



Mahidol University
Faculty of Environment
and Resource Studies



Sustainable Forest Management Based on Community Agroforestry System, Lampang Province, Thailand

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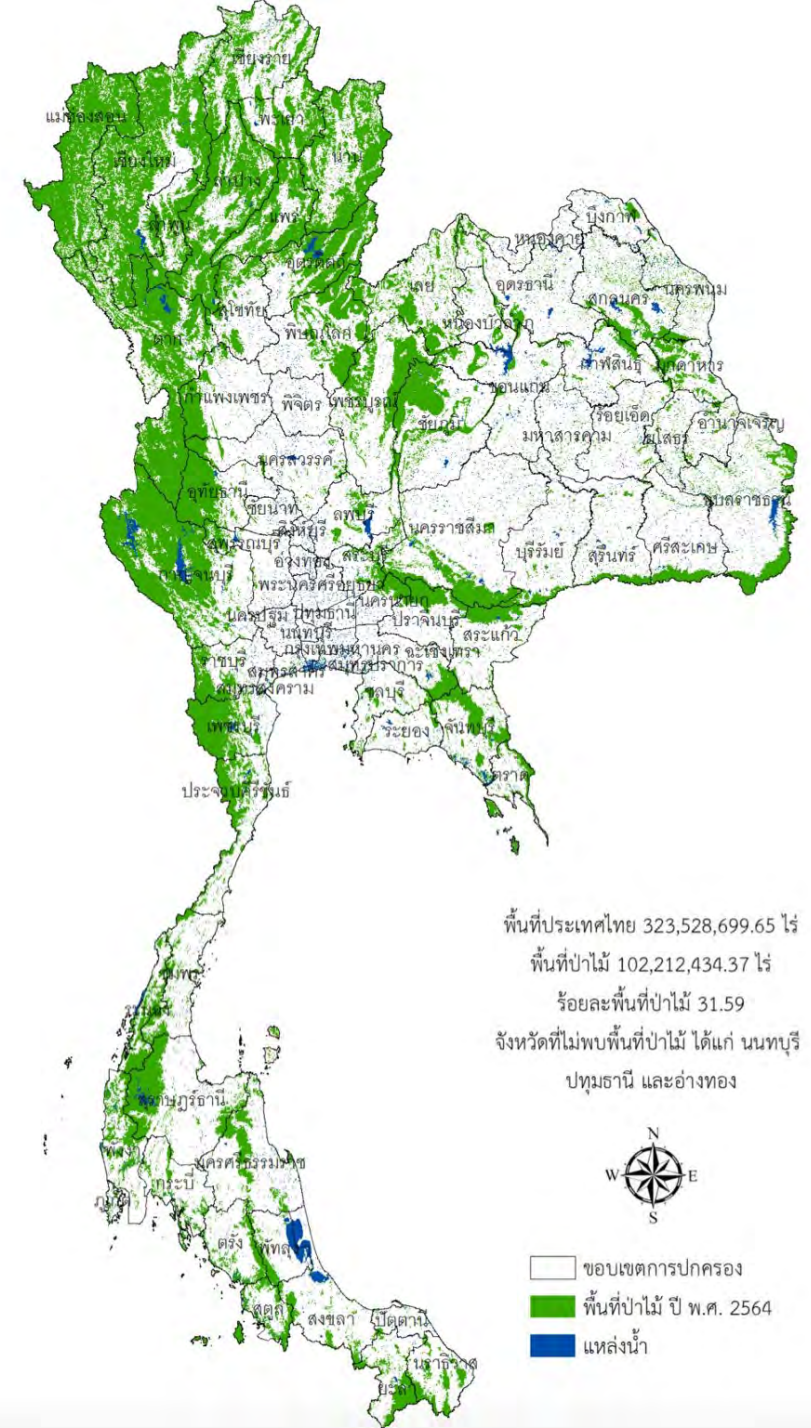


Mahidol University, Thailand



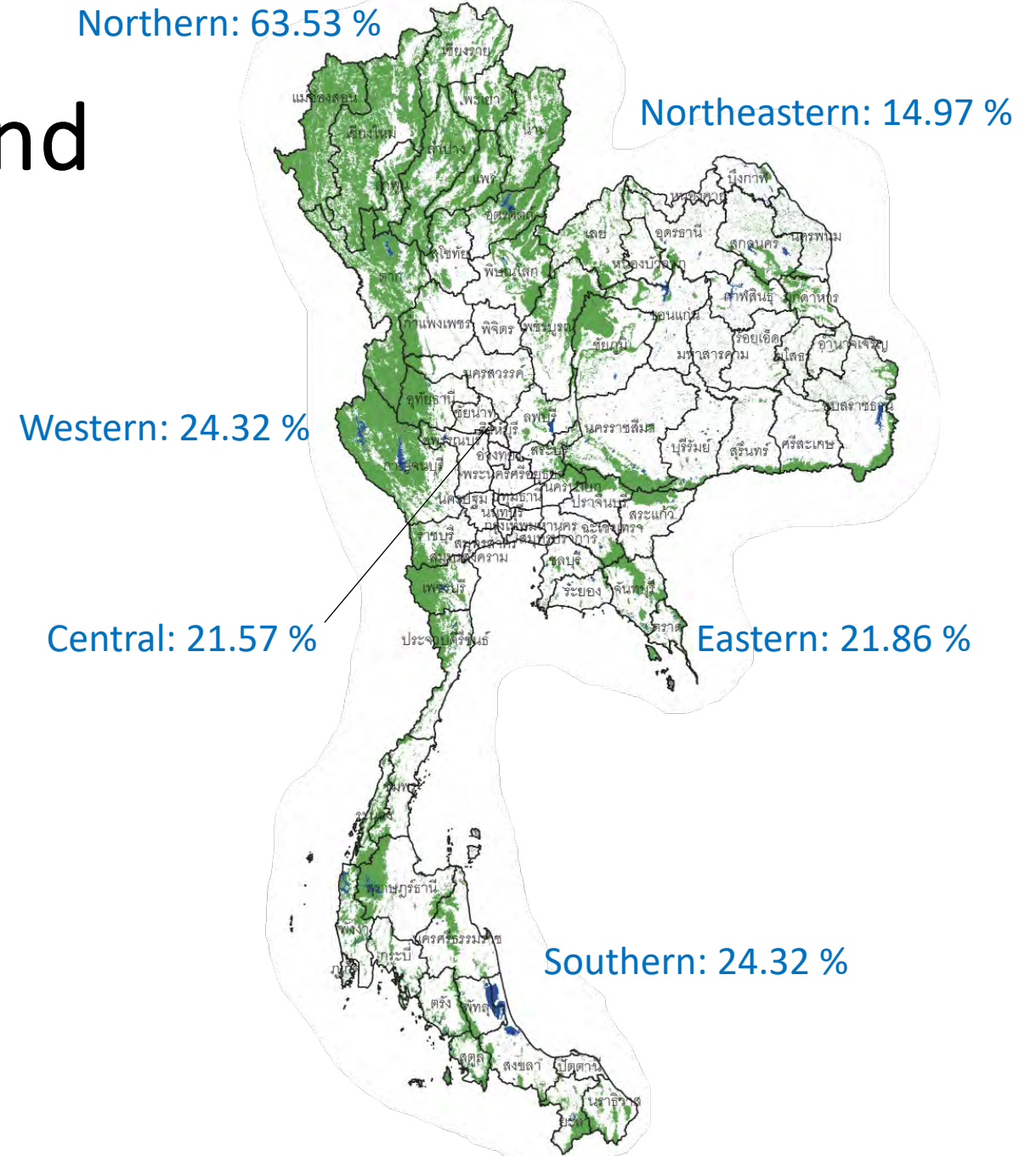
- 629 Programs offered from 17 faculties, 6 colleges, 9 research institutions and 6 campuses
- 30,000 students
- www.mahidol.ac.th

