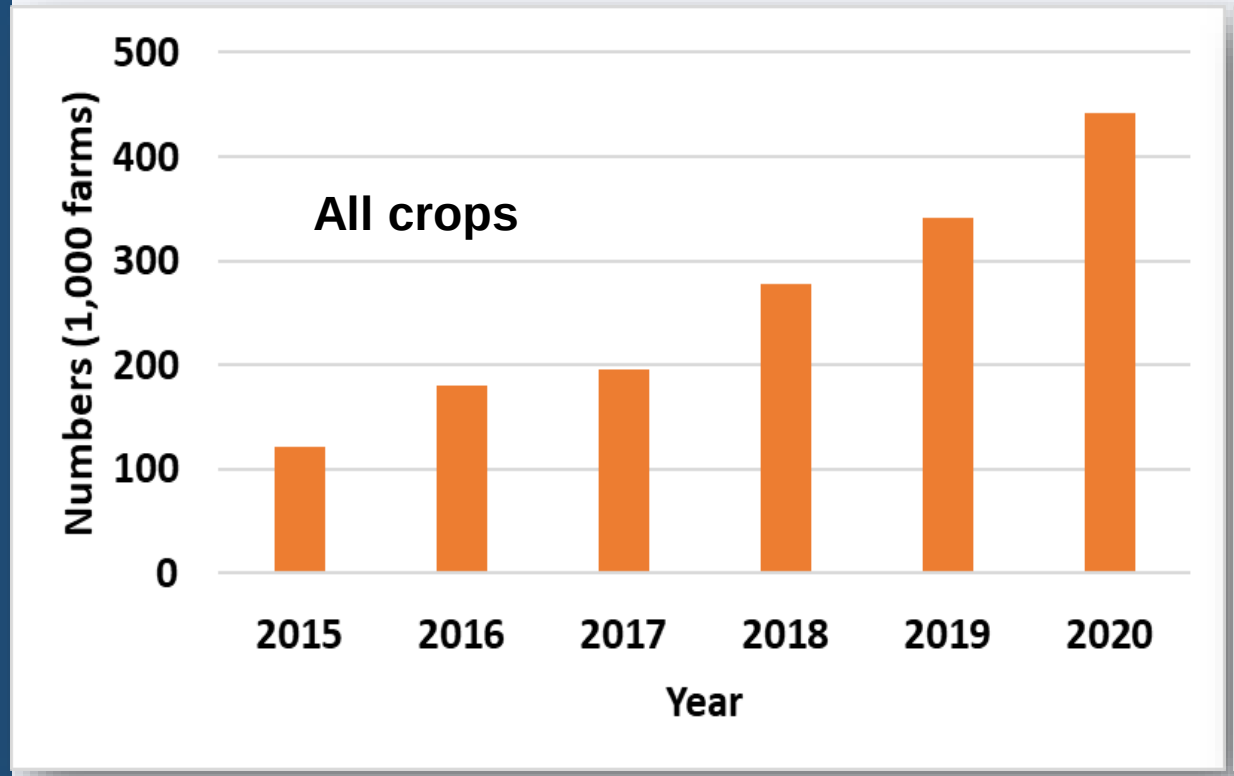
Prediction for changes of proper seedling time of soybean

