Chapter 6:

Nature-Based Solutions for Food Security and Community Resilience to Climate Change Impacts: A Case Study of Food Forest in Vietnam

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CHAPTER HIGHLIGHTS

Vulnerability of ethnic minorities in Vietnam to Climate Change

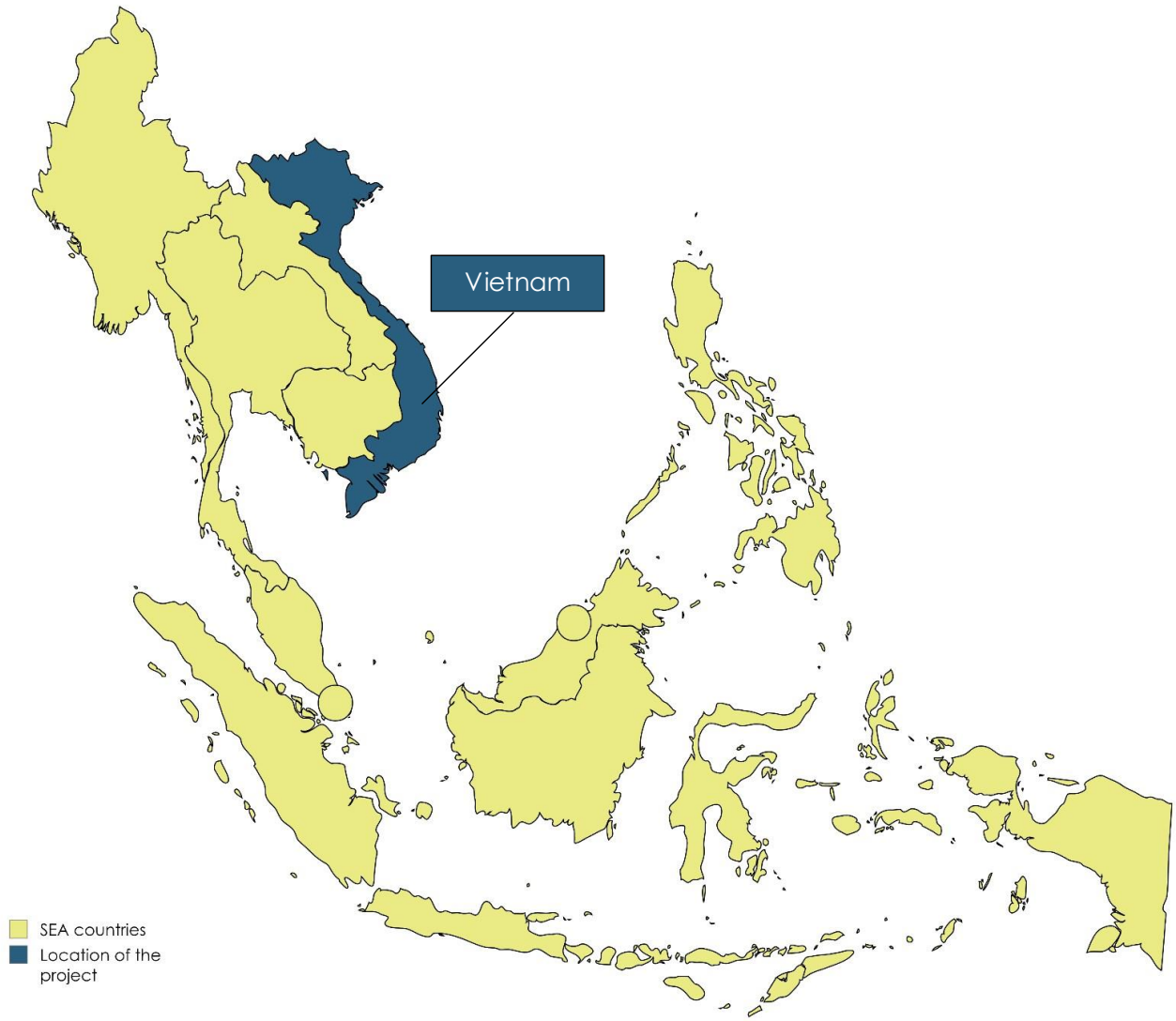
This section shows ethnic minorities in Vietnam have been experiencing slower income growth.

