PROMOTING AGROFORESTRY AS A CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGY IN SOUTHEAST ASIA

A POLICY BRIEF

Philippine Agroforestry Education and Research Network
Indonesia Network for Agroforestry Education
Lao Network for Agroforestry Education
Thailand Network for Agroforestry Education
Vietnam Network for Agroforestry Education

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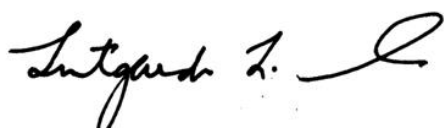
PREFACE

This Policy Brief is one of the major outputs of the project entitled "Scaling-Up Agroforestry Promotion for Climate Change Mitigation and Adaptation in Southeast Asia". This project was carried out by the Philippine Agroforestry Education and Research Network (PAFERN), in collaboration with the four country networks of the Southeast Asian Network for Agroforestry Education (SEANAFE), namely: Indonesia Network for Agroforestry Education, Lao Network for Agroforestry Education, Thailand Network for Agroforestry Education, and Vietnam Network for Agroforestry Education (VNAFE), with fund support from the Asia-Pacific Network for Global Change Research (APN). Primarily, this project was implemented to enhance information exchange and technical capacity development among the SEANAFE member-countries in agroforestry development and promotion in Southeast Asia.

Agroforestry, a land-use management system that combines the production of agricultural crops with the woody perennials, livestock and/or aquatic resources, is one of the interventions that is being considered in climate change mitigation and adaptation.

This Policy brief highlights the issue of climate change, particularly its impacts to humanity and the environment; the concepts of agroforestry and its role in climate change mitigation and adaptation; the experiences of PAFERN and its collaborators in scaling-up agroforestry promotion for climate change mitigation and adaptation in Southeast Asia; and the indicative policy options in promoting agroforestry as a climate change mitigation and adaptation strategy in Indonesia, Lao PDR, the Philippines, Thailand and Vietnam.

The project collaborators believe that this policy brief will serve as its instrument in its advocacy of institutionalizing agroforestry at various levels and sectors in Southeast Asia.

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CLIMATE CHANGE AND ITS IMPACTS IN SOUTHEAST ASIA

What is climate change?

Climate change is defined by the Intergovernmental Panel for Climate Change (IPCC) as a statistically significant variation that persists for an extended period, typically decades or longer. It includes shifts in the frequency and magnitude of sporadic weather events as well as slow continuous rise in global mean surface temperature. Climate change is also known as the global warming. It is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over a comparable time periods (UNFCC as cited by Lasco et al, 2004).

The IPCC has concluded that human activities that emit greenhouse gases into the atmosphere are responsible for most of the warming of at least the past 50 years ((http://www/ifpri.org/ PUBS/newsletters/IPFPRI forum/if200612.asp). Lasco et al (2004) reports that the concentration of carbon dioxide in the atmosphere has increased by more than 30% since pre-industrial times and is still increasing at an average rate of 0.4% per year, primarily due to the combustion of fossil fuels and deforestation.

Stronger and more frequent typhoons, warmer nights, and longer and hotter days are few of the most common evidences that climate change is real. These evidences, however, are often confused with weather changes. From the popular phrase "climate is what you expect, while weather is what you get", weather changes refer to the different conditions of temperature, rain, and wind from this day to the next. Climate change, meanwhile, refers to the differences in the average weather condition for a certain period – a month, 10 years to thousands or millions of years.

Today, climate change is a global concern especially in the agriculture sector. Evidences of climate change are limiting food supply, altering cropping seasons, increasing incidence of pests and diseases, rationing water supply, and forcing farmers to adapt using meager resources.

The IPCC TAR (2001) projects that precipitation will increase over high latitude regions in both summer and winter. Increases are also projected over northern mid-latitudes, tropical Africa and Antarctica in winter, and in southern and Eastern Asia in summer. Larger year-to-year variations in precipitation are very likely over most areas where an increase in mean precipitation is projected. In addition, the IPCC Report (2001) highlights that "yields of some crops in tropical agricultural areas would decreases with even minimal increases in temperature because they are near their maximum temperature tolerance. Where there is also a large decrease in rainfall in subtropical and tropical dryland/rainfed systems, crop yields would be even more adversely affected."