From the historical trend of forest area reduction from the past to the present, as of the year 1973, Thailand had a total forest area of 43.21 % of the country's total area. However, by the year 2021, Thailand's remaining forest area was 31.64 % of the country's area.



The Forest Area of Thailand

- 163,417.56 sq.km.
- 31.57 %
- Top 3 provinces with high forest covered
 - Mae Hong Son: 84.31 %
 - Tak: 71.64 %
 - Lampang: 69.77 %



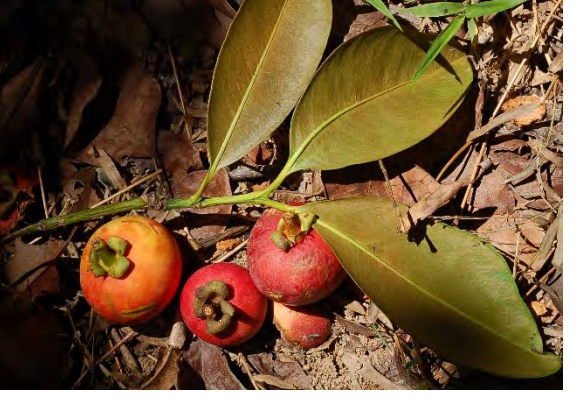
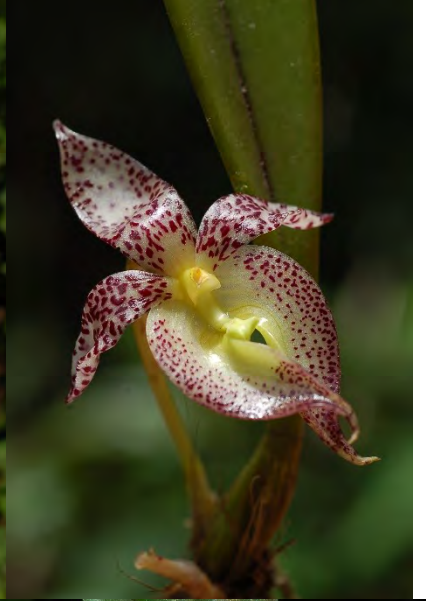
Thailand's vegetation is diverse and includes tropical rainforests, dry evergreen forests, deciduous forests, mangroves, and the tropical grasslands. The vegetation varies across different regions of the country due to differences in climate and soil conditions.

In northern Thailand, the vegetation consists of evergreen forests, mixed deciduous forests, and pine forests. The forests in this region are dominated by teak, oak, and pine trees.



Dry-evergreen forest (semi-evergreen forest)







Montane forest



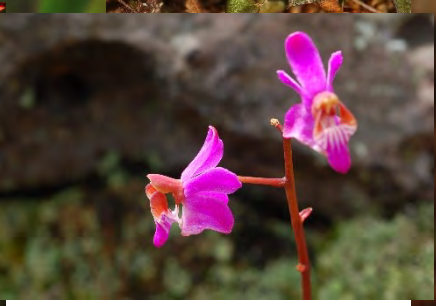


Pine forest









In several areas of the country, forest types are ranging from mixed deciduous, deciduous dipterocarp to seasonal evergreen forests in altitude below approximately 1,000 m.

Mixed deciduous forest and deciduous dipterocarp forest can be found in North, Northeast, Southwestern, Southeastern except Peninsular Thailand.