Food forests for climate adaptation

This section shows food forest development has reduced flood damage, increase crop yield and locals' income.

Challenges of implementing food forests

This section shows limited awareness as well as understanding of nature-based solutions as the main obstacle.



Summary

- **Affiliation:** Thai Nguyen University of Agriculture and Forestry
- **Population:** 1.3 million
- **Project Type:** Nature-based solution to climate change
- **Time Scale:** 2022 - 2024
- **Stakeholders involved:** villagers, government officials and local commune leaders
- **Funding:** USD 83000
- **Sponsor:** Asia Pacific Network for Global Change Research
- **Impacts:** Improved food security and climate change adaption among local communities. Scaled up of nature-based solutions/food forest for food security and climate change resilience

Relevance of this chapter to SEACAR's themes

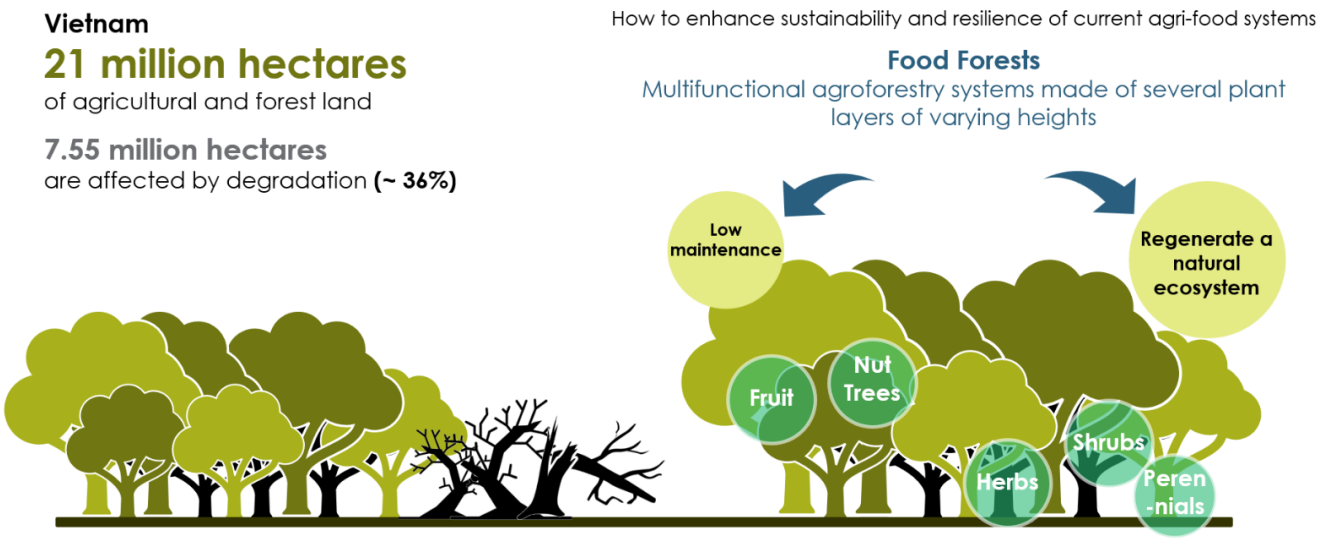
Summary

Climate change and food insecurity are major societal challenges faced by humanity. Food security depends on the sustainable management of healthy ecosystems. The syntropic food forest is a nature-based solution which is low-maintenance. It helps to regenerate a natural ecosystem by combining forest trees with fruit, nut trees, shrubs, herbs and perennials in different layers.

Food forests perform well with suitable or appropriate social-cultural and environmental conditions by building capacity, providing quality food, enhancing biodiversity, and regenerating soil fertility. The development of food forests as nature-based solutions in the project area has contributed to the reduction in crop loss from drought in 2023 between 20-35%, reduced flood damage as a result of tree growing along stream banks, increased crop yield about 25%, and improved income and livelihoods for local villagers from selling food forest products. In addition, the project has raised awareness about climate change impacts and food forests as nature-based solutions for more than 2000 people in the locality.

