AGROECOLOGY FUTURES

Inspiring and innovating stories from the Agroecology Learning Alliance in South East Asia – ALiSEA –

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– ALiSEA –

Pierre Ferrand & Sophie Le Jeune,
November 2018

ALiSEA

Agro-ecology Learning alliance in South East Asia

6 agroecology schools

- Organic Agriculture (OA)
- Integrated Pest Management (IPM)/ Integrated Cropping Management (ICM)
- System of Rice Intensification (SRI)
- Integrated Farming (VAC)
- Conservation Agriculture (CA)
- Agro-Forestry (AF)

http://ali-sea.org/

ALiSEA key achievements

115 members from **5** countries of the **Mekong Region**
Cambodia – Laos – Myanmar – Thailand – Vietnam

4 axes of intervention

Organization of multi stakeholders & thematic workshops

18 national and regional level workshops – **13** national, **5** regional – organized in **3** years gathering about **1,000** participants from over **120** organizations

Implementation of studies & co-research process

2 years of Small Grant Facility

26 small grants awarded in **5** countries and implemented by local and international organizations (NGOs, Universities, Private sector)

Development of knowledge management & communication tools

An online knowledge sharing platform on agroecology in the Mekong Region with over **602** resources, **64** case studies and about **16,000** visitors/month & about **1,700** subscribers to the quarterly newsletter

A presence on social media with over **8,600** followers on **5** different Facebook Pages (En/Vn/La/Khm/Bur) and a YouTube channel of over **84** videos

BACKGROUND

About GRET

Gret (https://www.gret.org/) is a French NGO which for 41 years has been acting from the field to policy level, to fight against the poverty and the inequalities. Its professionals intervene on a broad range of topics in order to provide sustainable and innovative responses for a fair development.

About the Agroecology Learning alliance in South East Asia (ALiSEA)

ALiSEA (https://ali-sea.org) is an innovative regional initiative aiming at facilitating and organizing exchanges, learnings and cooperation between government, civil society, research institute, universities and private sector stakeholders about agroecology in the Mekong region. Its objective is to gather all these actors to form a strong coalition of stakeholders at different levels that is capable of feeding public policies and advocating for a wider dissemination of successful alternative agriculture practices. The ALiSEA regional secretariat is located in Vientiane, Lao PDR, with national secretariats in Vietnam, Myanmar and Cambodia.

About this book

This book results from the compilation of different case studies from the ALiSEA Small Grant Facility and other research work carried out since 2015. ALiSEA funded 26 initiatives to support agroecology activities in the Mekong region, which were translated into several knowledge products. These later were reviewed and harmonized to produce this capitalization book. The small grant initiatives were implemented by a broad diversity of stakeholders and participated to change the agriculture sector at different levels, from production unit to policy level. ALiSEA considers these stories as first hand and precious illustrations from the field, which could inspire others to act for a transition toward agroecology in the Mekong region.

About the Editors & Authors

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Layout and design: Rémy Rossi

Case studies from: ADC, ADG, CGFED, Chalmers University, Chulalongkorn University, CIRAD, CISDOMA, Echo Asia, GRET, MIID, MIPAD, NAV, NUoL, NOMAFSI, Ockenden, RIKOLTO, SPERI, Svay Rieng University & Royal University of Agriculture, TdH Italy, TOA, RCRD, Vivre de sa Terre

To quote this book:

Ferrand P., Le Jeune S. (2018), Agroecology Futures: Inspiring and innovating stories from the Agroecology Learning Alliance in South East Asia, ALiSEA & GRET, Vientiane, Lao PDR.

Foreword

Agroecology is a big word. At AFD we use it all the time and we have for years. Often as a concept and a set of good practices we wish and hope to promote in the course of the five to ten years of the projects we finance as a donor agency. Also, as a reassurance that we are pushing agricultural development in the "South" away from some of the flaws, risks and downfalls (namely in environmental and social terms) of the "conventional" model of the "North".