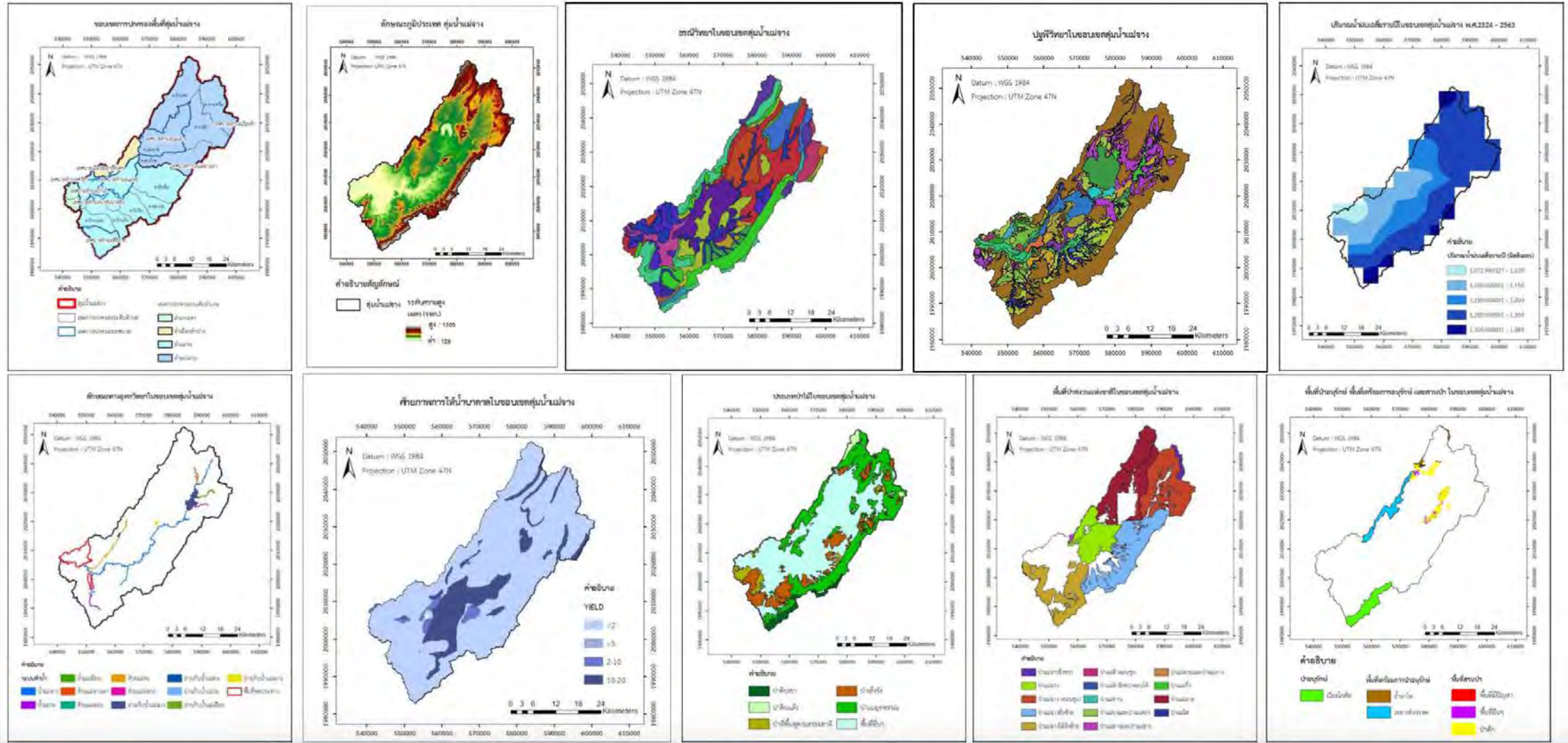




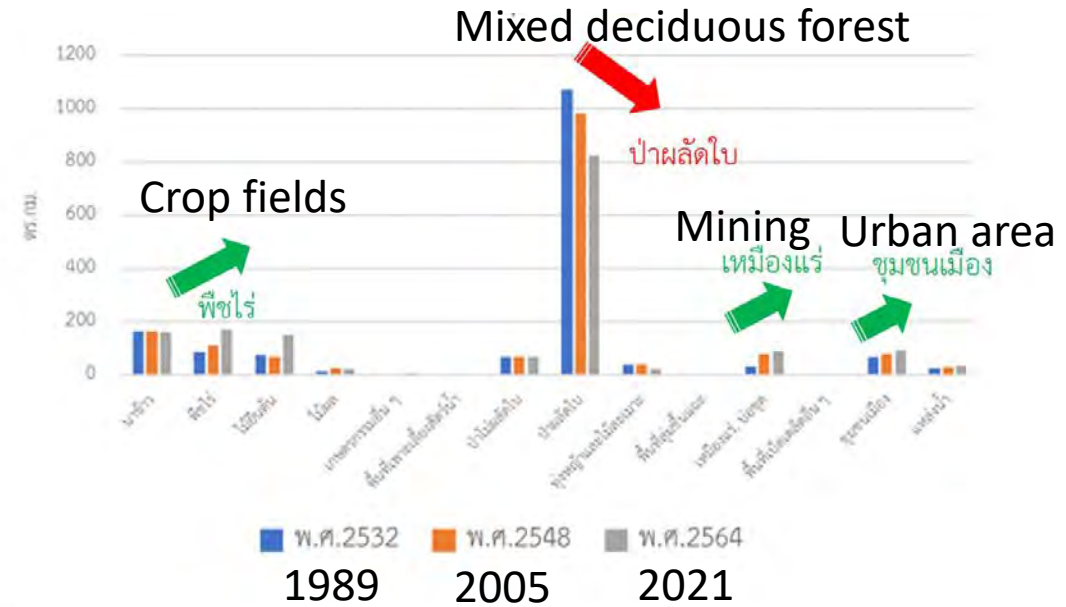
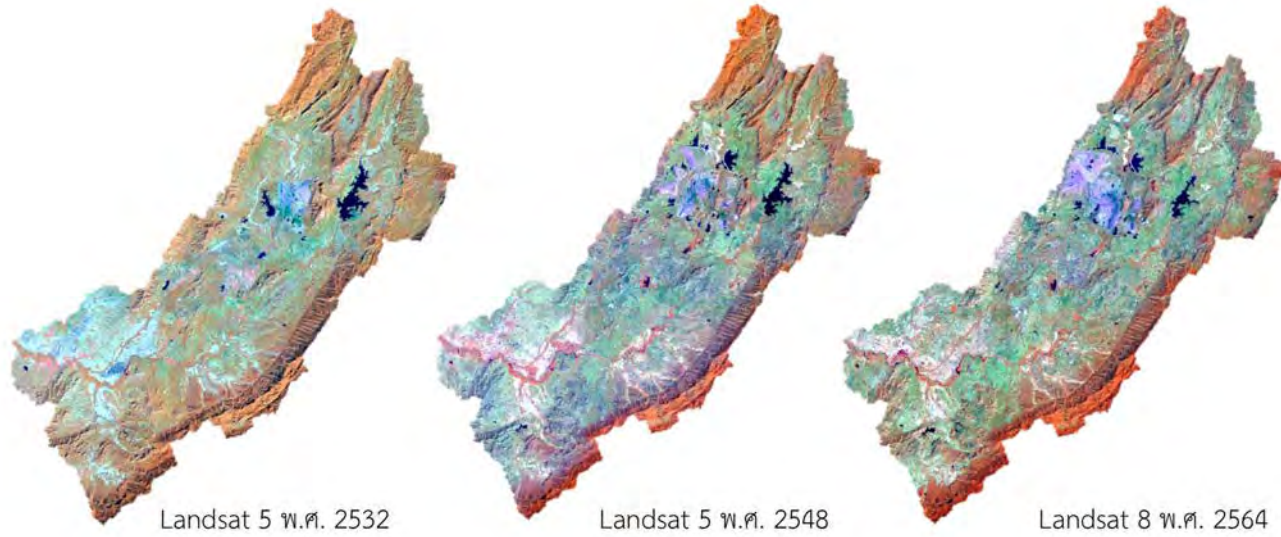


- Lampang Province is a northern province of Thailand. The majority of farmers engage in rice cultivation and mono-crop farming, which they have been doing for a long time.
- Currently, changes in climate conditions such as recurring droughts, forest fires, and irregular rainfall patterns have led to decreased agricultural yields and loss of income from farming.
- Families are facing income shortages, and some individuals might even sell their land to investors for capital. These issues do not provide sustainable solutions for the local population."