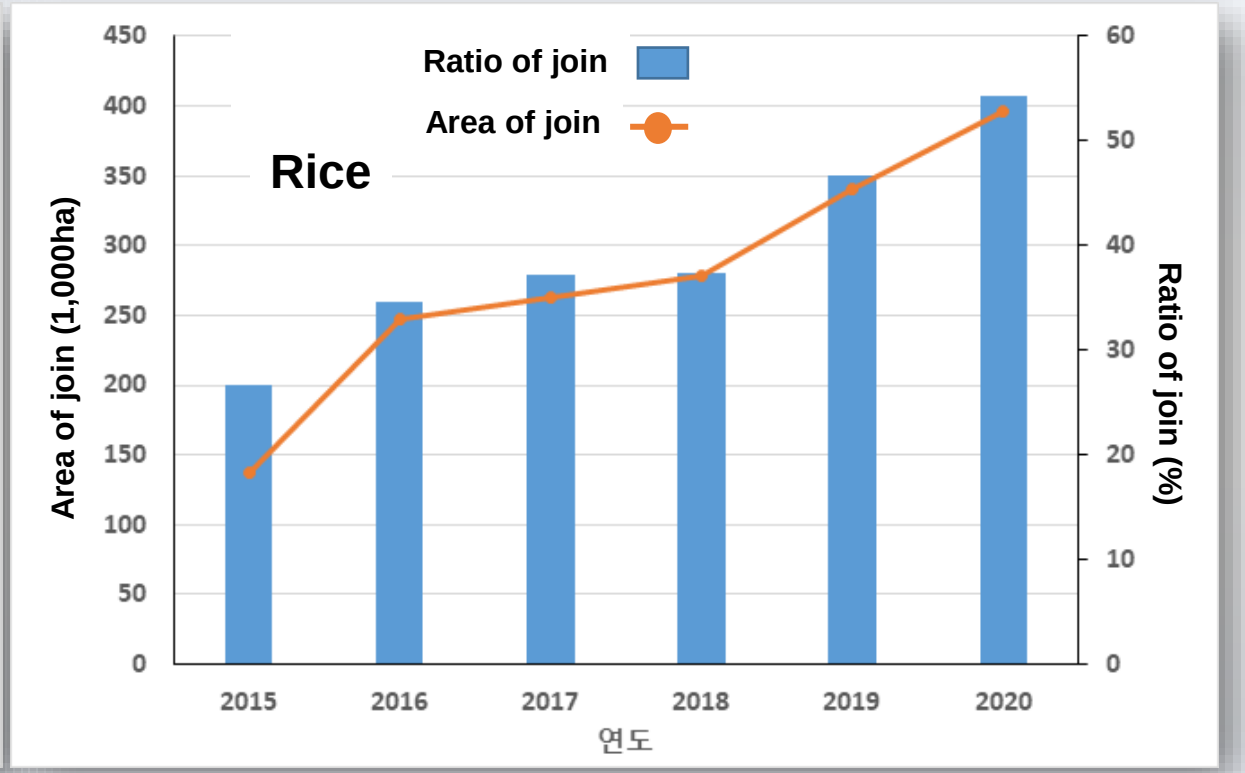




** The technology of simulation of soybean was introduced to predict and define optimum seeding periods in the future.
As you see the two figures with two regions, proper seedling time predicted to be delayed in 2030's and 2040's compared with present time at all of regions.
So we has to prepare development of technology for moving seedling time locally to sustainable pricution.