These projections point to the fact that the agriculture sector would be the most vulnerable to climate change, because of its dependence to water and climatic conditions. Climate change poses threats and risks to agricultural production, in general, and to the poor/marginal farmers, in particular. Ironically, the farmers have the least contribution to gas emissions in the atmosphere, and yet, they are considered to be the most vulnerable to the negative effects of climate change.

How do we experience climate change?

Increase in temperature. Studies have shown that climate change is due to increasing emission and accumulation of greenhouse gases such as carbon dioxide in the atmosphere. Greenhouse gases are released from human activities such as deforestation, burning, chemical use, and many others. These gases trap surface heat in the atmosphere and prevent them from being released into space. This condition, known as the greenhouse effect, increases global temperature which changes both weather and climate conditions.

More powerful typhoons. Global warming increases ocean temperature and rate of evaporation. As water vapor increases, the more rains typhoons carry. Climate change, through global warming, has increased the number, frequency, and intensity of typhoons in the country over the years.

Extreme climate variability. Climate variability refers to short-term changes in climate such as longer dry or rainy season, intense heat during summer, more rains during rainy months, and many more. This is caused by the El Nino southern Oscillation or ENSO event. ENSO has two phases—the El Nino phase causes extensive drought while La Nina phase causes more rains and longer rainy seasons.

Rise in sea levels. Increasing global temperature causes glaciers and polar ice caps to melt thereby making sea levels rise. In the Philippines, experts identified a 15-centimeter increase in sea level from 1980 to 1989. If sea levels continue to increase, more lands could be submerged under water permanently.

How does climate change affect the environment?

Limited food supply. Climate change can alter the schedule and duration of cropping seasons. It can extend El Nino or bring more rains than usual during La Nina. Farmers can become confused as to when they should plant crops, thereby affecting length of cropping season, time of harvest and food supply. Water shortage during dry months can also affect crop growth and overall food production.

Increased occurrence of pests and diseases. Climate change can vary the life cycle of pests – increasing their population at a different time. Farmers may be unaware of or caught unprepared for these changes. Diseases can also become prevalent based on the environmental conditions resulting from climate change. Floods due to the series of typhoons in October have increased the incidence of malaria, dengue, leptospirosis, and other water-borne diseases which normally occur during the months of June to August.

Ecological imbalance. Climate change can make summer months warmer or cold months cooler than usual. These changes in temperature can cause animal to migrate to more suitable places, or force them to adapt with adverse effects on their physical conditions. Some may even die and become extinct because of their inability to adapt to extreme changes in environmental conditions. Biodiversity is thus, at more risk now than ever because of climate change.

ROLE OF AGROFORESTRY IN CLIMATE CHANGE MITIGATION AND ADAPTATION

Basic concepts of agroforestry

Agroforestry is a dynamic, ecologically-based natural resources management system that, through the integration of trees on farms and in their agricultural landscape, diversifies and sustain production for increased social, economic and environmental benefits (Leakey as cited in Feature Essay, 2007: 5). It deliberately combines woody perennials with herbaceous crops and/or animals, either in some form of spatial arrangement or temporal sequence on the same land (Lundgren and Raintree, 1983). From this definition, agroforestry system is characterized to have : a) two or more species of plants (or plants and animals) at least one of which is a woody perennial; b) two or more outputs; c) always longer than one year cycle; and, d) significant interaction between woody and non-woody components (Lasco and Visco, 2003). The interactions among these different components make agroforestry unique from agriculture and forestry.

Benefits from agroforestry

Agroforestry systems produce multiple benefits – increased income from diverse sources; increased food production; improved supply of fodder for fish and livestock; increased supply of fuelwood; improved soil fertility and water supply; improved habitats; and many more. The diverse components also provide multiple harvests at different times of the year thereby ensuring income and reducing the risk of crop loss. Because of these benefits, agroforestry can improve the lives of the farmers, help reduce poverty, and maintain ecological stability.

Beetz (2002) points out that the resulting biological interactions provide multiple benefits, including diversified income sources, increased biological production, better water quality, and improved habitat for both humans and wildlife. Its multifunctional nature offers a range of the above and below ground opportunities and benefits. It can serve as live fences, woodlots and habitats of wildlife. Further, it can improve soil biota and fertility.

What are the different agroforestry models?

There are different types of agroforestry systems which practitioners and farmers could choose from according to available resources and environmental conditions of their farms.