The spatial data of Mae Chang River Basin, Lampang Province

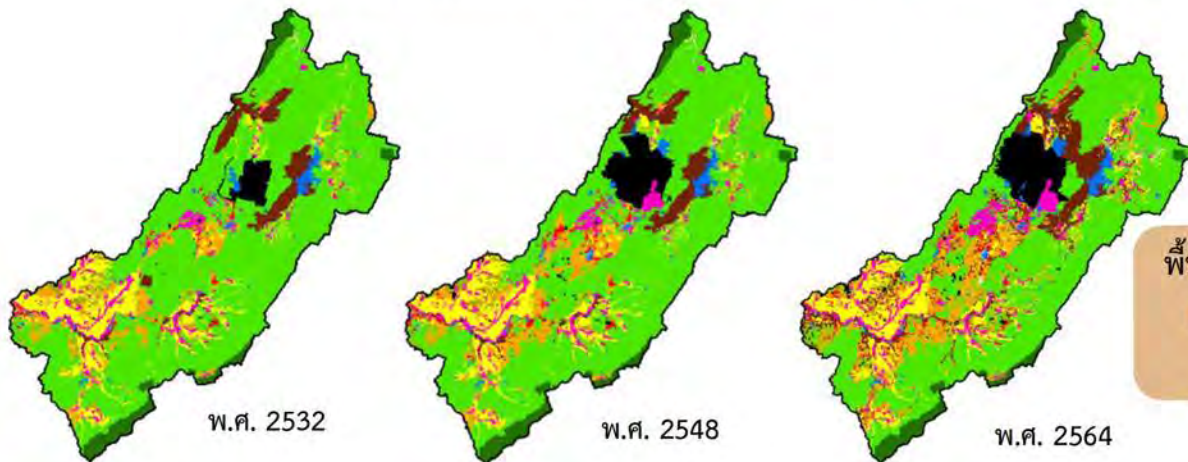


Landuse and land cover changed in Mae Chang River Basin in 1989, 2005 and 2021

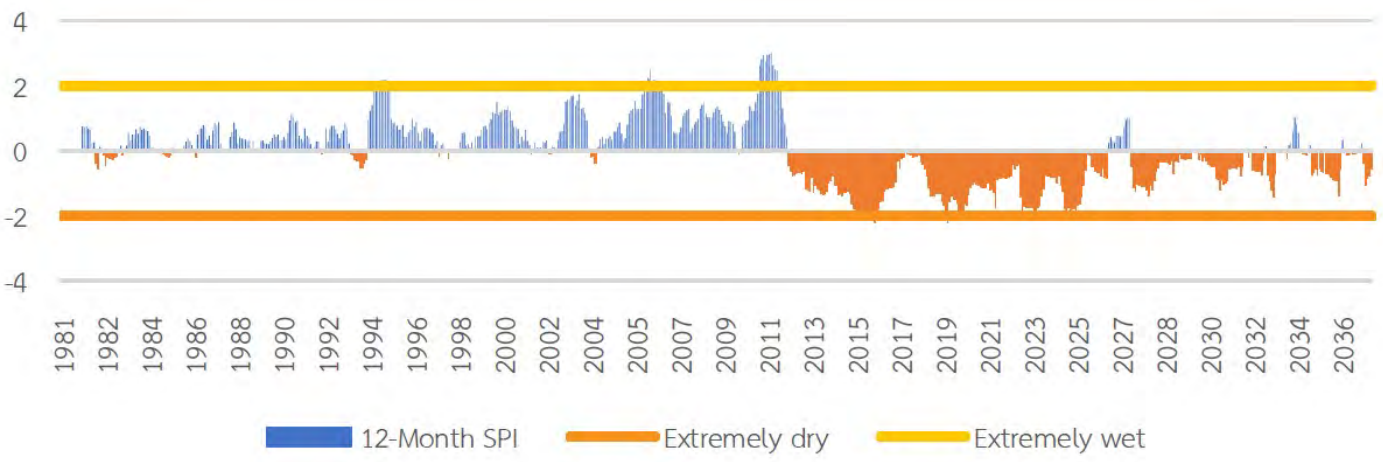
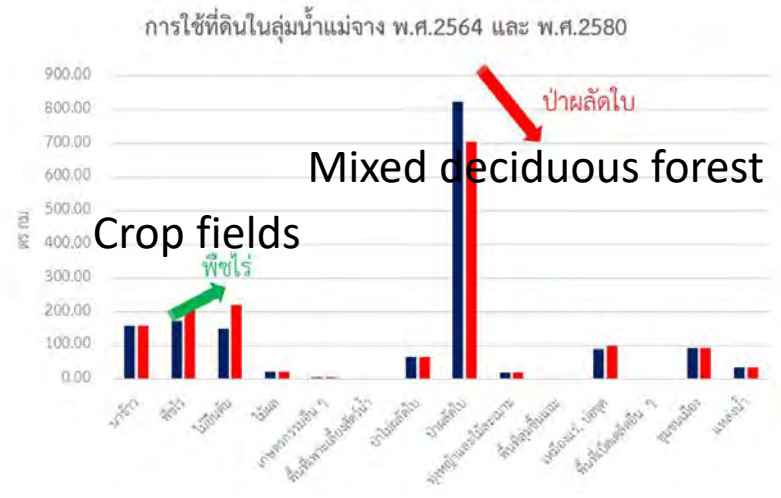
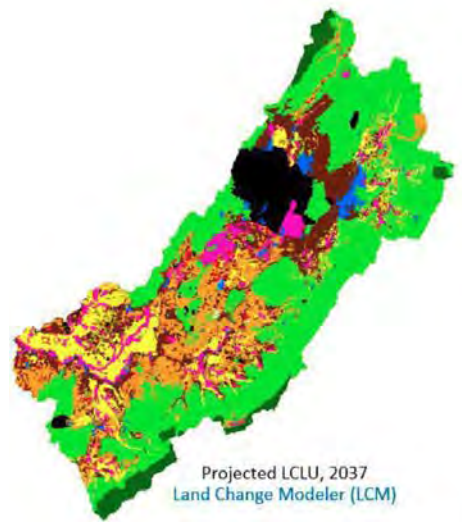
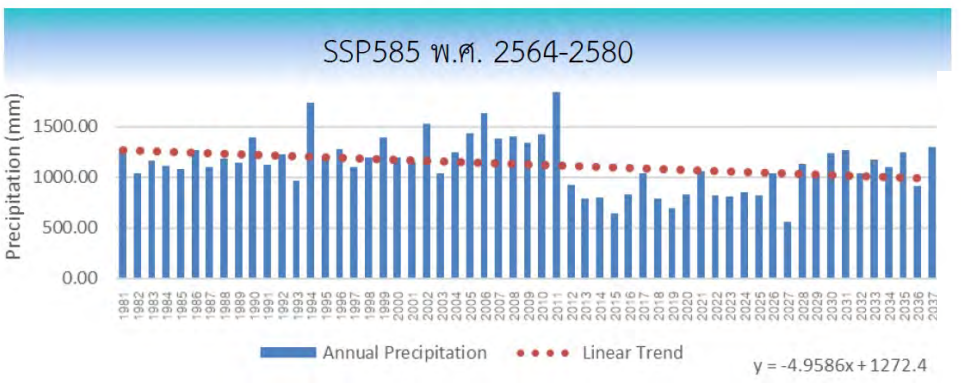
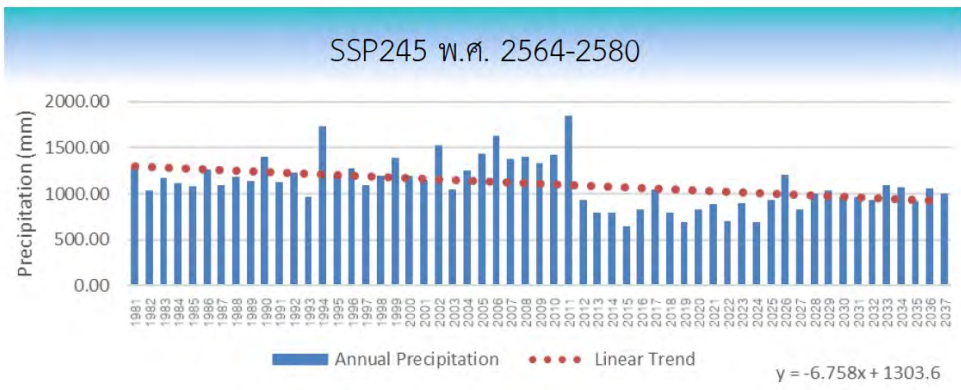