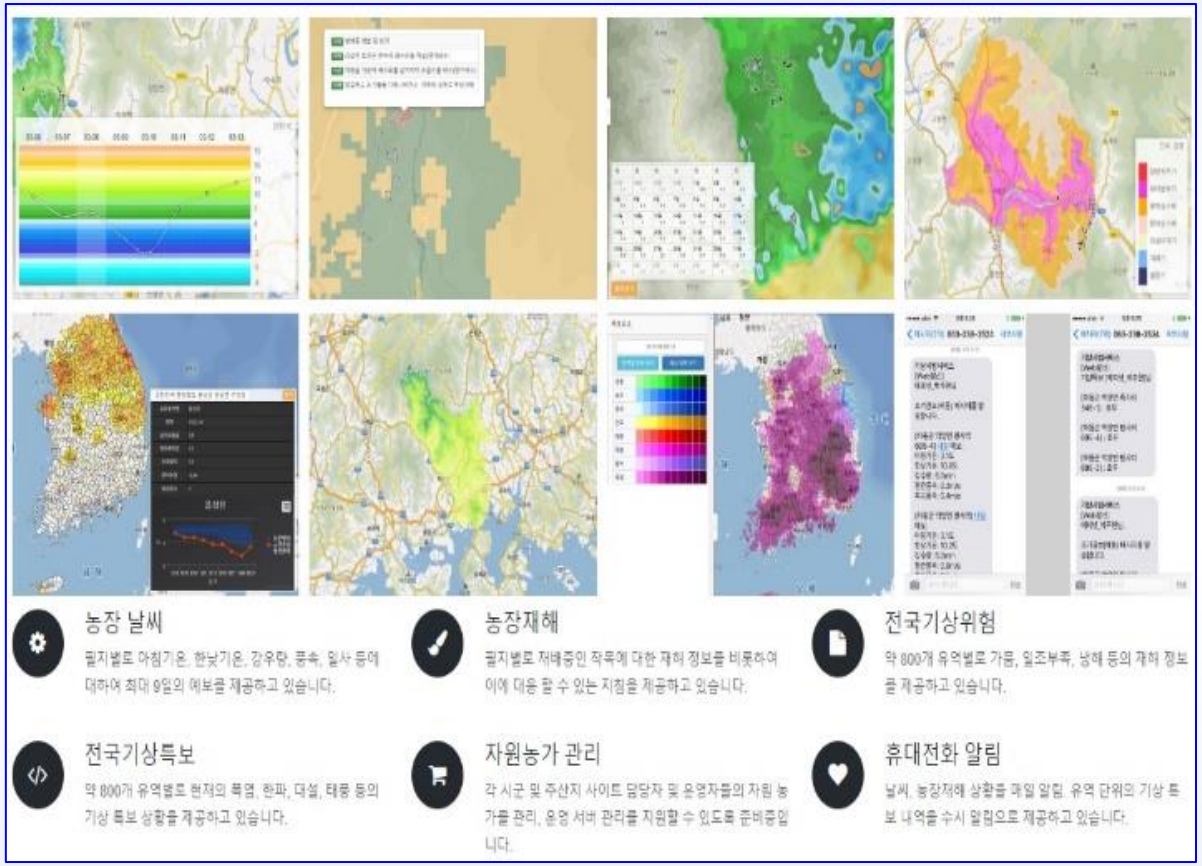
Insurance for damage due to climate disaster





