Climate Change and the Impacts of Plant Variety Protection

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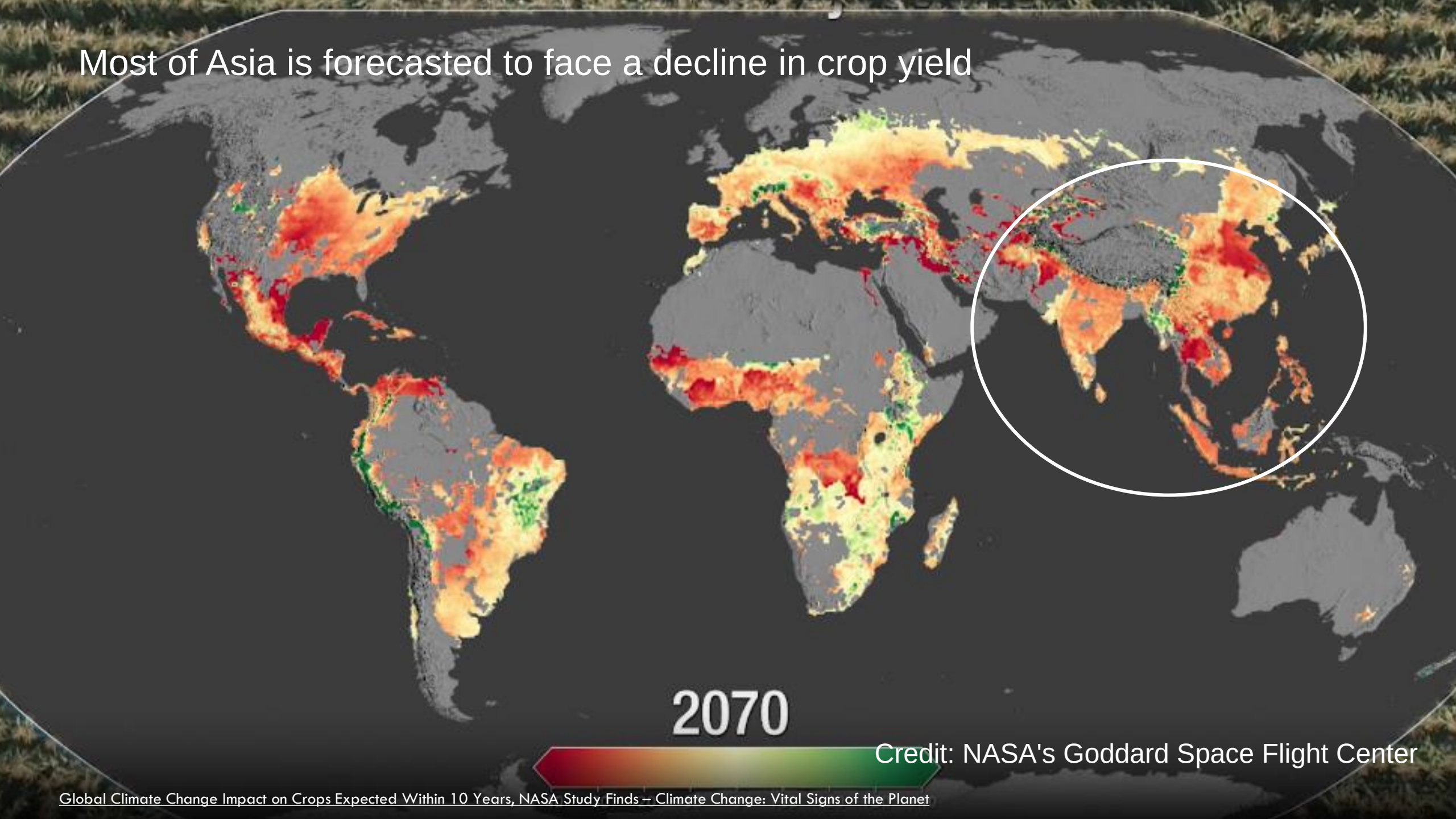
Climate Change
and its Impacts on Agriculture

Most of Asia is forecasted to face a decline in crop yield



Credit: NASA's Goddard Space Flight Center

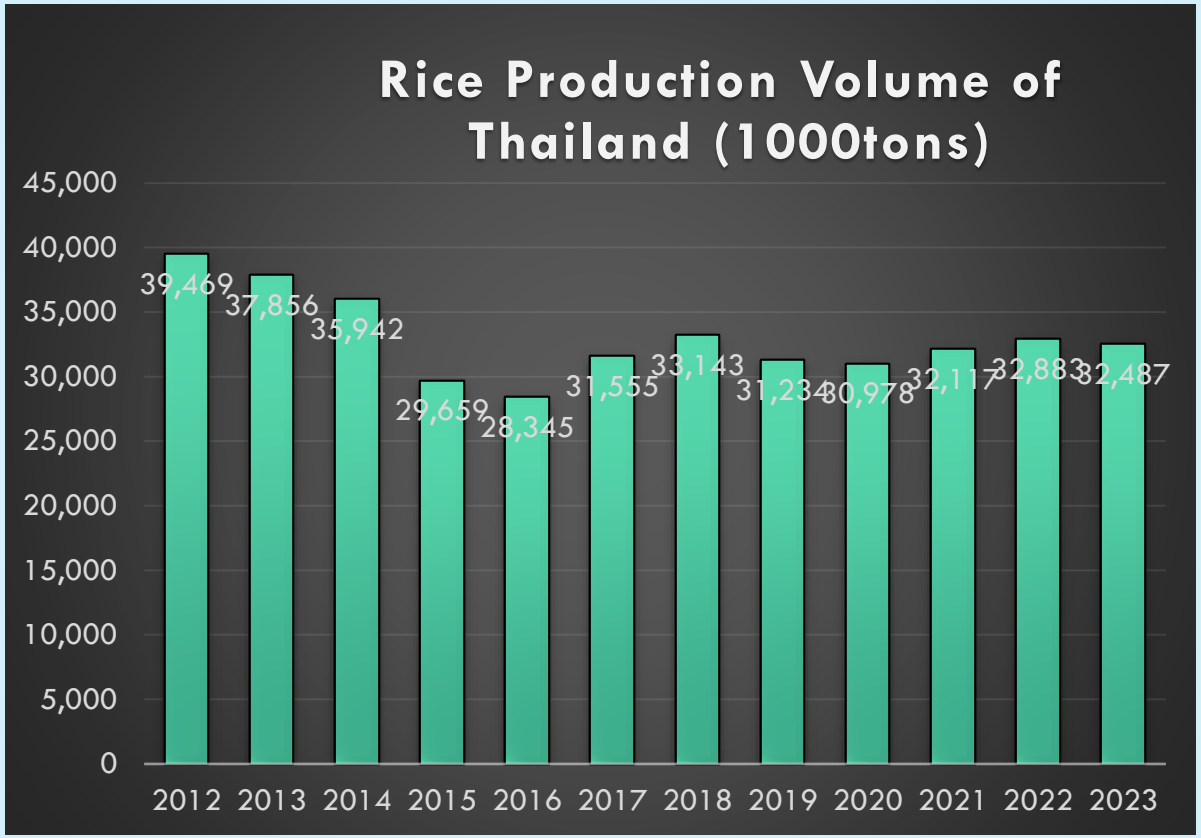
Global Climate Change Impact on Crops Expected Within 10 Years, NASA Study Finds – Climate Change: Vital Signs of the Planet

"Simulations project that the regions of South and Southeast Asia will face the largest decreases in wheat production in the world (20%–75% and 10%–95% declines, respectively), and Southeast Asia will have substantial decreases in attainable rice production (Fischer, Shah, and Van Velthuizen 2002; Fischer et al. 2005; Lobell et al. 2008)."