ผลการประเมินการใช้ที่ดิน

- นาข้าว (Rice)
- เกษตรกรรมอื่น ๆ (Other agriculture)
- ทุ่งหญ้าและไม้ละเมาะ (Grassland and scrubland)
- ชุมชนเมือง (Urban area)
- พืชไร่ (Crop fields)
- พื้นที่เพาะเลี้ยงสัตว์น้ำ (Aquaculture area)
- พื้นที่ชุ่มชื้นและ (Wetland and)
- แหล่งน้ำ (Water source)
- ไม้ยืนต้น (Deciduous tree)
- ป่าไม่ผลัดใบ (Evergreen forest)
- เหมืองแร่, ป่อซูด (Mining, salt pond)
- ไม่ผล (Non-fruit)
- ป่าผลัดใบ (Deciduous forest)
- พื้นที่เปิดเตล็ดอื่น ๆ (Other open areas)

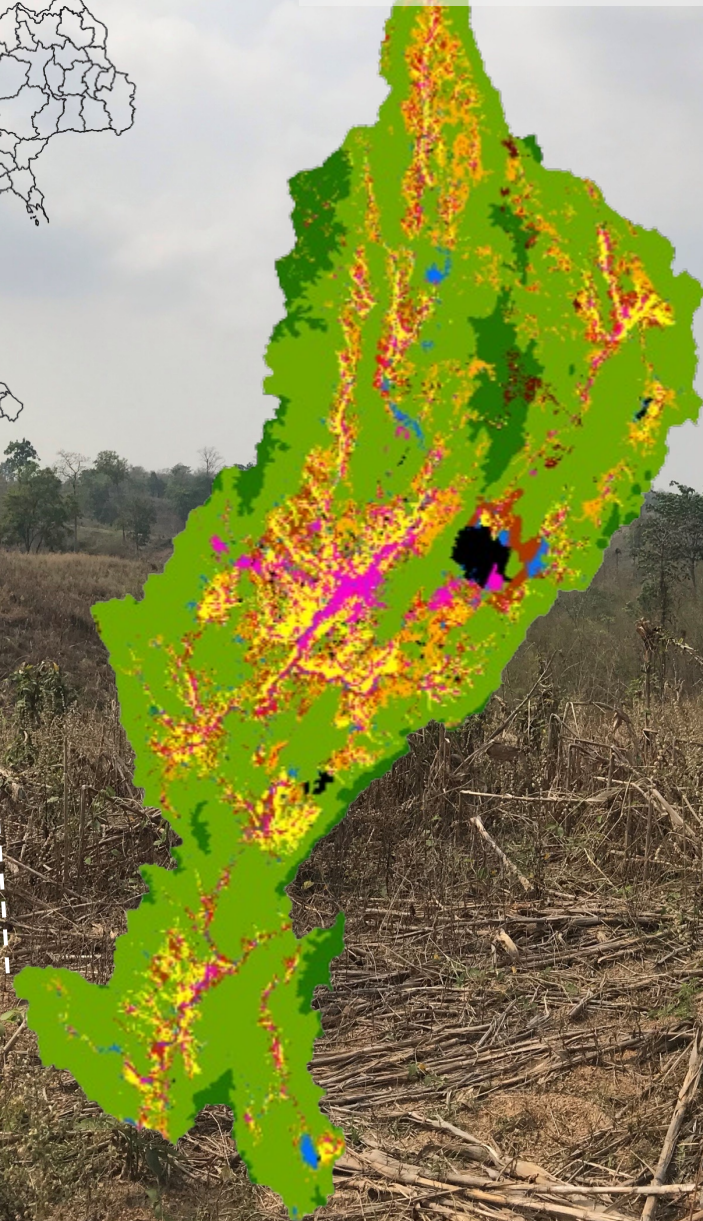


พื้นที่เกษตรกรรมเพิ่มขึ้นอย่างต่อเนื่อง



Based on the analysis of data for the future years 2021-2036 using the Invest model and the scenario that may unfold in the future due to greenhouse gas emissions, the amount of rainfall in the studied area is consistently decreasing. Researchers have recognized the significance of areas facing recurring drought issues. These issues will have an impact on forests, biodiversity, as well as the local population.