6.1 Introduction

Food security depends on the sustainable management of healthy ecosystems. However, 50% of the world's agricultural land and marine ecosystems have been degraded (Iseman & Miralles, 2021). For example, Vietnam has approximately 21 million hectares of agricultural and forest land, of which 7.55 million hectares are affected by degradation (Gobin et al., 2020). Current agri-food systems need to become more sustainable and resilient. Nature-based solutions (NBS) offer the potential to achieve this. NBS were endorsed in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment, the Climate Change and Land Report of the Intergovernmental Panel on Climate Change, and the Global



Adaptation Commission Report, and were highlighted as one of nine key action tracks at the 2019 UN Climate Action Summit (Seddon et al., 2020).

Food forests as nature-based solutions, are multifunctional agroforestry systems made of several plant layers of varying heights, including trees, shrubs, and groundcover plants (Albrecht & Wiek, 2021). In the late 20th century, alternative agriculture known as syntropic agriculture or food forest which mimics nature in food production was developed by Ernst Götsch. Unlike most modern agricultural systems that rely heavily on fossil fuels, herbicides, pesticides and fertilisers, which are frequently linked to issues such as pesticide accumulation, degradation of soil structure, nitrate leaching and groundwater pollution. The syntropic forest is a NBS which is low-maintenance and helps to regenerate a natural ecosystem by combining forest trees with fruit, nut trees, shrubs, herbs and perennials in different layers. This combination creates a closed circulatory system, which does not require the addition of external fertilisers. The majority of food forests perform well on social-cultural and environmental criteria by building capacity, providing quality food, enhancing biodiversity and regenerating soil fertility. However, the practice and application of food forests are still very limited. Therefore, it is essential to implement measures to promote the development of syntropic food forests, especially in the Mountainous Region of Vietnam where the majority of the population are ethnic minority people.

6.2 Ethnic minority, climate change vulnerability and adaptation

6.2.1 Poverty, food security and vulnerability among ethnic minority people in Vietnam

Viet Nam has achieved a historically rapid reduction of extreme poverty over the past three decades. However, conditions for some groups have lagged. Some remote and mountainous areas, where agricultural productivity has grown more slowly and fewer jobs are available outside of agriculture, have experienced slower income growth than most. Ethnic minorities make up 15% of the total population but accounted for 79% of the poor in 2020. Ethnic minority households living in mountainous and remote areas, especially in the northern mountainous provinces, the Central Highlands and the Northwest mountainous region were more likely to be among the chronically poor (World Bank, 2022).

Vietnam is one of the world's most vulnerable countries to climate change (World Bank, 2021). Climatic stresses most impact vulnerable communities, such as those in the upland areas of the Northern Mountainous Region (NMR) (Son et al., 2019). It is also within NMR where many of the ethnic minorities of the country reside. Since they often live in the more remote areas, their limited access to markets and services adds to their vulnerability.

Key concerns associated with climate change in the NMR of Vietnam are drought in the dry season; soil erosion, landslides, and flooding in the rainy season (summer); and changing temperature

regimes such as additional cold spells (Son & Kingsbury, 2020).

Son La is a mountainous province in the Central Northwest of Vietnam. In the past years, Son La has been regularly affected by floods, flash floods, landslides and drought (DONRE, 2019). In addition to climate stresses, the vulnerability of local communities is also determined by other social processes such as poverty, inequality, unsustainable use of natural resources and poor infrastructure.

6.2.2 Adaptation to climate change impacts

Livelihood diversification has been the main strategy adopted for living with climate variability and other stressors in the project area. The diversity of the economic portfolio gives greater flexibility to households for adjusting to change. The biophysical factors of the mountainous environment have encouraged the local people to adopt multiple livelihood strategies and a variety of different agricultural production methods to support their subsistence.

Traditional and local knowledge are essential principles for communities to cope with climate variability and change in the project area. For example, local communities were found to use small reservoirs and ponds and created dams to hold water on smaller streams. Villagers used combinations of these measures, often simultaneously. In the case of land management, strategies include manuring, mulching, ploughing in crop residues and fallowing. In crop management, strategies included planting native varieties, timing of planting, crop diversification and crop rotation. In agricultural production, local knowledge-based responses include using local drought-resistant crops and switching from rice to other cash crops. Numerous native crops and animals are cultivated in the home gardens or farms. Native plants and animals support maintaining the natural ecosystem and increasing the resilience to climate change. These examples illustrate the importance of local knowledge and experience for communities in coping with and adapting to climate change impacts.