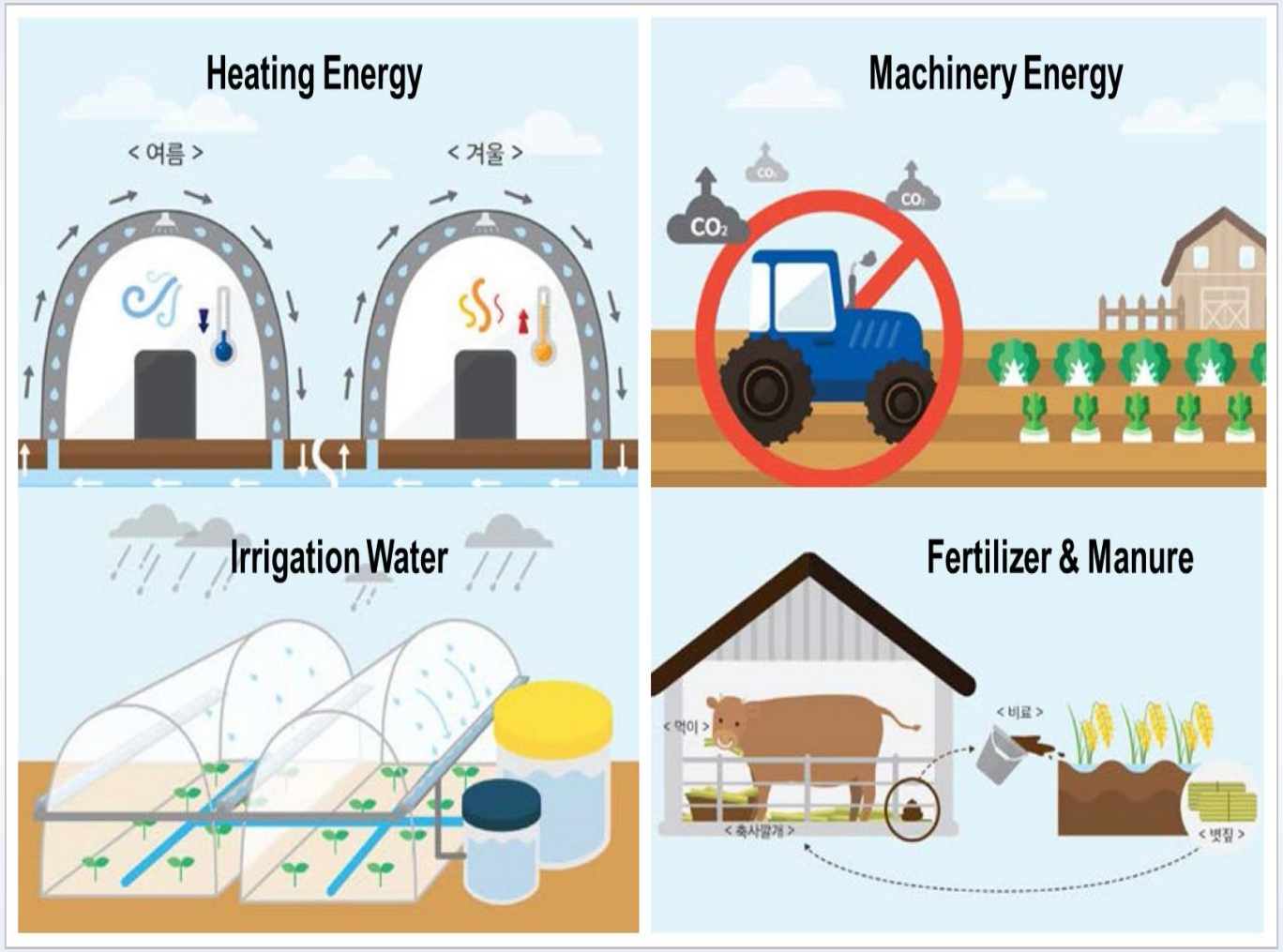
** Introduction with political and legal implementation is also important to copping with climate change. Since crop disaster insurance has been introduced in 2013, the numbers of kinds of crops have been gradually increased from 54 crops in 2013 to 67 crops in 2017. Farmers joined have been continuously increased like left figure. Especially, the ratio of joined farmers has been over 50% in 2020.

Early warning system against climate disaster



** As we mentioned previously, there are many weather disasters every year. To reduce damage, it's very important for farmers to get the information of weather and disaster occurrence as fast as they can. So we have established system, called early warning system against agricultural dimate disasters, and provide internet and mobile service including present and forecast weather in farm scale, national weather breaking news, and mobile alarm.

Certification for low carbon products



** Another supporting system is certification for low carbon products. The items for getting certification are consisted of saving heating energy, machinery energy, efficient use of irrigation water, reducing fertilizer and manure and etc. farmers who have been obtained certification could receive low carbon labeled marker which can attach their product to have merit to sell.

Establishing ‘carbon offset scheme’ for voluntary reduction of GHG emission

Registration → Certification reduction → Payment incentive
~10$/1t CO_2-eq

** To expand benefit for farmers, we added another system called ‘carbon offset scheme’ which is to pay directly to farmers who are certified carbon reduction instead of giving low carbon label. Payment incentive is about 10$/1t co2-eq. It seems not to be much.