Expansion of agricultural area in Lamphang Province



Overall in 2021

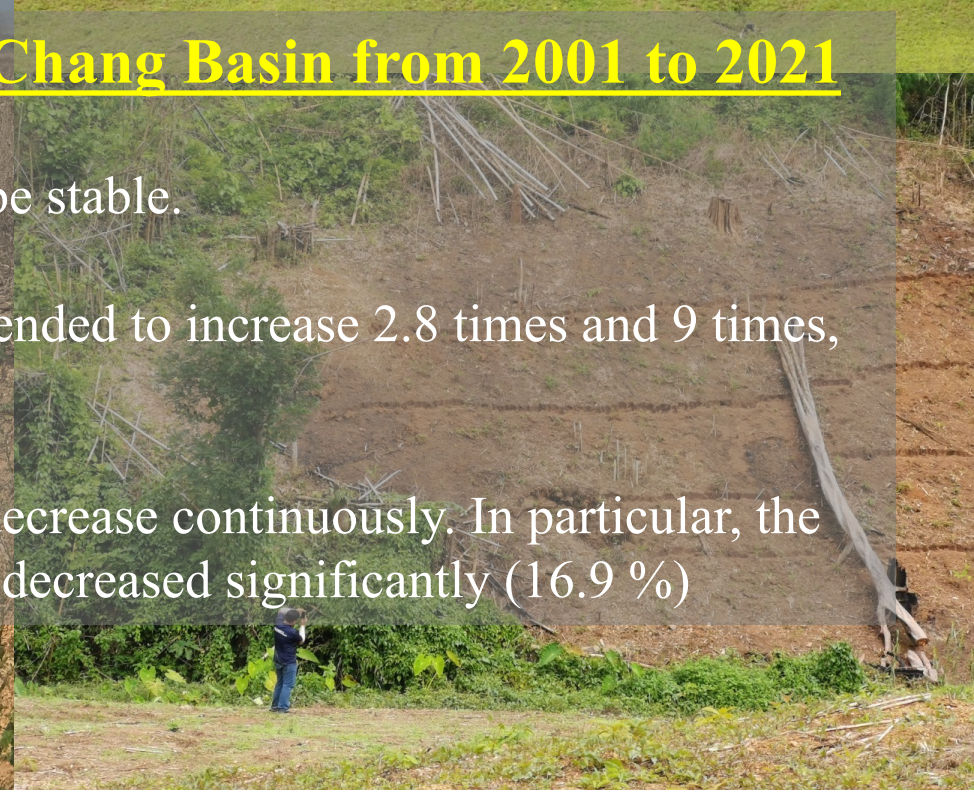
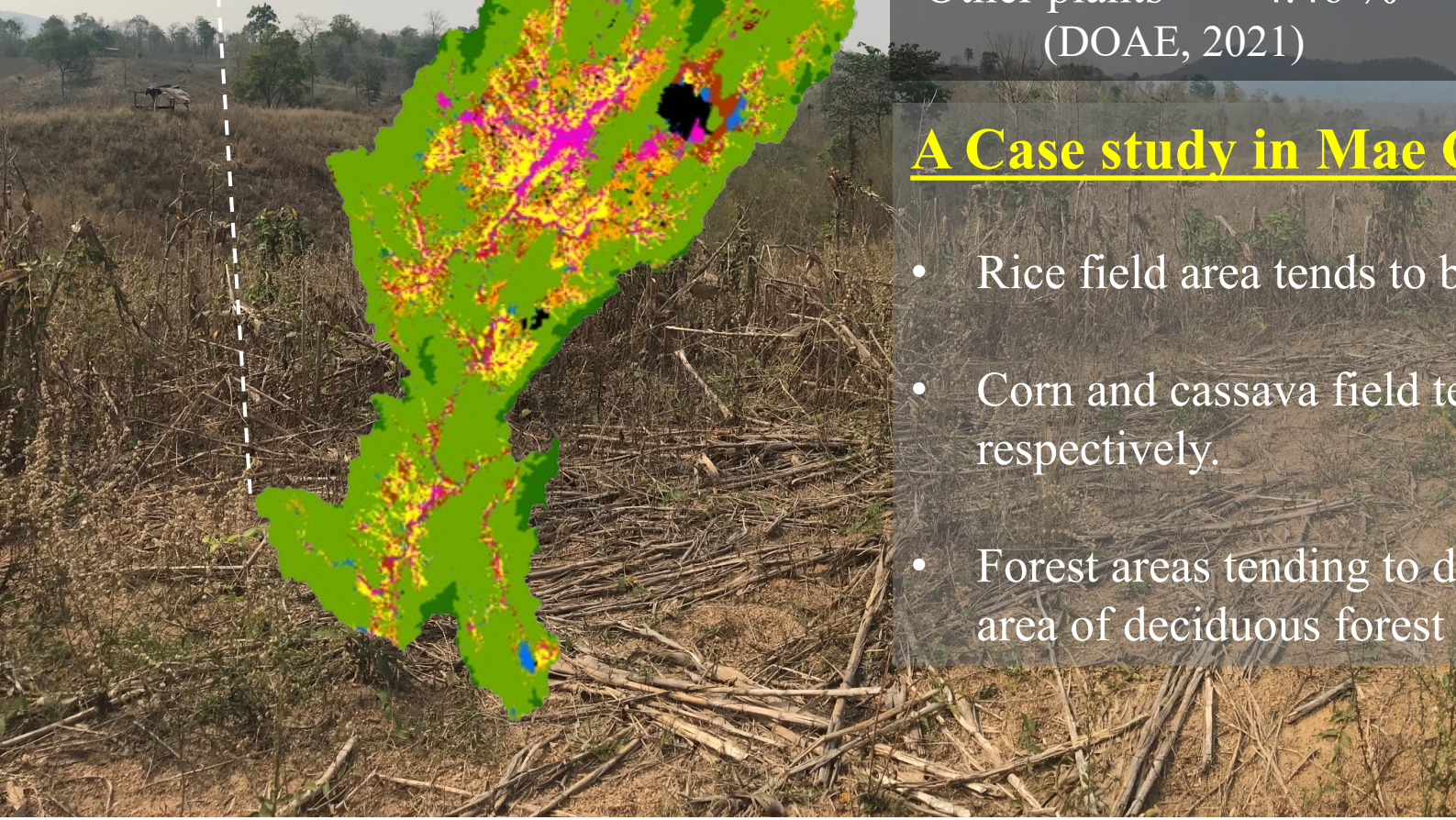
-Rice fields	43.39%
-Field crops	36.33 %
-Plantations	14%
-Vegetables	1.82 %
-Other plants	4.46 %

(DOAE, 2021)