6.3 Food Forest as a nature-based solution to food security and climate change resilience

In the project area, food forest models have been developed as nature-based solutions (NBS) to food security and climate change resilience. The development of food forests as NBS contributed to the reduction of crop loss by 20 to 35% during the drought period in 2023, reduced flood damage as a result of trees growing on slopes or stream banks, increased the yield of some crops by about 25%, and improved income for local villagers from selling food forest products. In addition, the project has raised awareness about climate change impacts and NBS for more than 2000 people.

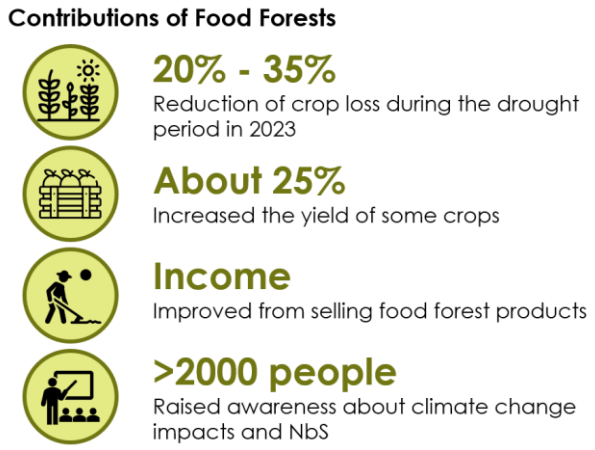


Figure 1. *Garden-pond-barn practice in Son La province.*

The pilot of a food forest that follows the International Union for Conservation of Nature (IUCN) Global Standard for NBS supports both the public and private sectors to reliably scale up NBS to accelerate its transition to a low-carbon future and to assist in the design, implementation, and verification of NBS actions (IUCN, 2020). Some food forests are established to regreen the bare hills while some have been developed to diversify the existing home garden or agroforestry systems practised by local people. Common farming systems in the project areas are garden-pond-barn or VAC in Vietnamese, and forest-garden-pond-barn or RVAC in Vietnamese (**Figure 1**). These existing farming systems are innovative but could be further improved to be more resilient in the context of climate change. Food forests developed in the project area are designed to be multifunctional biodiverse agroforestry systems consisting of varying plant layers, including trees, shrubs and ground cover.

Training on NBS principles and food forest design and implementation has been provided to villagers, government officials and local commune leaders (**Figure 2**). Technical support from the Thai Nguyen University of Agriculture and Forestry has been provided to households who pilot the demonstrations. Today, 59 households in the same village applied NBS principles and practices at their farms in different forms such as mixed farming, vermi-composting or ecological gardens. For example, farmers reported that by applying a circular agriculture model with vermicomposting, animal raising and growing crops reduced the cost of animal raising by at least 35% and increased the revenue from selling agricultural products by 15%. This is due to crops with higher quality produced through this method. The application of these NBS has promoted the development of organic agriculture in the area which facilitates the agri-tourism business and improves livelihoods for local villagers.

Figure 2. *Training on designing and piloting nature-based solutions for local farmers.*

NBS practices and food forests are closely connected with the concept of mixed farming. In the project area, households are supported to adopt mixed farming practices under food forest and agroforestry models. Particularly, farmers have been taught to intercrop maize and bean, growing red pea nuts in the one-crop rice land to adapt to drought and lack of water in the dry season. They also practise rice and duck farming systems. Experts from the Thai Nguyen University of Agriculture and Forestry guided farmers to mix different crops such as shade-tolerant plants growing in the home gardens (**Figure 3**). Mixed farming implies a switch away from mono-crop agriculture to growing a set of interdependent crops where the cultivation of one creates favourable conditions for others. Crop diversity is seen as an effective strategy to improve soil fertility, and enhance the resilience of the production systems. The use of local feed and manure instead of imports and chemical fertilisers can also contribute to the reduction of CO_2 emissions in agriculture. The minimum size for a food forest is 0.5ha in an ecologically rich environment. For a severely impoverished environment, a larger area is recommended.