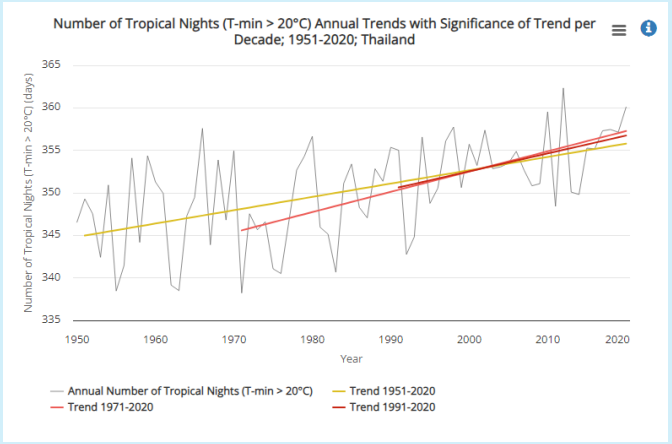
Building Climate Resilience in the Agriculture Sector of Asia and the Pacific (adb.org)

Climate Change in Thailand

Intensified rains and prolonged droughts as well as nighttime temperature increase are observed, likely affecting rice production in Thailand.



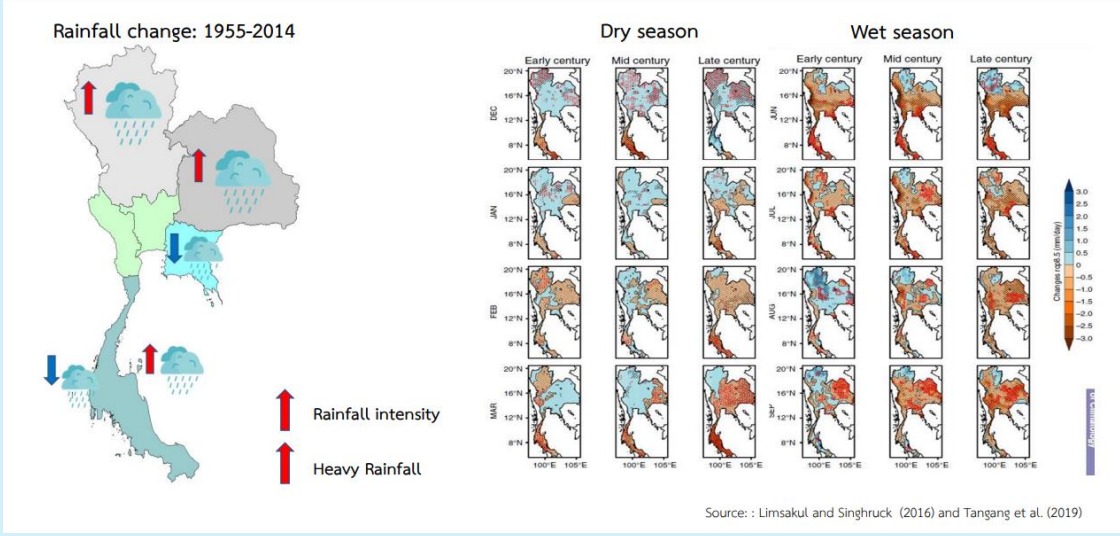
Source: AGRICULTURAL STATISTICS OF THAILAND 2020~2023 OFFICE OF AGRICULTURAL ECONOMICS



Nighttime temperature is rising

Thailand - Trends & Variability - Historical | Climate Change Knowledge Portal (worldbank.org)

Observed/projected changes in rainfall over Thailand

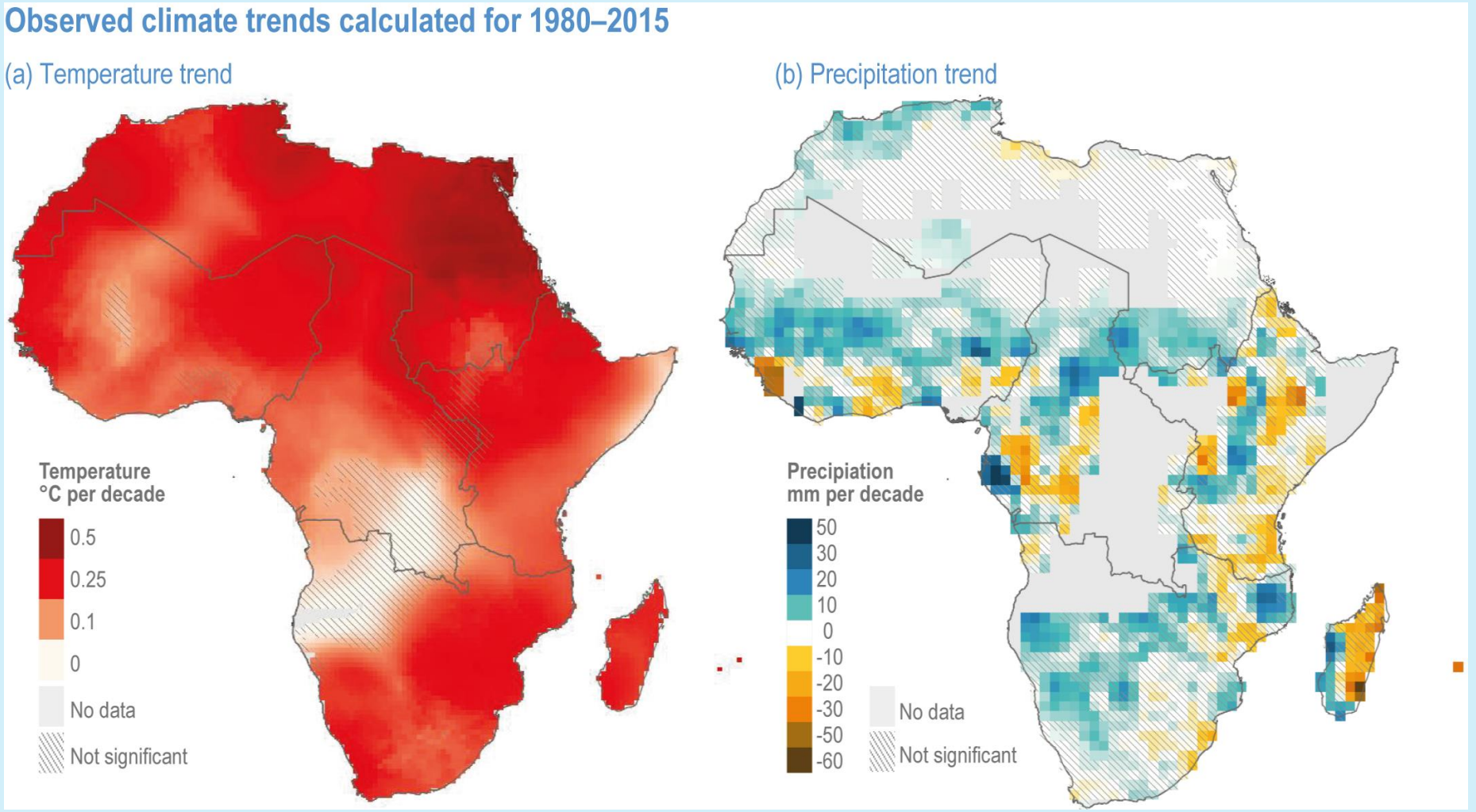


Source: : Limsakul and Singhruck (2016) and Tangang et al. (2019)

Presentation from Dr. Atsamon Limsakul Environmental Research and Training Center (ERTC) Department of Environmental Quality Promotion (DEQP) at the “Policy Forum on Thailand’s Sustainable Green Growth: Embedding Resilience” 19 May 2021 Observed/projected changes in temperature over Thailand

Why we need UPOV
in the face of Climate Change

Climate Change comes with Regional Variance.
One variety cannot save all the regions.