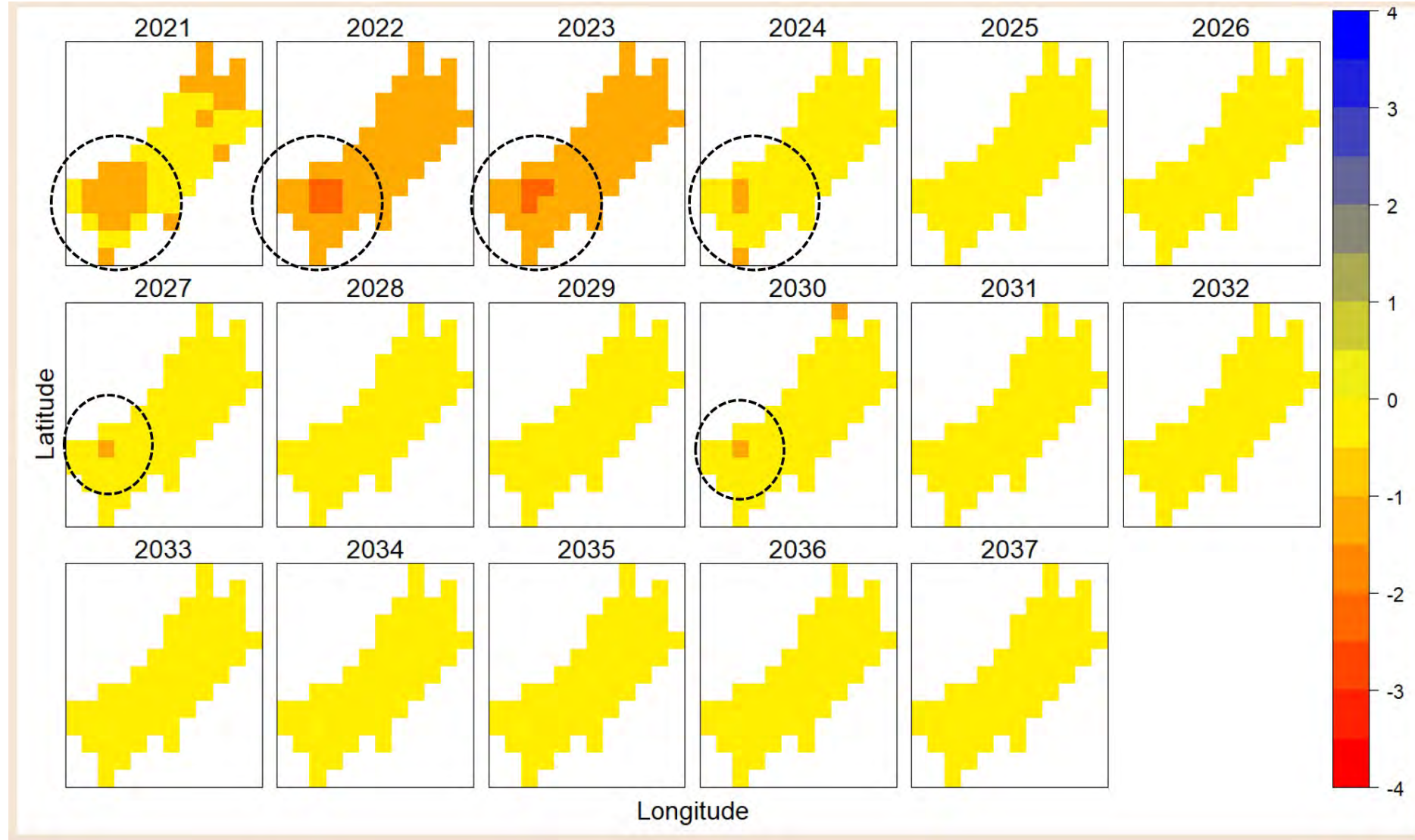


A Case study in Mae Chang Basin from 2001 to 2021

- Rice field area tends to be stable.
- Corn and cassava field tended to increase 2.8 times and 9 times, respectively.
- Forest areas tending to decrease continuously. In particular, the area of deciduous forest decreased significantly (16.9 %)



Drought Risk Area in Mae Chang River Basin, Lampang Province using the standardized precipitation index



- The results of the research have led to policy recommendations at both the provincial and national levels due to the issues arising from recurring droughts and the challenge of monocrop cultivation.
- The suggested approach involves implementing an agroforestry system that integrates knowledge from forestry, agriculture, and local wisdom.
- This is aimed at building resilience within local communities for long-term sustainability. The proposed agroforestry project aims to empower communities to apply this approach actively.
- This initiative is intended to address the impact of recurring droughts on forests, biodiversity, and the livelihoods of local people.
- By utilizing local knowledge and expertise in forestry and agriculture, the agroforestry project seeks to enhance resource efficiency and provide a more resilient livelihood for local communities.
- Ultimately, these efforts aim to mitigate the impacts of natural disasters and ongoing climate change, creating a stronger and more sustainable future for both natural resources and local communities.

The image shows a well-maintained agroforestry plot. In the foreground, there are several rows of young coffee plants, each supported by a wooden stake. The ground is brown and appears to be recently tilled. In the background, there is a dense forest of taller trees, including a prominent palm tree on the left. The sky is overcast and grey. The text is overlaid in the center of the image in a white, serif font.

The project aims to a holistic approach to sustainable forestry management (SFM) in drought regions by implementing community management of forests and agroforestry



Agroforestry is a farming practice that imitates the structure and function of a natural forest. It involves cultivating a diverse range of crops, including small plants on the ground and tall fruit trees, creating a harmonious and multi-layered ecosystem with the forest tree species



Key Elements of the Agroforestry Framework:

Integration of Components: Agroforestry systems intentionally combine trees, crops, and/or livestock, creating synergies between the different elements to improve overall productivity and sustainability.

Biodiversity Enhancement: Agroforestry systems often promote biodiversity by providing habitat for various plant and animal species. This can contribute to ecosystem resilience and pest control.

Resource Utilization: Agroforestry optimizes the use of available resources, such as sunlight, water, and nutrients, to improve the efficiency of production.

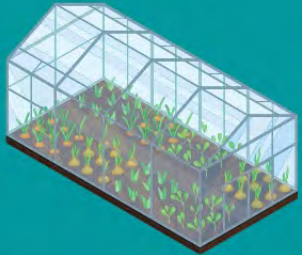
Sustainability: The framework is designed to promote long-term ecological, economic, and social sustainability by balancing resource use with conservation.

Local Knowledge and Adaptation: Successful agroforestry practices often build on traditional knowledge and are adapted to local conditions, taking into account climate, soil, and cultural factors.



Community Agroforestry Systems on Sustainable Forest Management (SFM)

Nursery



Forest:
*Wood, Precious wood, Native plant,
Herb etc.*

Crop fields, Plantation:
*Rice, Fruit, Corn, Vegetable,
Mushroom*

Livestock:

Cattle, buffalo,
chicken, duck, pig etc.



Bio-fertilizer



Fishery:
fish, frog, shrimp,
shellfish, etc.



Insect farming:
Bees, Crickets, Ants



**Cultivation of
mushroom**



Planting fast-growing trees can be an effective strategy to take advantage of the wood resources



In arid or dry soil conditions, Some plants ex. Banana helps the effective soil moisture retainers and light shade to the other seedlings





- **Diverse plant completely cover the ground and protect the soil from erosion**
- Irrigation pond containing fish and crabs for sale and household consumption