Agrisilvicultural systems produce agricultural crops and trees at the same time. One can choose from the following:

Alley cropping system where trees act as hedges and agricultural crops are planted on alleys

Photo courtesy of UPLB-Institute of Agroforestry

Multistorey systems where trees and crops of different heights are planted

Photo courtesy of UPLB-Institute of Agroforestry

Improved fallow system where some land areas are planted while others are left to rest
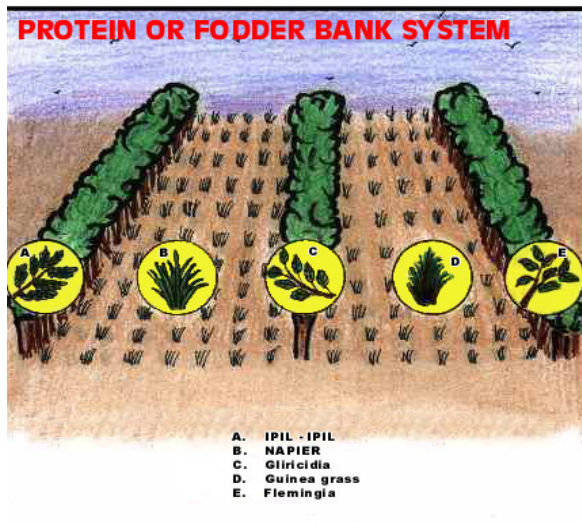

Photo courtesy of UPLB-Institute of Agroforestry

Silvipastoral system combines the planting of trees and the production of livestock. Livestock may include cattle, carabaos, goats and sheep. One can choose from the following:

Tree-cop grazing system, where animals are allowed to graze freely between trees

TREE-CROP GRAZING SYSTEM
EXAMPLE: Cattle grazing under Lumbang (*Aleurites mollucana*) **plantation in NALCO, Agusan del Norte.**

PROTEIN OR FODDER BANK SYSTEM

A. IPIL - IPIL
B. NAPIER
C. Gliricidia
D. Guinea grass
E. Flemingia

Protein bank system where leguminous trees provide supplementary protein for livestock

Live fence system where fodder trees are used as fences

LIVE FENCE SYSTEM

ALLEY CROPPING WITH PASTURE GRASSES, FODDER TREES OR SHRUBS
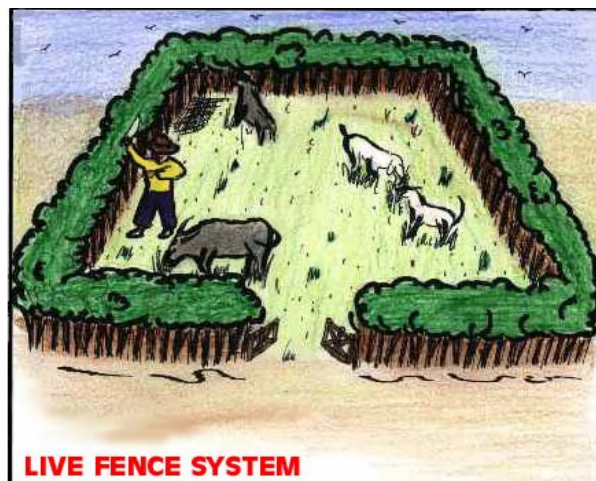
Agrisilvipastoral system produces agricultural crops, trees, and livestock in the same area

EXAMPLE: Simple Agro-Livestock Technology (SALT) 2
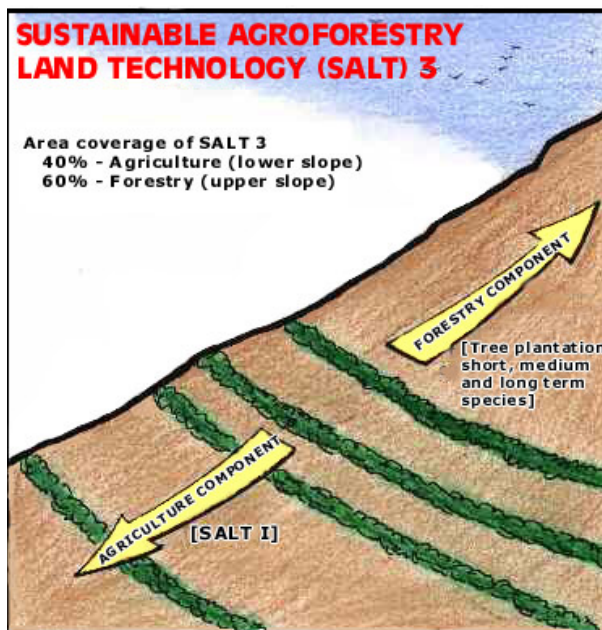A goat-based agroforestry system model developed by the Mindanao Baptist Rural Life Center in Bansaland, Davao del Sur.
All Rights Reserved. 2000. Institute of Agroforestry