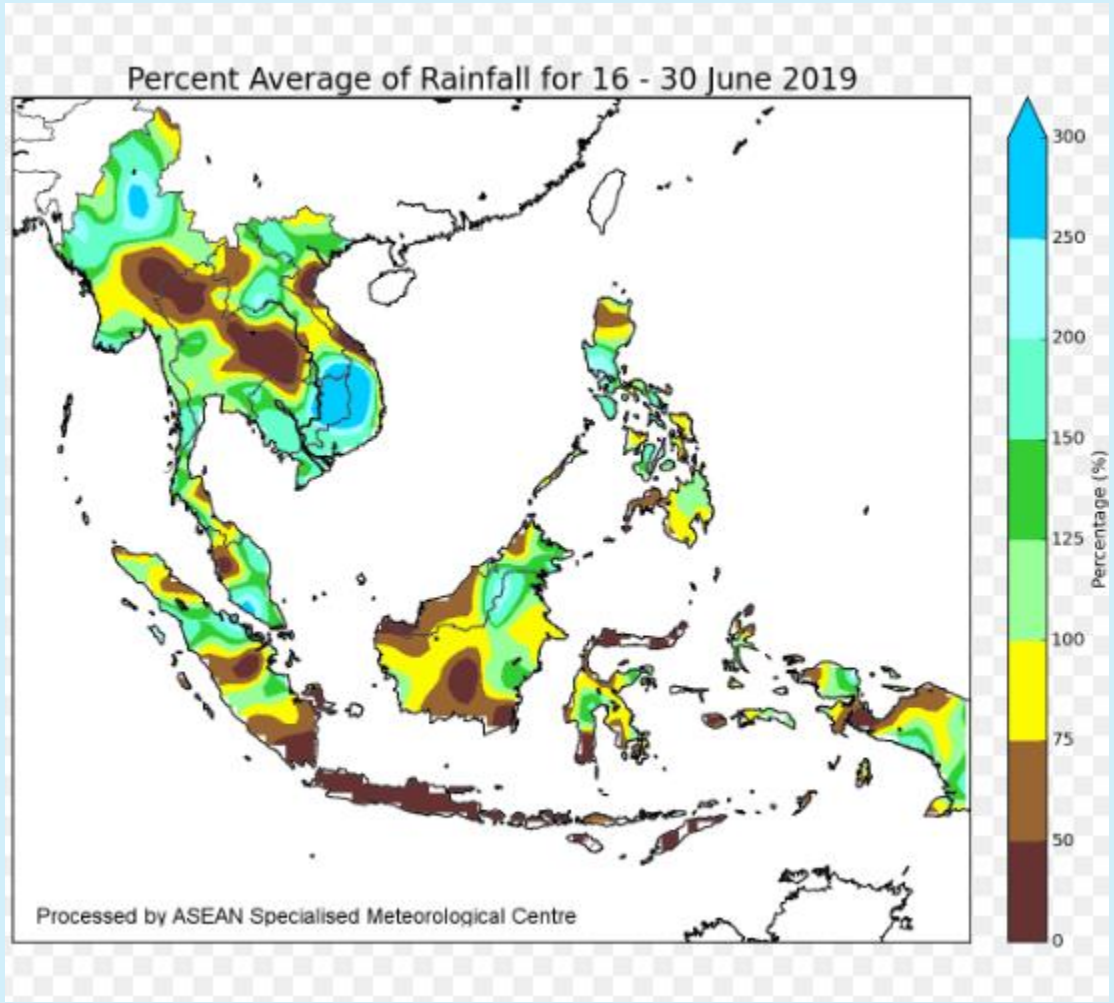


IPCC Sixth Assessment Report

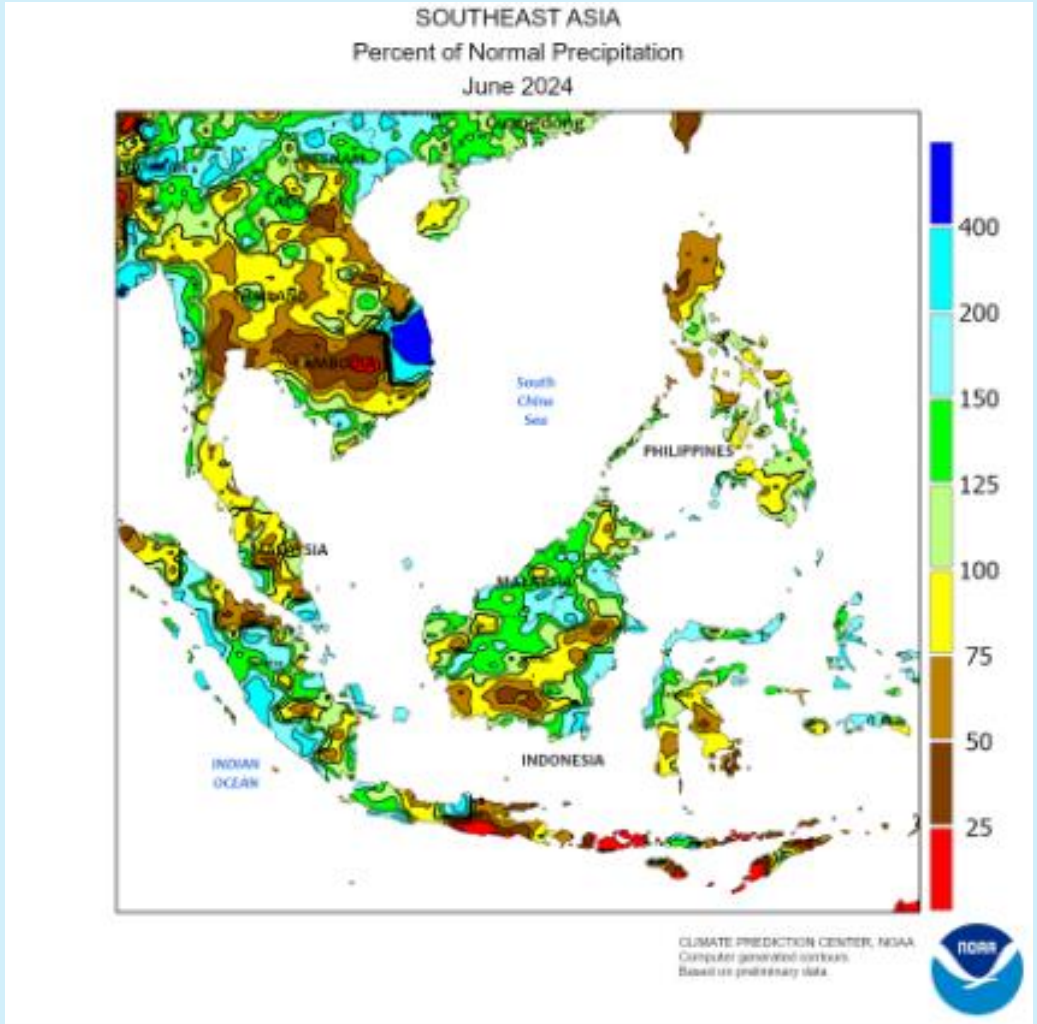
Figure 9.13 in Trisos, C.H., I.O. Adelekan, E. Totin, A. Ayanlade, J. Efitre, A. Gemeda, K. Kalaba, C. Lennard, C. Masao, Y. Mgaya, G. Ngaruiya, D. Olago, N.P. Simpson, and S. Zakieldeen, 2022: Africa. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1285–1455, doi:10.1017/9781009325844.011.

Climate will further change the needs for adaptation in 10 years and 20 years.

One successful variety will not continue to be the salvation eternally, as there will be new demands and challenges.