Remote sensing and UAVs Application

DJI Phantom 4 Multispectral



Sensors



UAV

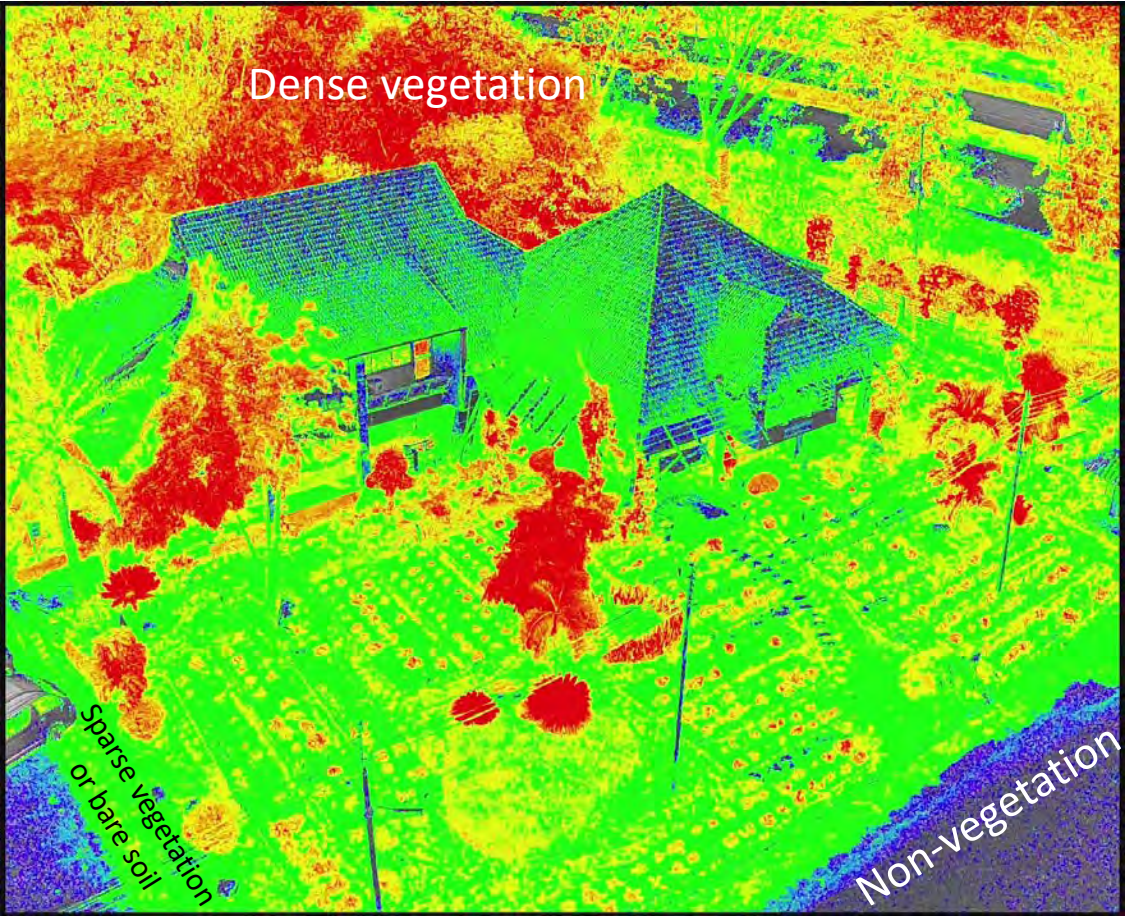


High Precision GNSS Mobile Station

Agroforestry area, Lampung Province



True Color



Vegetation Index : NDVI

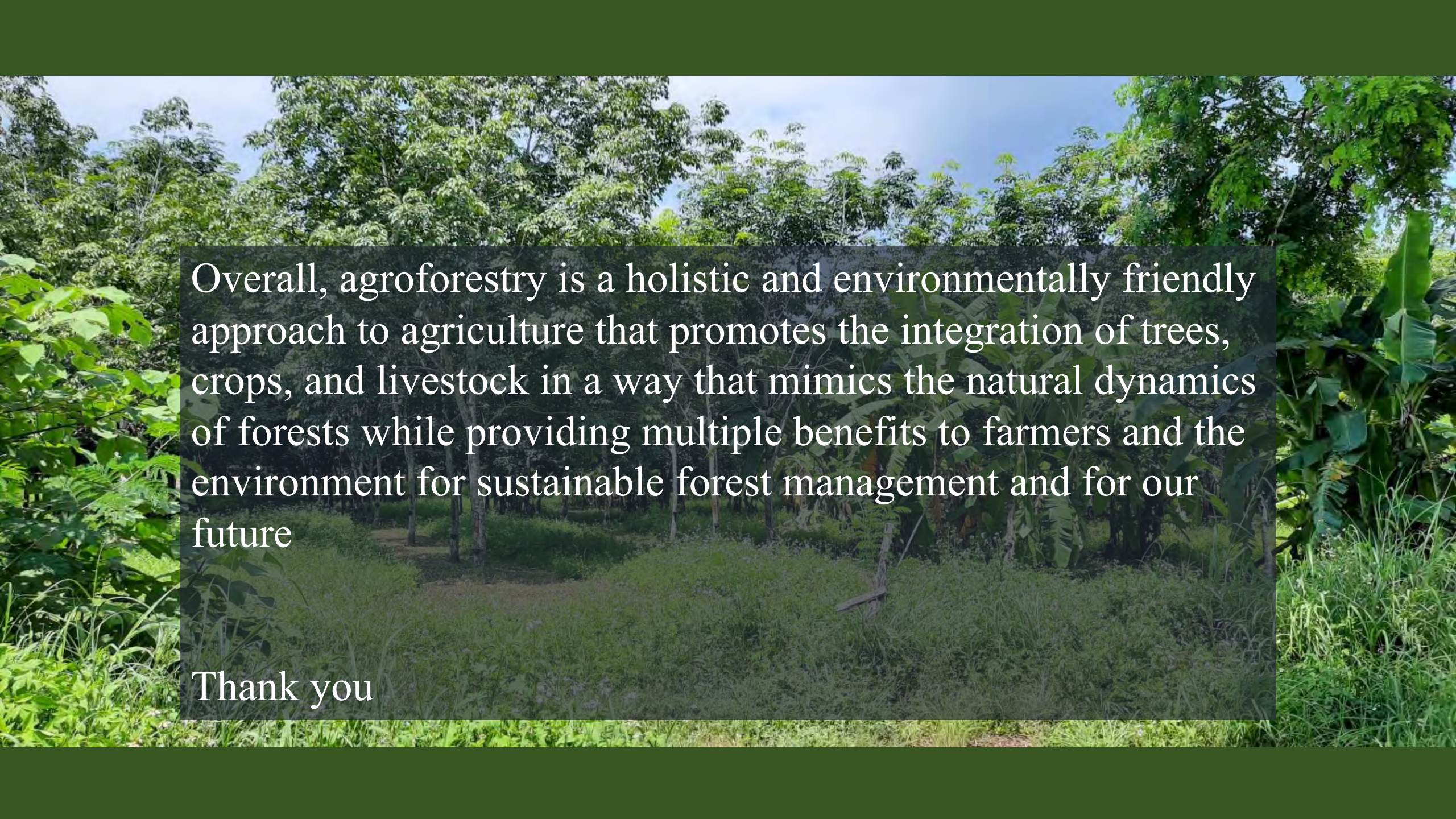
3D Model in Agroforestry area, Lampung



Diversification through agroforestry-based farming, home processing of agricultural products, and community forest management enabled villagers to recapture control of their lives.

At the same time, restoration of their forest removed carbon dioxide from the atmosphere, making a local contribution to reducing greenhouse gases and the control of global warming.



The background image shows a vibrant agroforestry system. In the foreground, there are dense green grasses and various leafy plants. The middle ground is filled with a mix of trees, including tall, thin trees and shorter, broader-leaved trees. The sky is a clear, bright blue. The overall scene is a healthy, integrated agricultural and forest environment.

Overall, agroforestry is a holistic and environmentally friendly approach to agriculture that promotes the integration of trees, crops, and livestock in a way that mimics the natural dynamics of forests while providing multiple benefits to farmers and the environment for sustainable forest management and for our future

Thank you