A few years ago, our *relationship* with Agroecology grew more intense, as the Agency and its agronomists became exhilarated by the sophistication of detailed and well-designed agronomical systems inspired by Brazilian no-till farmers and tested, sometimes developed and scaled-up, in S.E. Asia and Madagascar, with AFD's support. During that time, for us agroecology meant no-tilling, direct sowing and mulch covered plots, on which cycle after cycle food and protective crops alternate, leaving the soil untouched, allowing it to slowly shift back to its natural equilibrium. In sloping and vulnerable tropical lands, as is part of S.E. Asia, these systems were expected to bring long awaited solutions to soil erosion, water efficiency and agricultural intensification (which sometimes also means localization of nomadic communities, in the context of traditional slash and burn practices), provided the right varieties are available for protection and *drilling* of the soil (necessary to avoid compacting) and the appropriate cropping patterns respected.

It is no secret that these systems are based on the use, intensive in the first years, of herbicides such as glyphosate or atrazine (still available in some countries – though now forbidden in Europe) for the management of the live plant cover and the establishment of the protective mulch. The use of these products has often been presented as a necessary evil (namely because they have been suspected – and in many cases proven – to be harmful to humans and nature, even under prescribed use conditions) for the development of these otherwise argued nature-based, ecological systems. There is much debate and question as to the value of this argument, even within AFD.

For me, this short and simplified story of our relationship with Agroecology brings us back, again and again, to the basic question: **what is agroecology?** And its immediate follow-up questions: What are its **inclusion and exclusion principles** and best practices (for example, is it compatible with the use of herbicides, which ones and in which conditions?)? How do we extend those practices and techniques to farmers, **taking into account the specificities of each territory?** How do we manage the **risks (economical, environmental, sanitary) related to these shifts in practices?**

As head of the Ecological Transitions and Natural Resources Department (NAT) at AFD the answer to these questions is absolutely crucial. Moreover, as a team involved in promoting and supporting transitions in the agricultural systems and rural territories in our partner countries, in the face of climate change and increasing vulnerabilities, we need to be in a position to provide detailed, appropriate and contextualized answers to these questions for each and every agricultural project designed with our partners and submitted to our Board.

That is why the work accomplished by ALiSEA over the course of 3 years with farmers in SE Asia is commendable and exactly what we need as a community of professionals claiming that agroecology is the way forward. This book provides answers to the questions mentioned above through a detailed, contextualized and territorial analysis, based on real stories and real farmers (outside of experimental fields), thereby defining agroecology and the **diversity of its practices.**

The grass-roots initiatives presented here, documented and brought to maturity with the support of ALiSEA, are a great collection of success stories that should allow us to identify the practices, principles and key factors of success that have made them work at local level. These factors are often (always!) site-specific and are related to the intertwined agronomic, economic and social dimensions of agricultural production. I can think of a few that are of key importance: which plant associations and rotations are realistic outside the demonstration field and extendable to or already practiced by farmers ; how is the specific equipment/machinery for agroecology adapted and made available for different types of famers and, in particular, for the small and medium size family farms that are the most vulnerable to climate change; how does agroecology translate into renewed and more decent forms of employment in agriculture?

For us, at AFD and specifically for our teams within the NAT Department, this contribution will be extremely useful to drive our work towards a more detailed and robust approach in supporting agroecology in SE Asia and around the world. My last words here would only be to call on our teams and partners to replicate and expand this analytical framework to other regions of the world in order to broaden our view and develop a true **knowledge-based and contextualized strategy for development of agroecology. AFD needs to be a leader on this endeavor.**

Gilles KLEITZ
Head of the Ecological Transitions and Natural Resources Department (NAT)
French Agency for Development (AFD)

Preface

In the Mekong Region, agroecology initiatives have emerged as early as in the 1970s' with the creation of the alternative agriculture network in the Kingdom of Thailand. However, 'modern agroecology' initiatives (combining traditional know how, agriculture practices and scientific knowledge) have not properly started to spread before the 2000's when national and international non-governmental organizations (NGO) pushed them as part of a global movement (Castella et al., 2015). This counter-movement to the global trend of agricultural intensification promotes more sustainable land uses, production of healthier food, and conservation of traditional knowledge and practices. It contributes to respond to the current challenges that affect the agriculture sector, such as decreasing soil fertility, agrochemicals pollution, biodiversity losses, and strong climate change impacts.