SUSTAINABLE AGROFORESTRY LAND TECHNOLOGY (SALT) 3

Area coverage of SALT 3
40% - Agriculture (lower slope)
60% - Forestry (upper slope)

Integrated agroforestry system combines the different systems from the previous categories

Agroforestry tree plantation integrated production system.
All Rights Reserved. 2000. Institute of Agroforestry

How can we mitigate climate change through agroforestry?

As reported by IPCC (2000), agroforestry has an important role to play in mitigation of atmospheric accumulation of greenhouse gases (GHG). Albrecht (2003) highlighted that of all the land uses analyzed in the Land-Use, Land-Use change and Forestry report of IPCC, agroforestry offered the highest potential for carbon sequestration in non-Annex I countries. Improved agroforestry systems that reduce the vulnerability of small-scale farmers and that help them adapt to changing conditions often meet the conditions for an eligible afforestation/ reforestation activity in the Clean Development Mechanism (CDM).

The interactions of the different components of agroforestry systems can help absorb and sequester carbon dioxide and other greenhouse gases from the atmosphere. Studies have shown about 5.7 million hectares of agroforestry systems in the Philippines can sequester around 1.37 to 26 million tons of carbon per year. Imagine how much more carbon can be absorbed if more farmers practice agroforestry?

How can we adapt to climate change through agroforestry?

Researches revealed that the agricultural sector would be most vulnerable to the impacts of climate change. Agricultural production is most affected by temperature and rainfall – two factors that are easily altered because of climate change.

Agroforestry ensures food security by generating direct benefits to farmers such as food, fodder, feed for fish and livestock, fuelwood, live fences, and other products. The diversity of crops provides multiple harvests at different times of the year, thereby reducing the risk of crop loss and food shortage.

Agroforestry helps maintain ecological balance by providing indirect benefits such as soil and water conservation, improved soil fertility, and improved microclimate conditions.

Agroforestry improves quality of life of farmers by increasing income due to multiple harvests and sale of products from the systemsincreasing income due to multiple harvests and sale of products from the systems' different components, thereby providing regular income throughout the year.

SCALING-UP AGROFORESTRY PROMOTION IN SOUTHEAST ASIA: EXPERIENCE OF THE SEANAFE MEMBER-INSTITUTIONS FROM THE APN-FUNDED PROJECT

Recognizing the potentials of agroforestry, PAFERN embarked on the project on "Scaling-Up Agroforestry Promotion for Climate Change Mitigation and Adaptation in Southeast Asia", with funding support from the Asia-Pacific Network for Global Change Research (APN). The project is a regional collaboration of the five country networks of the Southeast Asian Network for Agroforestry Education (SEANAFE), namely: Indonesia Network for Agroforestry Education (INAFE), Lao Network for Agroforestry Education (LaoNAFE), PAFERN, Thailand Network for Agroforestry Education (ThaiNAFE), and the Vietnam Network for Agroforestry Education (VNAFE).

The project objectives

Besides fostering closer collaboration among the five country networks, this initiative will also serve as an opportunity for information exchange, sharing of technical expertise, and capacity development in the region. Specifically, the project aims to: a) provide capability-building programs among the junior agroforestry lecturers in the five participating country networks; b) develop agroforestry information materials for use in teaching and in public awareness programs; and, c) create public awareness programs about the relevance of agroforestry in sustainable upland development.

The project components

1. *Consultative meeting-workshop*

The consultative meeting-workshop served as a venue to orient the representatives of the five participating SEANAFE country networks about the project, including the mode of operation, and the expected deliverables. This meeting also served as an opportunity to organize the project facilitating team (PFT).