ASEAN SPECIALEZED METROLOGICAL CENTER Regional Weather – Regional Rainfall | (asean.org)

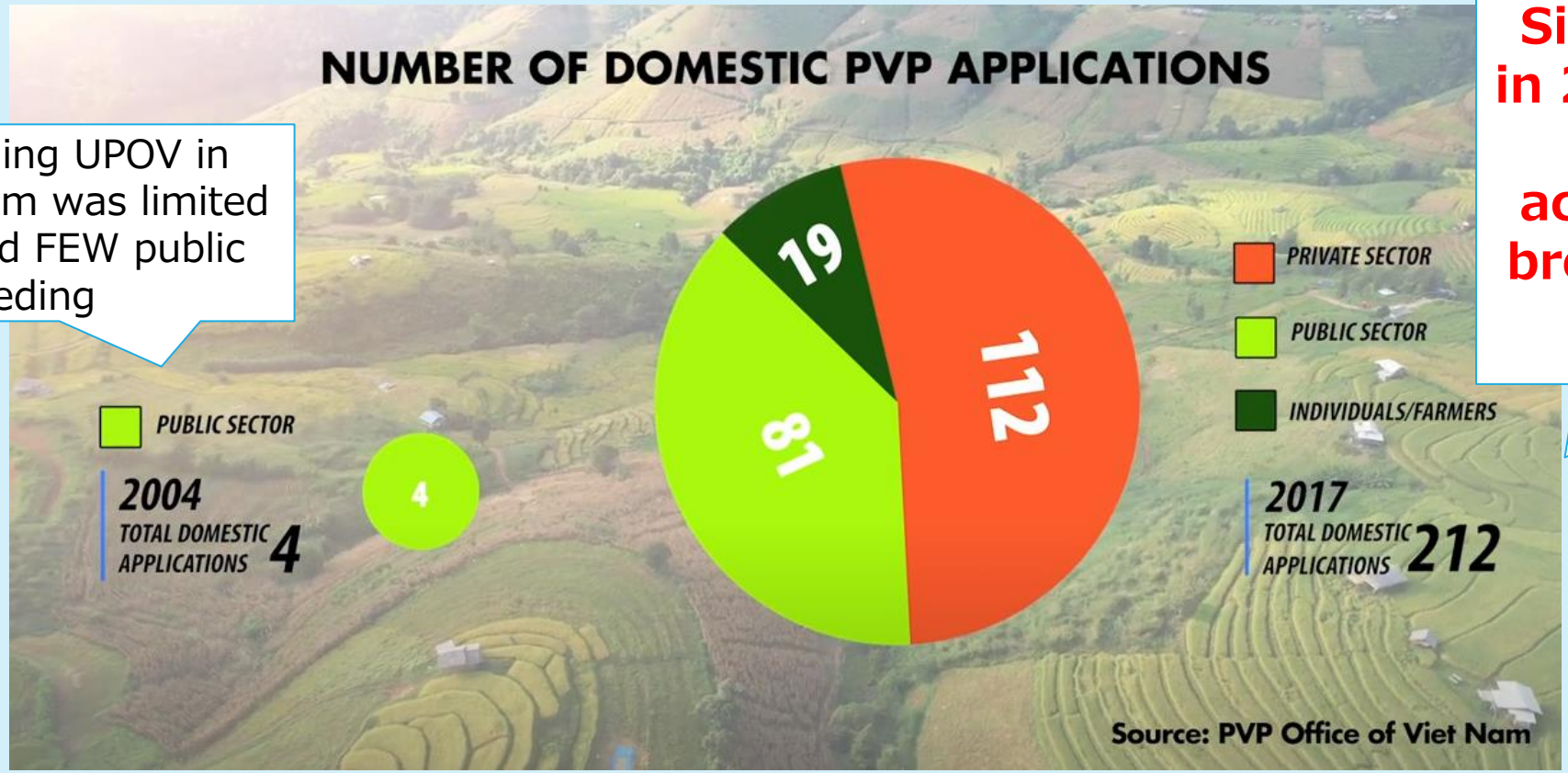


Climate Prediction Center - Monitoring and Data: Regional Climate Maps - Asia (noaa.gov)

No One Size Fits All.

Battling Climate Change requires **continuous response to the changing needs of the domestic condition**. Which in turn asks for an ongoing breeding activity by **the breeding community as whole, most importantly domestically**.

Before joining UPOV in 2006, Vietnam was limited to ONLY and FEW public breeding



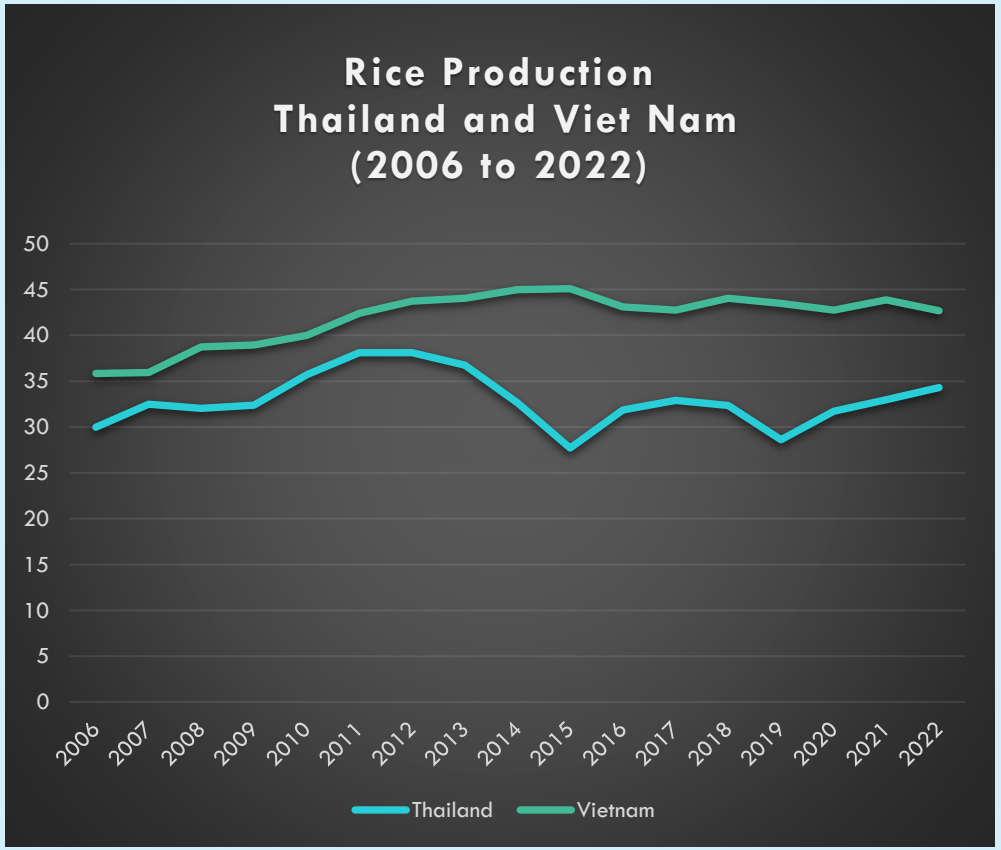
Since joining UPOV, in 2006, the domestic private sector actively invests into breeding activities in Vietnam

Individual farmers and Private Sector cannot risk investment,

UNLESS there is a good system (UPOV)

Climate Change
A Challenge to Competitiveness

Droughts and unpredictable rains in recent years have created major challenges for Thailand's rice production.
In 2012, the country slipped from its position as the world's top exporter and has since struggled to get back to the leading spot, according to CNA.



Source: FAO Statistics

Voices of the Thailand rice industry cries for better domestic varieties

"**For the same kind of rice, sometimes ours costs more than rice from other origins by US$100 per tonne**. As a result, **our market share has shrunk.** Buyers have opted for other sellers such as India and Vietnam or - for fragrant rice - Cambodia, Myanmar and Pakistan, which offered cheaper prices," said Chookiat Ophaswongse, honorary president of the Thai Rice Exporters Association (TREA).