Thus, many stakeholders have been promoting agroecology, accumulating a wealth of experience across the Mekong Region. To answer the need for knowledge sharing about agroecology and to increase its visibility and credibility, the Agroecology Learning alliance in South East Asia (ALiSEA) has emerged to network all of them nationally and regionally. Farmer organizations, Civil Society Organizations, Research centers and Universities, Government agencies and Private sector have joined in to raise awareness among policy makers and consumers, while supporting the wider dissemination of successful alternative agricultural practices.

Starting from 2015, ALiSEA focuses in priority on Cambodia, Laos, Myanmar and Vietnam and has several collaborations with organizations based in Thailand as well.

Through its Small Grant Facility, ALiSEA funded 26 organizations for implementing agroecology initiatives. These Small Grants involved a great diversity of actors – farmers, university teachers, development practitioners and government bodies –and played an important role in supporting the testing, innovating and knowledge capitalizing process fostering a transition toward agroecology in the Mekong region.

This book results from the compilation of knowledge products elaborated by the ALiSEA grantees, and gives an insight into the stunning dynamic and the diversity of agroecology initiatives across the Mekong region.

It aims at sharing successful and concrete examples of stakeholders acting for the transition toward agroecology, with the objective of inspiring others.

The book is organized in five thematic parts, addressing complementary aspects of agroecology and answering similar challenges.

Pierre Ferrand, ALiSEA Regional Coordinator
& Sophie Le Jeune, ALiSEA Jr Researcher

List of acronyms

ADB	Asian Development Bank
ADC	Agriculture and Forestry Research & Development Center for Mountainous Region
ADDA	Agricultural Development Denmark Asia
ADG	Belgian NGO Aide au Développement Gembloux
AFD	French Agency for Development
AIT	Asian Institute of Technology
ALiSEA	Agroecology Learning Alliance in South-East Asia
ASEAN	Association of South East Asian Nations
CA	Conservation Agriculture
CANSEA	Conservation Agriculture Network for Southeast Asia
CASRAD	Centre for Agrarian Systems Research and Development, Vietnam
CEDAC	Centre d'Etude et de Développement Agricole Cambodgien, Cambodge
CGFED	Research Center for Gender, Family and Environment in Development, Vietnam
CGIAR	Consultative Group for International Agricultural Research
CIRAD	Centre for International Research on Agricultural Development
CIRD	Cambodian Institute for Research and Rural Development, Cambodia
CISDOMA	Consultative Institute for Socio-Economic Development of Rural and Mountainous Areas
CDE	Center for Development and Environment
COrAA	The Cambodian Organic Agriculture Association, Cambodia
EM	Effective Microorganism
FAG	Faculty of Agriculture, Laos
FAO	Food and Agriculture Organization of the United Nations
GMS	Greater Mekong Sub-region
ICC	International Cooperation Center, Vietnam
IFOAM	International Federation of Organic Agriculture Movements
IK	Indigenous Knowledge
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
LURAS	Lao Upland Rural Advisory Service, Laos
MIPAD	Mondulkiri Indigenous People's Association for Development, Cambodia
MIID	Myanmar Institute for Integrated Development, Myanmar
NAV	Nature Agriculture Village, Cambodia
NIS	National Institute of Planning, Ministry of Planning, Cambodia
PGS	Participatory Guarantee System
RUA	Royal University of Agriculture, Cambodia
SPERI	Social Policy Ecology Research Institute, Vietnam
SRI	System of Rice Intensification
TDH	Terre des Hommes Italia, Italy
TOA	Toward Organic Asia, Thailand
ToT	Training of Trainers
UNESCO	United Nations Educational, Scientific and Cultural Organization

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Figure 1: A family of rice farmers in Bokeo Province, Laos

Introduction

1 South East Asia at a crossroads: from agricultural intensification to ecological matters

The Mekong region, comprises Thailand, Myanmar, Laos, Vietnam, Cambodia and the China's province of Yunnan, which are home of more than 326 million people (ADB, 2018). ALiSEA focuses specifically on **Myanmar**, **Laos**, **Vietnam** and **Cambodia**. In these countries, the great majority of the population is living in rural areas, where they rely mainly on agriculture for their livelihoods. Despite important differences between the countries of the Mekong region, they face similar rapid changes and challenges in their agriculture sector.