2. *Development of agroforestry information materials*

The project team has produced a brochure that highlights climate change — its description, effects and impacts to the environment. The information material also emphasizes the potentials of agroforestry in mitigating and adapting to climate change. The brochure was reproduced was reproduced for use in the public awareness programs such as the conduct of the National Agroforestry Roadshow

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4. *Regional Training-Workshop on Agroforestry and Climate Change*

A two-day training-workshop was organized on October 9-11, 2009 at the SEARCA Residence Hotel, University of the Philippines Los Banos, College, Laguna, Philippines . Ten (10) faculty members representing the INAFE, LaoNAFE, PAFERN, ThaiNAFE, MaNAFE, and VNAFE, including the six (6) SEANAFE Board Members comprised the training participants.

Among the topics that were discussed during the training include: Recent Climate Change Research; Multifunctionality of Agroforestry; and, Carbon Sequestration Potentials of Agroforestry Models.

The regional training-workshop also served as a venue to review the draft information materials/brochures that were produced earlier by the project team; and, develop plans for the conduct of the National Agroforestry Roadshows.

5. *National Agroforestry Roadshows*

The National Agroforestry Roadshow, also known as caravan or motorcade, serves as the public awareness component of this project. The Agroforestry Roadshows are organized as an information campaign about the potentials of agroforestry in mitigating and adapting to climate change. The roadshows are conducted in the most strategic location in each of the five country networks.

The roadshows are participated by representatives from various sectors including the non-government organizations, government agencies, academic institutions, research organizations, people's organizations, and private industry.

Information materials about climate change and the potentials of agroforestry in climate change mitigation and adaptation are distributed not only to the roadshow participants but also to the other people along the streets, farmers, schoolchildren and teachers.

6. ***Development and production of policy brief on promoting agroforestry for climate change mitigation and adaptation***

The policy brief highlights the issues on climate change, including its impacts to the agriculture sector, particularly the upland farmers; basic concepts and principles of agroforestry, a land use management system that has been pointed out by many literature as a key strategy for climate change mitigation and adaptation; multifunctionality of the different agroforestry models that exist in the region.

The policy brief also outlines the indicative policy options for institutionalizing agroforestry as a climate change mitigation and adaptation strategy in each of the five participating country networks.

Project's mode of operation

The APN-funded project was headed by a Project Leader from the Philippines. The five country network coordinators of SEANAFE (e.g. PAFERN, LaoNAFE, INAFE, ThaiNAFE, and VNAFE) who served as the members of the Project Facilitating Team (PFT). The PFT spearheaded the overall project implementation.

INDICATIVE POLICY OPTIONS

Philippines

Work towards institutionalizing agroforestry as a development strategy

The local government units in the Philippines play a very significant role in the sustainable natural resources conservation. The recent study conducted by the UPLB Institute of Agroforestry indicated that many local government units have been employing agroforestry as their main strategy in carrying out their institutional mandates in environmental conservation and protection.

Thus, the local government units should pursue policy advocacy to intensify agroforestry promotion as a development strategy within their spheres of influence. The policy initiatives may include the inclusion of agroforestry in the annual municipal and provincial development plans; creation of permanent government positions for Agroforesters at the Municipal Environment and Natural Resources Office (MENRO); and the delineation and classification of agroforestry areas.

Intensify agroforestry promotion at all levels and sectors

The state colleges and universities should continue implementing need-driven and responsive agroforestry education programs that would be able to address the needs of the society. The SCUs should identify strategies that would make their agroforestry education programs more attractive to the prospective students and employers.

The agroforestry education networks should continue serving as the core organizations in agroforestry development and promotion in the Philippines. These organizations should continue conducting research and development projects; implementing capacity-building programs such as offering relevant training programs; facilitating and coordinating the national agroforestry activities; developing relevant IEC materials for information dissemination; and, lobbying for the institutionalization of agroforestry as a development strategy in the Philippines

The non-government organizations should intensify agroforestry advocacy through their grassroots-level oriented extension programs and continuously serve as the bridge between the farming communities and the national and local government for the promotion of pro-farmer development programs.

The people's organizations and fafarmers should sustain the adoption of different agroforestry technologies, and the active participation in various agroforestry development endeavors.