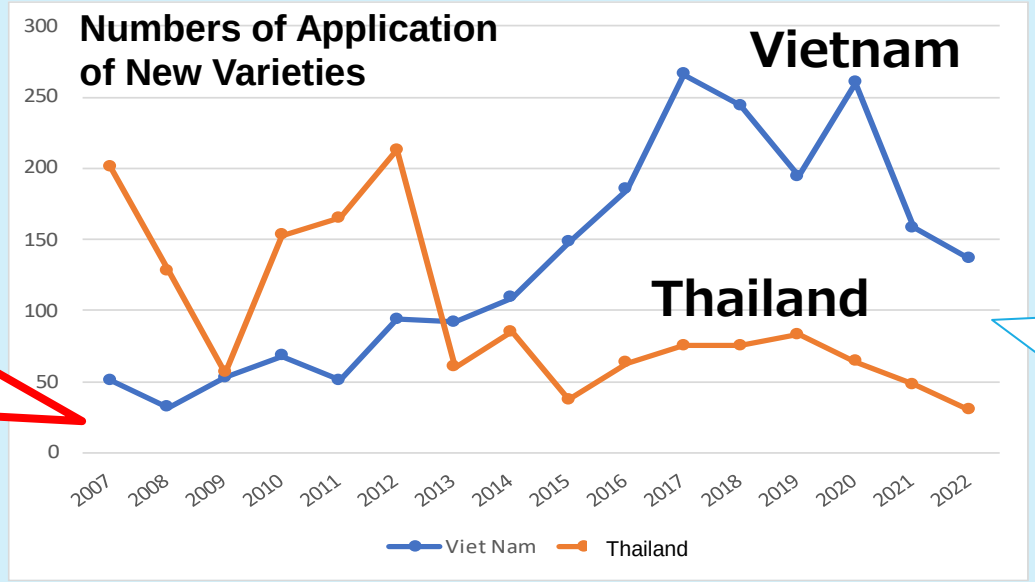
While the country produces about 450kg of paddy per 0.16 hectares, its competitors India and Vietnam generate 800kg to 900kg on average.

"If we don't do anything with our production sector, we'll gradually decline in terms of export capacity. **Our rice industry will become weaker and weaker as our competitors grow stronger with high-yield rice varieties, not to mention the taste and appearance, which they've continued to develop."**

Source: Rice and the Climate Crisis: Thai rice exports taking a hit, with lack of research and development an additional challenge - CNA (channelnewsasia.com)

UPOV
Continued Source of Competitiveness

Vietnam joins UPOV 2006

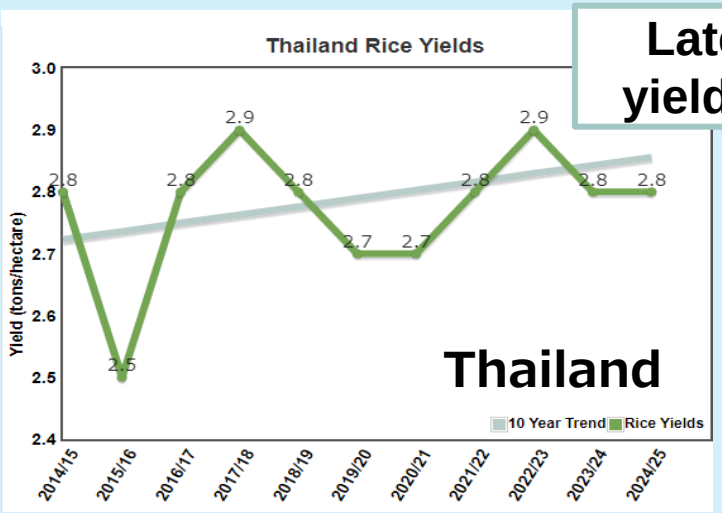


Source: EAPVPF Country Report and JATAFF

UPOV system enables breeders to continuously invest in breeding new varieties. Accumulation of investment over the years is reflected in the country's competitiveness.

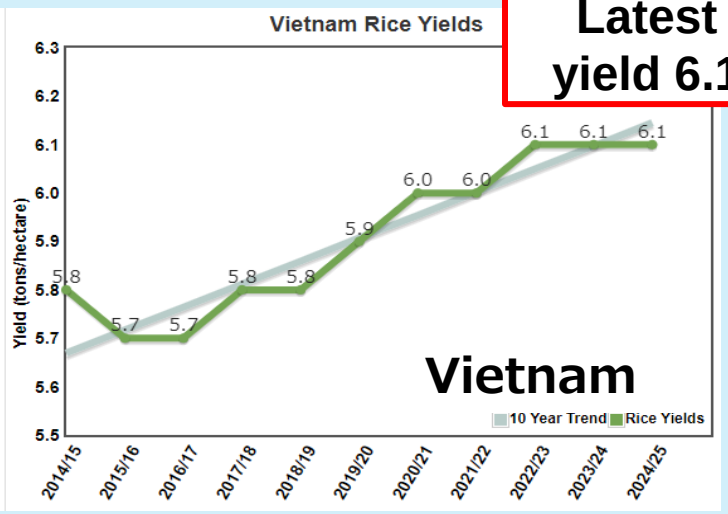
Vietnam now, outnumbers Thailand in the numbers of applications for over a decade

Latest yield 2.8



Source: USDA Foreign Agricultural Service

Latest yield 6.1



Source: USDA Foreign Agricultural Service

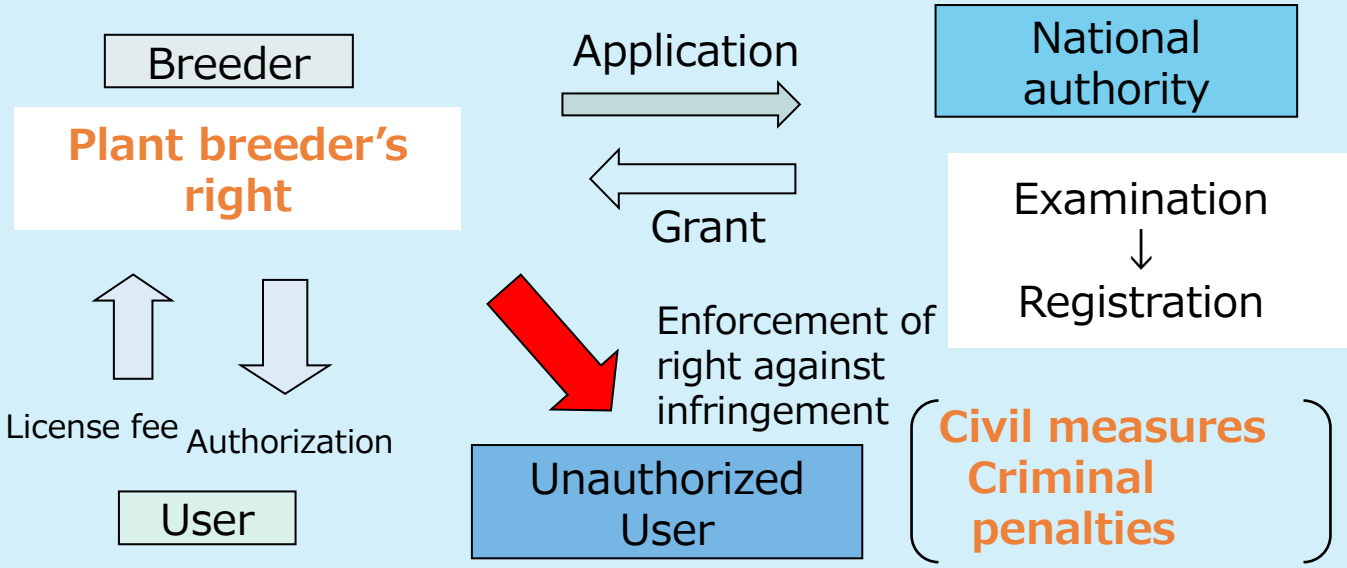
Vietnam Rice Yield Continues to grow despite climate challenges.