Farmers in the Mekong region have historically practiced subsistence-based integrated farming, which combines crops, livestock and trees in a complex landscape mosaic. Agriculture practices in the region result from a long adaptive process by subsistence farmers and rely on strong ecological knowledge that has been built up over many generations (Castella et Al, 2015). Paddy rice grown in the lowlands and upland rice produced as part of long-term rotational agriculture have long been the main staple food throughout Southeast Asia. Shifting cultivation systems, largely practiced in the Mekong region, involves agroecology principles as an integrated fallow period for restoring soil nutrients, home gardens characterized by high biodiversity, the practice of agroforestry based on nitrogen fixing trees. Family farming, which remains the main productive system of the region and has occupied a central role in the **sustainable development of the agricultural sector** in the Mekong region for centuries.

However, family farming in the Mekong region is now being challenged by the emergence of national and regional **dynamics for large scale agriculture production**, in which they can hardly compete. The main objective of agricultural policies in the region has been to increase production and productivity, in order to improve food security and autonomy in the context of population growth, but also, more recently, to increase exports to the world market. As a result, all countries in the Mekong Region have engaged in a process of 'modernization' of agriculture. This modernization process consisted in applying the agricultural practices of the Green Revolution including mono-cropping, hybrid seeds and the intensive use of chemical inputs (Castella et al. 2015).

If intensive farming allowed important gains for short term productivity, the adoption of new intensive practices combined with the decline of traditional farming results today in high **environmental degradation**, **human's health issues and a decreasing agriculture productivity** in the Mekong region. Myanmar, Vietnam, Thailand, Laos, Cambodia, all are now facing an agriculture crisis being characterized by decreasing productivity and declining agroecological conditions for agriculture production. The majority of the regional **land area shows medium- to high-levels of degradation**, resulting from the loss of natural vegetation, mono-cropping, poor soil conservation technique and cultivation on fragile soils in upland areas Mekong State of Land draft, 2018).

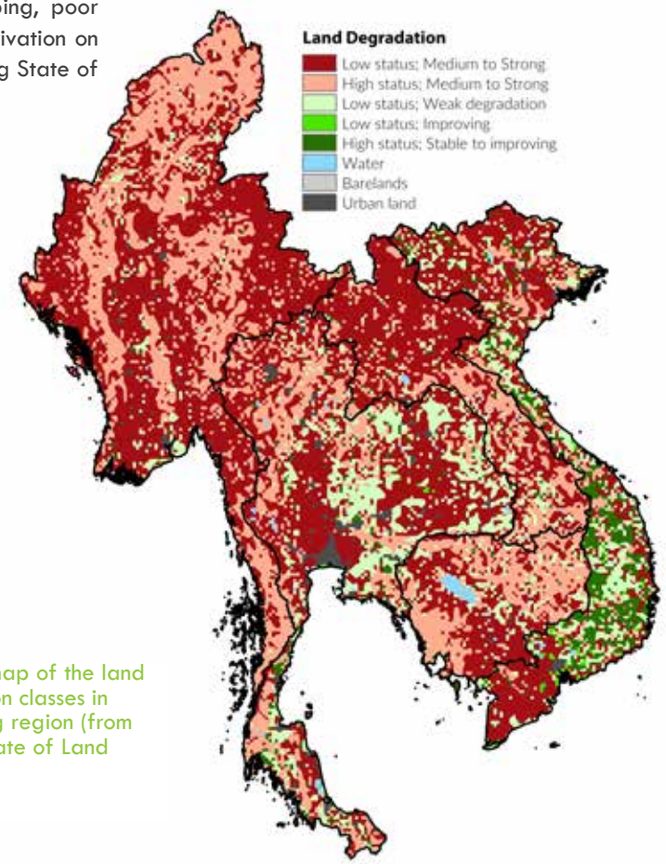


Figure 2: map of the land degradation classes in the Mekong region (from Mekong State of Land draft, p40)