Research-oriented institutions should continue advancing the science of agroforestry

The research institutions and state colleges and universities should generate new knowledge through the conduct of research and development programs, including the documentation of successful agroforestry technologies, and climate change adaptation strategies of farmers from various areas in the Philippines. These documentation of agroforestry technologies should be packaged for dissemination among the agroforestry farmers for possible replication in their areas.

Indonesia

Integrate agroforestry in the policies on natural resources conservation at the local government units

The Government of Indonesia has already redesigned the development policy for the forestry sector to address food security concerns. Based on existing regulation, agroforestry is identified as one of the appropriate strategies for food security. Since agroforestry is already recognized at the national level, it is hightime that the local government units also become aware about the potentials of agroforestry, and ultimately, integrate agroforestry in the development of local policies and regulations on natural resources conservation.

Continue organizing capacity-building programs in agroforestry

Recognizing the potentials of agroforestry, there is a need to continue providing training programs and other capacity-building activities at the national and local levels not only to create an appreciation about agroforestry, but also the enhance the technical skills of the development workers in agroforestry.

Thailand

Establish local community learning centers in agroforestry

There are practitioners in Thailand who have successfully implemented agroforestry using their own/local practices. The agroforestry education networks and the local government could work together to select the farmers' agroforestry fields to serve as the learning laboratory and demonstration areas for the students, researchers and farmers.

The agroforestry education networks in partnership with local government units should continue establishing community learning centers to serve as a venue for agroforestry technology transfer, promotion of local agroforestry practices among the agriculture students, farmers and development workers. The farmers and researchers should consult with the local agriculturists in providing technical information support for the new agriculturists.

Create consciousness among the young generation about the natural resources conservation

The higher learning institutions and universities in Thailand could promote natural resources conservation among the young generation through visits and information drive among the primary and secondary schools. With this, the transfer of knowledge on natural resources conservation and management could be disseminated and could be inculcated into the minds of the young students.

The agroforestry education network, particularly the ThaiNAFE could produce teaching materials for use by the young students in order to develop consciousness in natural resources conservation.

Publication and distribution of agroforestry research and development initiatives

There are agroforestry institutions in Thailand that are engaged in various agroforestry research and development programs. The concerned institutions should work towards disseminating the results and outcomes of the research and development projects for an effective agroforestry promotion in the country.

Because many researches have already indicated the potentials of agroforestry in climate change mitigation and adaptation, the agroforestry education network should sustain its initiative or organizing public awareness programs.

Lao PDR

Promote institutional collaboration for agroforestry promotion

Lao Government has engaged many stakeholders in agroforestry development in order to manage natural resources sustainably. Contract farming is one of government initiatives that promote agroforestry for the benefit of the local people.

The state-managed agroforestry schools have been upgraded into Colleges and universities. In addition, cooperation with regional organizations such as SEANAFE has played an important role in strengthening capacity of staff and institutions, and in enhancing agroforestry networks. These initiatives should be sustained and even expanded to cover all sectors in the country in order to widen the promotion of agroforestry at all levels.

Strengthening research-orientation in the field of agroforestry

Colleges and universities are continuously conducting researches about the roles of agroforestry in relation to climate change especially Reduction of Emission from Degradation and Deforestation (REDD) issues. The knowledge gained from these researches will provide better understanding of local villagers (agroforestry farmers) to voluntary participate in environmental conservation and protection.

Vietnam

Integrate agroforestry promotion in the extension programs for upland communities

In Vietnam, the extension programs have focused mainly on agriculture system and mono industry tree development. Therefore, a number of sloping and upland areas are now facing problems on farm productivity and environmental degradation.

It is hightime, therefore , to integrate agroforestry in the extension programs in Vietnam in order to help rehabilitate the degraded upland areas.

Improve agroforestry education at different levels

There is a need to continue improving the curricular programs in agroforestry at various levels. Agroforestry education is needed to train the young generation about the significance of agroforestry. If properly equipped with knowledge and skills, the young generation could serve as the best agent for promoting sustainable agroforestry in various communities in Vietnam.

On-farm agroforestry researches should be sustained and improved

Up to now, too much agroforestry research is being conducted by the academic institutions. The research results, however, are difficult to apply in the real field conditions. Thus, the researchers should now focus on conducting on-farm researches in collaboration with the farmers. These researches more or less fit the actual field conditions, and at the same time, would be able to harness the indigenous knowledge system of the farmers in agroforestry farm development.