Implement of demonstration project for reducing methane in paddy

5월 30일 이앙, 중만생종

재배단계			5월 20	30	6월 6	7	7월 6	7	20	27	8월 28	3	11	22	29	9월 30	23	24
			써레질	이앙	활착기		분얼기	최고분얼기		무효분얼기	유수형성기		수잉기	출수기		등숙기		등숙후기
저탄소 (4주)	최고	수동	4		7		0				4			2			무관개	
	최저	수동	2		4		-10				2			-3			무관개	
	기간		7		30		28				26			25			30	
저탄소 (3주)	최고	수동	4		7		0				4			2			무관개	
	최저	수동	2		4		-10				2			-3			무관개	
	기간		7		30		21				33			25			30	
관행 (2주)	최고	수동	4		7		0				4			2			무관개	
	최저	수동	2		4		-10				2			-3			무관개	
	기간		7		30		14				40			25			30	
물관리 (상시담수)	최고	수동	4		7		4							2			무관개	
	최저	수동	2		4		2							-3			무관개	
	기간		7		30		54							25			30	

Low carbon irrigation schedule

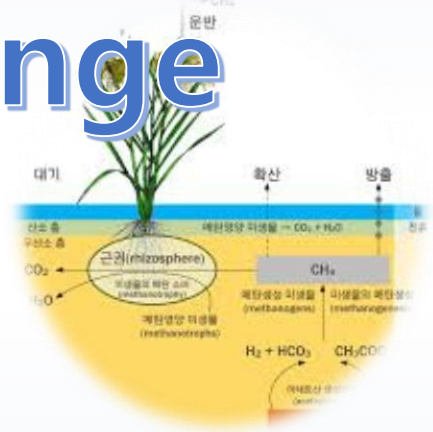
Mobile gate control app

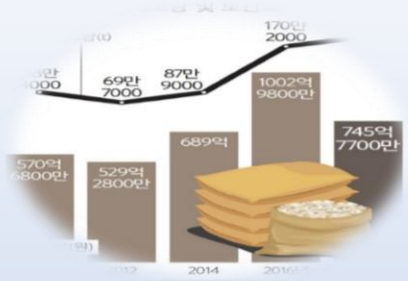
Automatic irrigation gate

Methane chamber

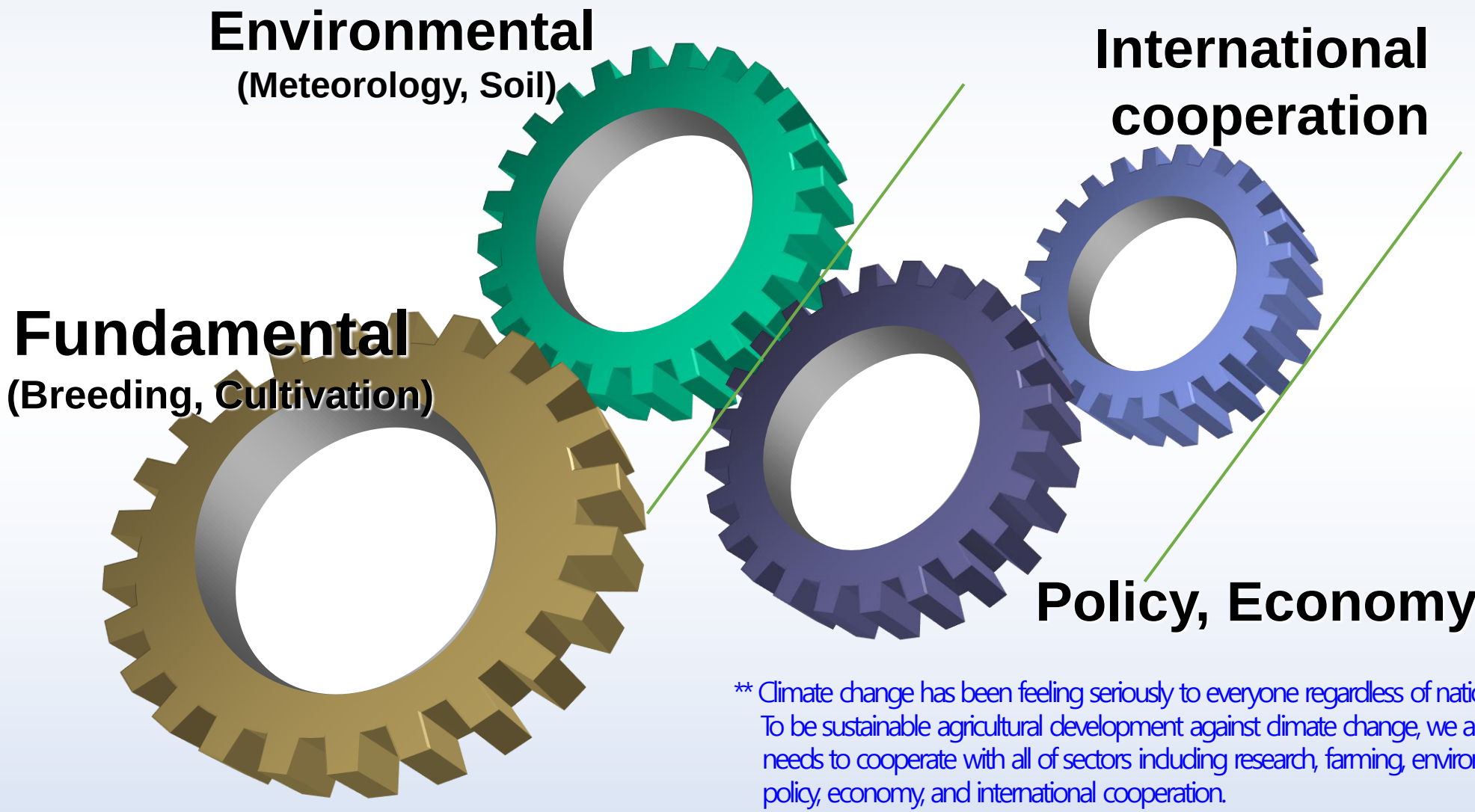