Climate change can further drive the differences in the coming years

UPOV (International Union for Protection of New Plant Varieties)

- Development of new plant varieties can take decades and require a large amount of prior investment.
- For society to benefit from the fruit of these investments, it is indispensable that these hard work have a protection mechanism that allows recuperation of investment.
- UPOV provides the international framework for Plant Variety Protection.

【Example Use of plant variety protection system】



※Under the 1991 UPOV Convention

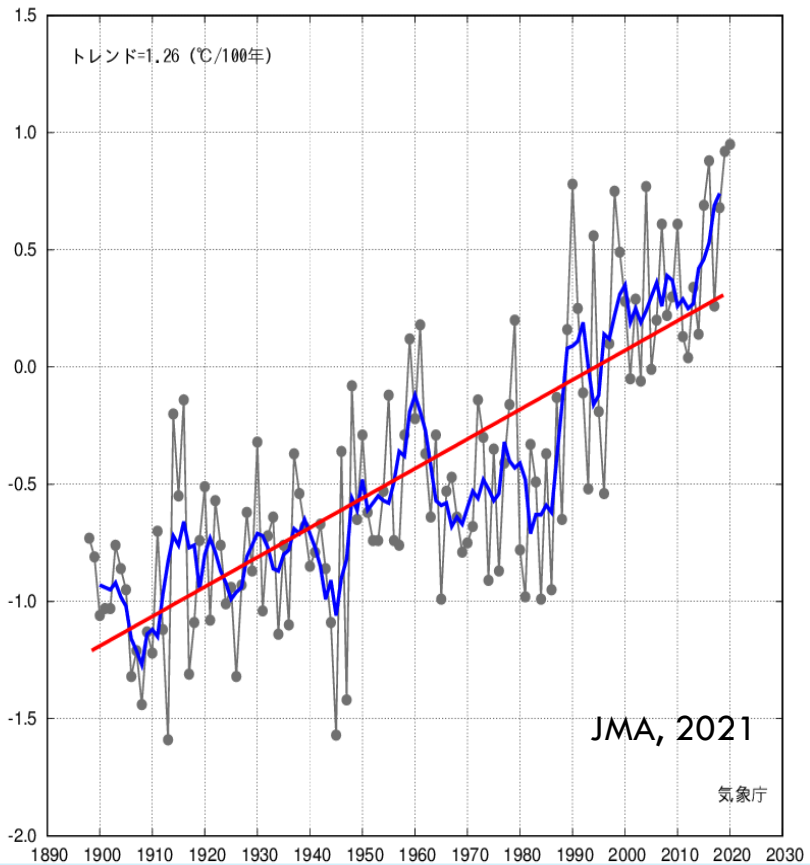
Japan’s fight with Climate Change

Climate Change in Japan

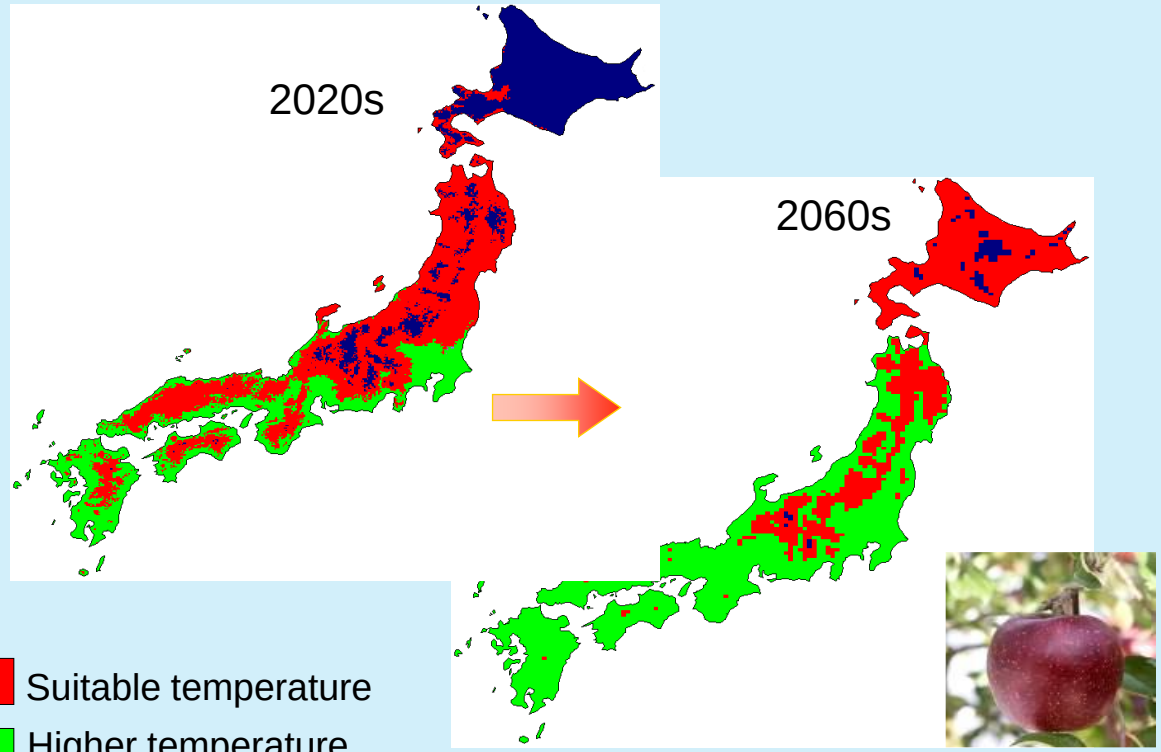
Average temperature has risen by 1.26 degrees Celsius per 100 years in Japan.

Agricultural production regions are expected to change with emerging high-temperature injury.

Average temperature trends in Japan over the past 130 years, relative to 1981-2010