Figure 3. *Mixed farming practice in Son La province.*

Food forests adopt basic principles of agroforestry (Albrecht & Wiek, 2021). Agroforestry, which is tree planting in combination with crops or pastures, is an integral part of the NBS approach. It is well known that tree planting can help restore biodiversity in agricultural landscapes while increasing soil fertility by enhancing the accumulation of organic matter from decaying nature. All households in the project area are practising agroforestry in different forms and prioritising local varieties and animal breeds for market preferences and biodiversity conservation purposes. The project only provides training for local people to make use of local resources and improve resource use. For example, farmers are trained to intercrop the right species (tolerant crops, nitrogen-fixing crops, medicinal plants) in the home gardens. For forest tree planting, this project supports farmers to grow local species to stabilise stream banks (**Figure 4**) and multi-purpose trees such as Canarium

and Cinamomum to maximise the benefits of the agro-forestry systems.

Figure 4. *Growing Melia trees to stabilise stream banks.*

6.4. Challenges and opportunities for improvement

6.4.1 Challenges

Limited awareness and understanding of NBS and food forests is the main challenge of this project as they are new concepts for most stakeholders. Limited awareness, understanding and agreement around NBS are barriers to scaling up their use. As argued by Nelson et al. (2020), NBS confront diverse challenges including a lack of awareness; knowledge gaps surrounding applications and effectiveness; insufficient understanding of costs and benefits; diverse stakeholder values and perspectives; and limited policy and economic instruments. Building a common understanding of the nature and value of NBS will be important for scaling up. Other challenges include limited research on NBS effectiveness, scalability, and long-term impacts on ecosystem services and community welfare. Understanding socio-economic benefits and trade-offs is also crucial for informed decision-making.

6.4.2 Stakeholder engagement and opportunities for improvement

This project empowers farmers, officials and policymakers through capacity building and upscaling of the practices in other villages. The promotion and upscaling of NBS practices are often hindered by the lack of both technical knowledge and market access for produce. Therefore, capacity building for relevant stakeholders, especially local communities is essential. Farmers need to be allowed to experiment with the new practices with technical support. Model farmers have played an important role in encouraging and convincing their fellow farmers to apply and scale up.

The Markets Systems Development approach has been applied in this project. It is crucial for scaling up sustainability and NBS practices. Cooperating with businesses to develop markets for nature-based products to sustain the NBS agricultural production is essential for scaling up the NBS proposed in this project. The project has collaborated with social enterprises working in the area to pilot the selling of given products and services to sustain the nature-based solutions proposed in this project.

Private sector participation incentivises farmers and local authorities to pilot and up-scale NBS practices for sale at higher prices. This is to ensure the sustainability of nature-based production with the participation of the private sector. The project works with authorities and farmers

to promote NBS, products and other ecosystem services.

6.5 Conclusions

The project results showed that food forests as a NBS has improved food security and climate change adaptation among local communities. There is a positive acceptance among local people, especially young people to pilot food forest practices. Local people see the benefits of developing food forests when it attracts more tourists to visit their village and experience the beauty of nature. NBS practices such as food forest, organic agriculture, circular agriculture such as vermicomposting, agroforestry and mixed farming have been applied in the project area to rebuild soil organic matter, improve soil fertility and increase soil organism biodiversity, creating many environmental and economic benefits to farmers. The promotion of NBS principles and practices could transform agricultural production in the way that can unlock local indigenous resources to develop a local economy where the people can earn livelihoods from their land sustainably.

6.6 Recommendations

The success of promoting NBS in general and food forests, particularly in Son La, for food security and climate change resilience comes from many reasons. The main reason is the application of the market system development approach where climate-friendly enterprises are involved in planning agriculture production and co-investing in production and consumption.

The scale-up of NBS practices benefits from the appreciation of local and indigenous knowledge. NBS practices promoted in this project are not new to local communities. Local communities in the mountainous region of Vietnam in general have adopted many NBS practices to adapt to the changing environment. In this project, we value the local knowledge through their voices and ideas and this gains acceptance from the communities.

In addition, improving the adoption of NBS requires learning from previous experience. Knowledge derived from previous cases would support the identification of the drivers and barriers of NBS implementation in other areas, generate lessons learned, and support upscaling in different regions or areas.

Acknowledgement

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