** We have been carrying out demonstration project on increase intermittent irrigation in paddy fields for reducing methane emission at several legions.
To getting related data and making easy management irrigation, we developed and applied remote control automatic irrigation gate in the base of mobile system.
By using this automatic gate, we could be understand and measured how to manage irrigation schedule without productivity and with reduction emission.

IV. Future against Climate Change





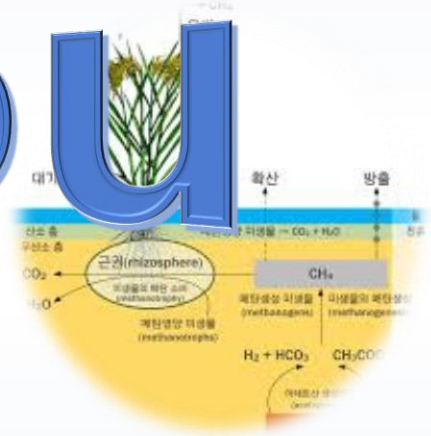
Organic integration with all of fields for responding climate change

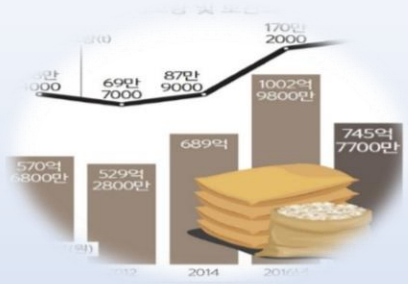


** Climate change has been feeling seriously to everyone regardless of nationality. To be sustainable agricultural development against climate change, we absolutely needs to cooperate with all of sectors including research, farming, environment, policy, economy, and international cooperation.

농사를
지어본들
豊
年

Thank you


대기
확산
방출
근권(rhizosphere)
CO_2
CH_4
$H_2 + HCO_3$


570억
6800만
529억
2800만
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2014