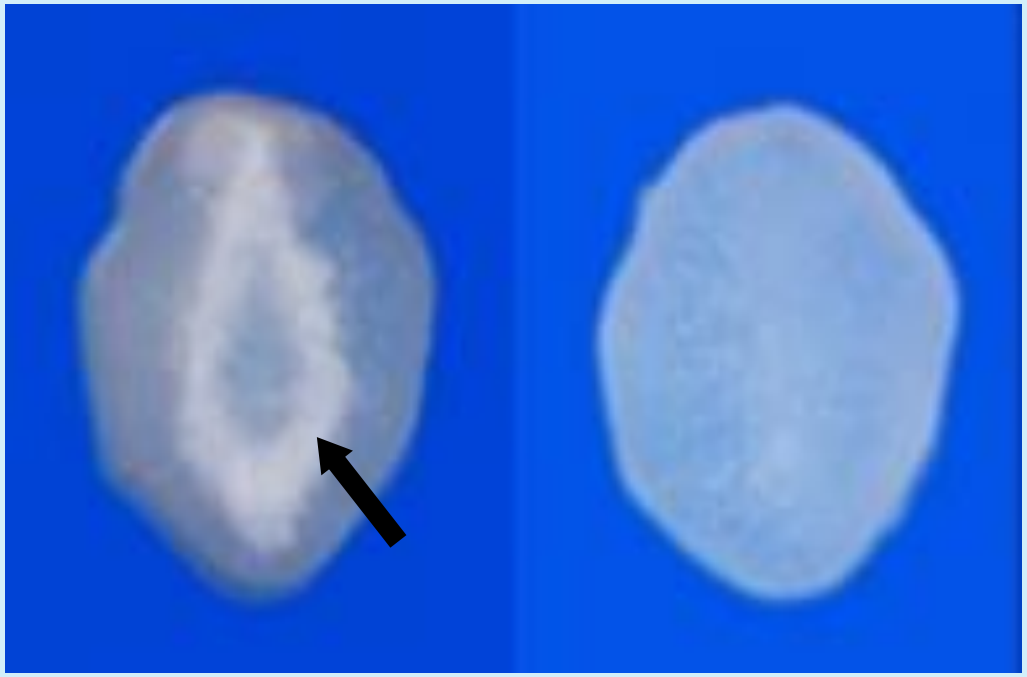


Suitable regions for apples are expected to change



Impacts of Climate Change on agricultural products

Rice



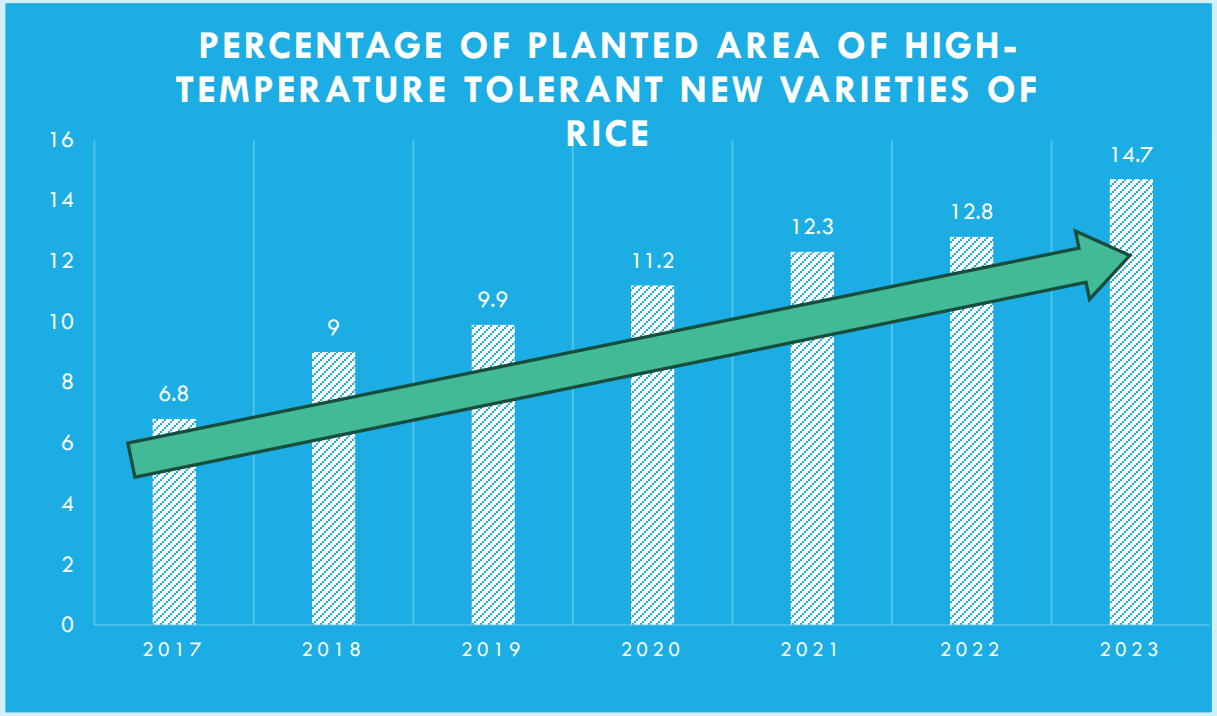
Immature starch formation in grain due to high temperatures.

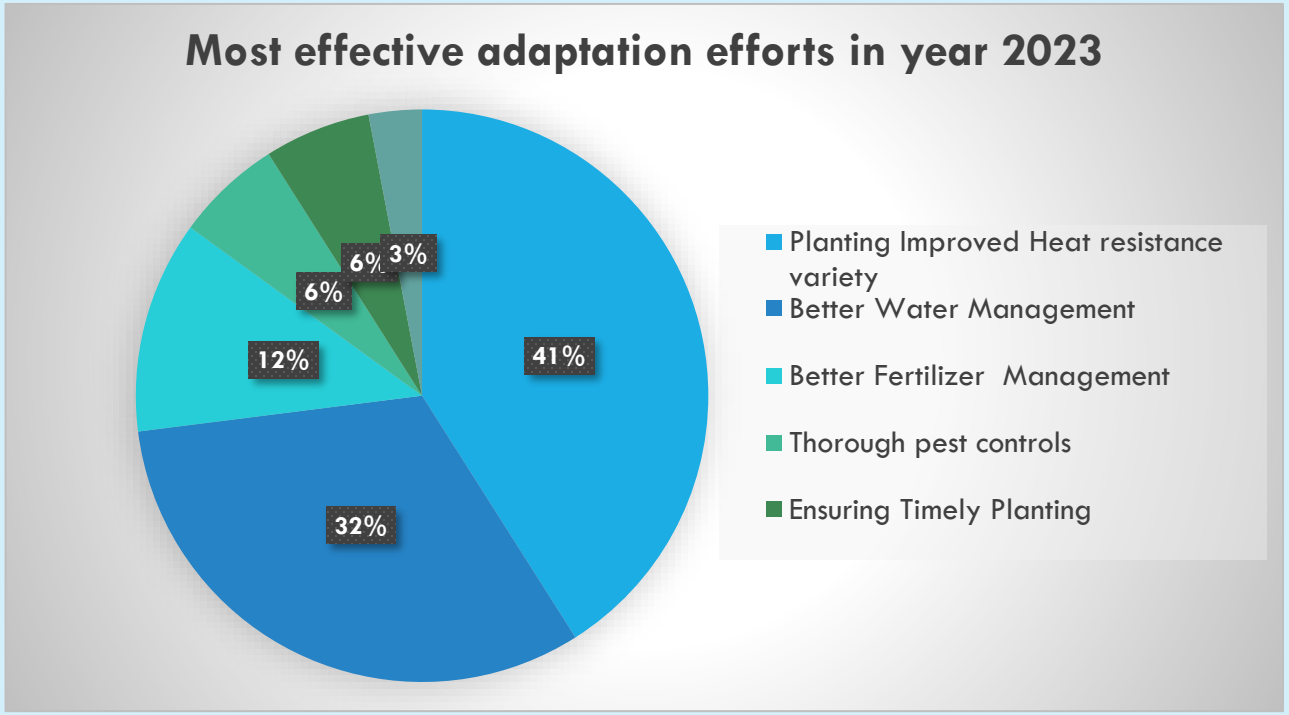
Apple

Poor or delayed coloring of fruit due to high temperature

Deterioration of fruit quality reported in other fruits (grapes, peaches, etc.)

Growing needs for New Varieties adapted to Climate Change

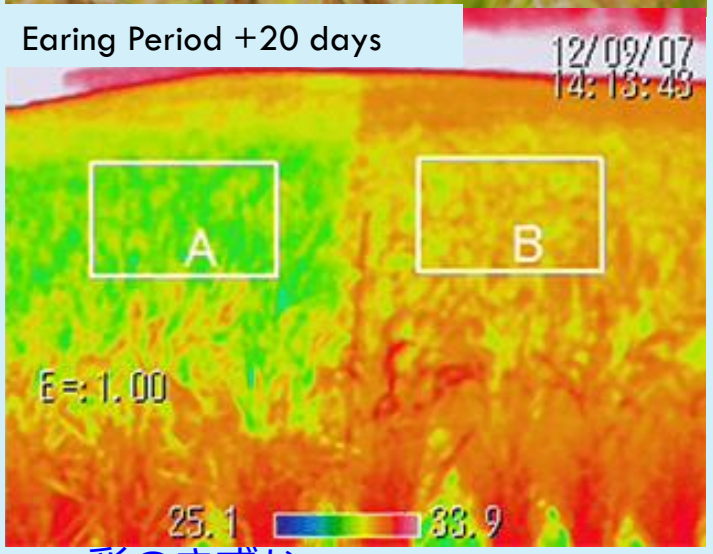




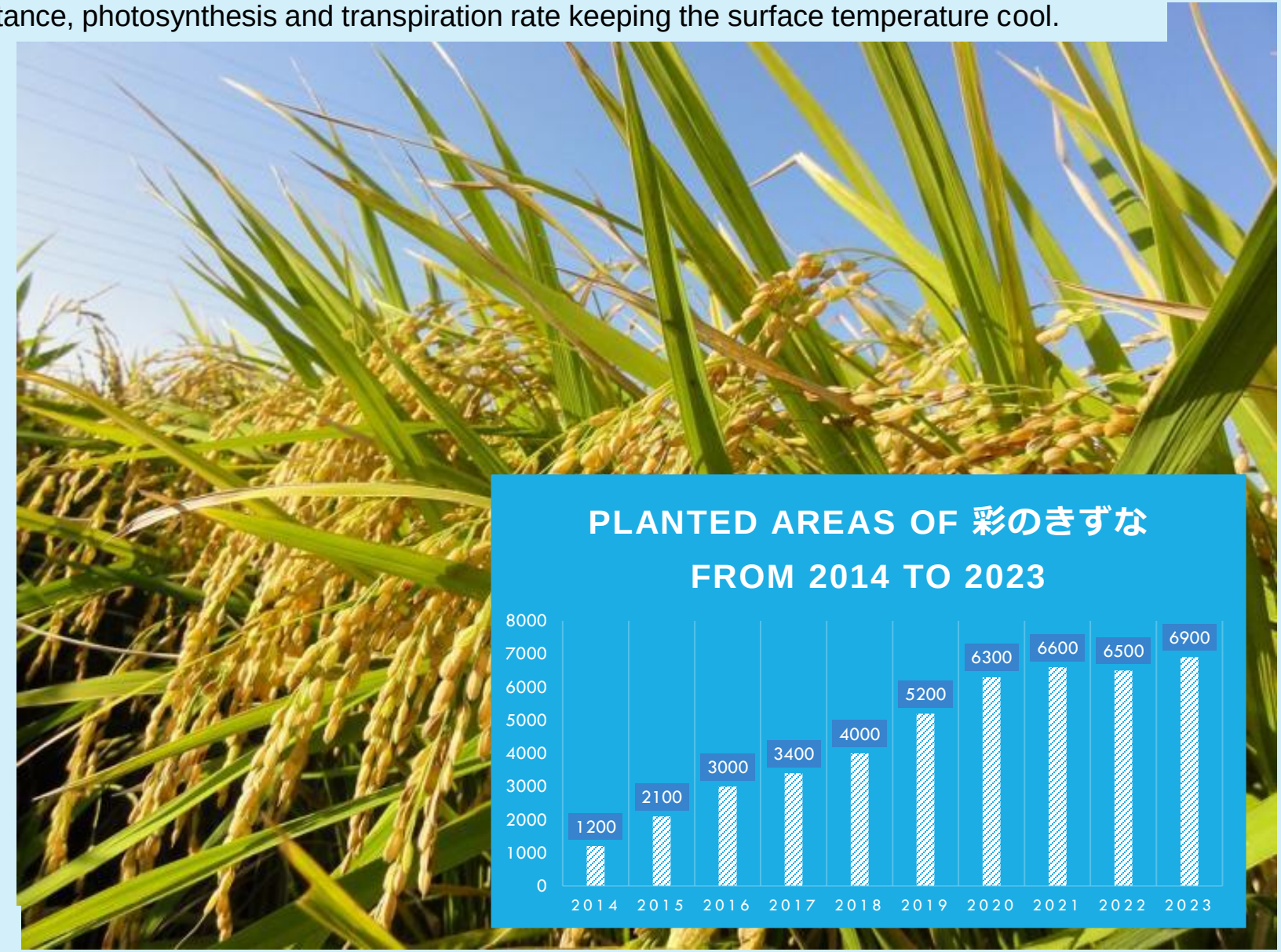
Report on the Impact of the Record High Temperatures in the Summer of 2023 and the Status of Effective Global Warming Adaptation Measures (MAFF)

KEEPING IT *COOL* IN THE HOT CLIMATE

"Sai no Kizuna" tops quality, good production, resistance to multiple diseases and pest, and reduces the use of agricultural chemicals.
Its biggest feature is its high stomatal conductance, photosynthesis and transpiration rate keeping the surface temperature cool.



Left: 彩のきずな Right: Other Varieties



「彩のきずな」について - 埼玉県 (saitama.lg.jp)

New plant varieties are key to adapt to Climate Changes

Rice

High temperature tolerant variety with few immature grains

NIJINOKIRAMEKI (protected new variety)

KOSHIHIKARI (existing variety)

Grapes

New varieties with good coloration even at high temperatures

Grosz Krone (PVP applied)

Apples

New varieties with good coloration even at high temperatures

BENIMINORI KINSHU

New varieties with good coloration

TSUGARU (existing variety)

Impatiens

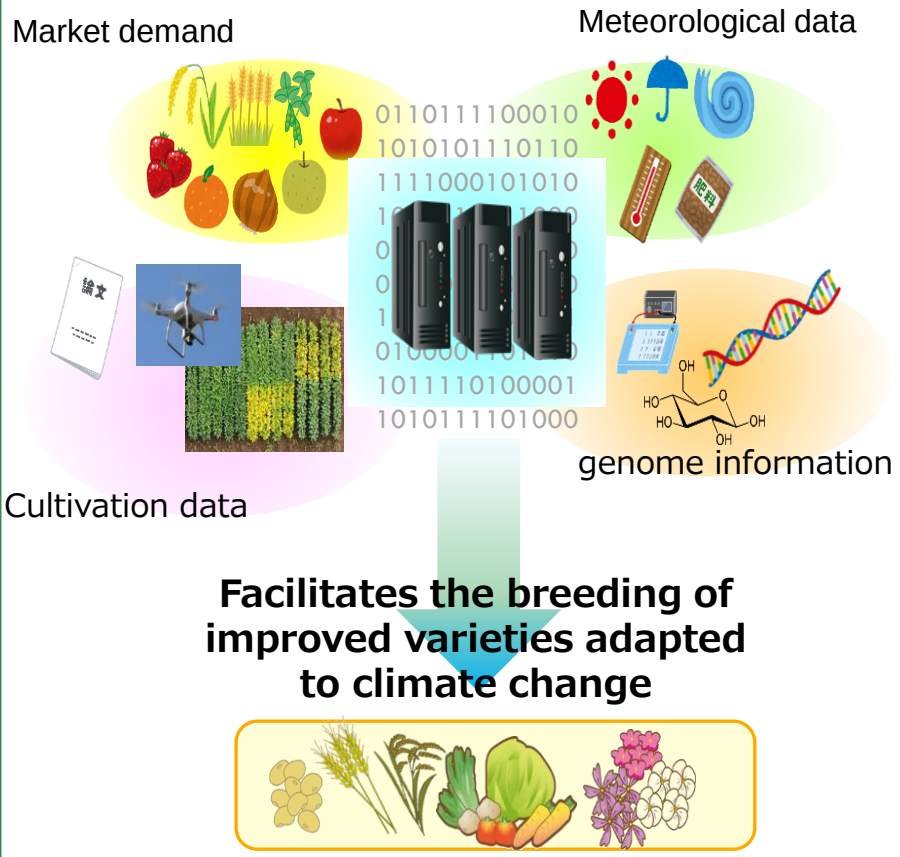
・Growing well in wide range conditions, even at high temperature

SunPatiens

Innovation to facilitate breeding of new varieties to adapt to Climate Change

"Smart breeding system" in combination with AI and new breeding technologies will enable more efficient and faster breeding by big data on phenotype-genotype information.

Developing the "Smart breeding system"



Genome Editing Technologies
- Pre-harvest sprouting tolerant wheat variety

It was bred by Okayama university and National Agriculture and food Research Organization.

THANK YOU FOR YOUR ATTENTION!

Any Questions?

Contact me at: minori_hagiwara110@maff.go.jp