The decline of soil fertility, a major limit to agricultural development, is fostered by the high **deforestation** rates in the Mekong region. The deforestation drivers include the rapid human growth in Southeast Asia, combined with the emergence of a rising and wealthier middle class. This dynamic has increased the demand for agroforestry and forestry products, leading to more pressure to convert remaining forests to agricultural, housing, or industrial uses (Roshetko, 2013). Forests losses are threatening the livelihoods of rural households in the Mekong region, who are highly reliant on forests for their daily food and wood collection (Yasmi, 2017). In addition, the growing adoption of pesticides that often accompany transition to market-oriented production is also threatening **farmers' and consumer's health**. The Rural Development Sole and the Provincial Health Departments have tested the blood of over 2000 students, teachers, farmers and consumers in the past two years in Laos. 41% show unacceptable levels of pesticide contamination (Rassapong, 2018). As a result of such agriculture shift, while being a large biodiversity hotspot, the Mekong region is also said to be the most biologically threatened globally (Hughes, 2017). **Biodiversity losses** of ecosystems and agroecosystem are not only an ethical concern but can also limit the resilience of agriculture systems to extreme weather events and to pest and diseases (GIZ, 2015). In addition, **farmers are becoming increasingly reliant to external inputs** across the Mekong region. The process of agricultural intensification, both in the lowlands and in the uplands, increases the systemic dependency of smallholder farmers on fossil fuels for both energy-intensive production and agrochemical inputs, leaving them more vulnerable to volatile prices. Farmers also increasingly depend on hybrid seeds distributed by large scale seed companies, which limits their resilience to extreme weather events, as they are progressively deprived from their capacity to store seeds and to select locally adapted species.

Climate change is adding upon these different challenges as its impacts are worsening in the Mekong region. The IPCC 4th Assessment Report (IPPC, 2013) states that Southeast Asia is expected to be increasingly affected by the adverse effects of climate change, including floods, periods of drought and devastating cyclones. Sea level rise and water saltation may also lead to large losses of agriculture lands in the coastal and delta regions of Vietnam, Cambodia, Myanmar and Thailand. Climate change impacts will add upon existing social inequalities as the poorest farmers are the most vulnerable to climate change because of their low incomes, greater reliance on agriculture and their limited capacity to seek alternative livelihood (Altieri, 2008).

Between intensification of agriculture practices and long-lasting traditional agriculture systems, **the Mekong region is today at a crossroads**. The negative impacts of the rising adoption of industrialized farming practices are already being felt. It is time now for all agriculture stakeholders to choose their pathway for agriculture development – the most sustainable and fair one being the transition toward agroecology.

Sophie Le Jeune, ALiSEA Jr researcher

2 Defining agroecology: a unifying concept for a diversity of schools

Agroecology approaches can bring solutions to the agricultural challenges of the Mekong region: it allows producing diversified and high-quality food, while preserving the environment, avoiding contaminating the environment and people, and mitigating global warming. As a polysemic concept, agroecology is understood in many different ways according to one's background and experience. Agroecology is an applied science, adapting ecological concepts and principles to the design and management of sustainable agroecosystems and providing a framework to assess the performance of agroecosystems (Altieri, 2002). Five historical principles have been identified by Miguel Altieri for defining agroecology. They mainly apply to the farming systems and agroecosystem levels:

Agroecology: historical principles (Altieri, 2005)

1. Enhanced recycling of biomass optimizing nutrient availability and balancing nutrient flows.
2. Securing favorable soil conditions for plant growth, particularly by managing organic matter and enhancing soil biotic activity
3. Minimizing losses due to flows of solar radiation, air and water by way of microclimate management, water harvesting and soil management through increased soil cover
4. Species and genetic diversification of the agroecosystem in time and space
5. Enhanced beneficial biological interactions and synergisms among agrobiodiversity components thus resulting in the promotion of key ecological processes and services.

Though agroecology initially dealt primarily with aspects of crop production and protection, in recent decades, new dimensions are becoming relevant such as environmental, social, economic, ethical and development issues. Therefore, agroecology can be defined by a three folded approach: a scientific discipline, an agricultural practice, and a social or political movement (Wezel et al., 2009). Additional principles have been formulated to broaden the scope of agroecology. One can mention those related to reconnecting the two most important parts of the food system - consumers and producers - through the development of alternative food networks based on resilience, participation, localness, fairness, and justice (Gliessman, 2015). And those including issues such as agrobiodiversity, agroecological transition and participation of the whole society (Stassart et al., 2012). Four of these principles can be listed:

Agroecology: some additional principles
(Stassart et al., 2012)

1. Valorise agrobiodiversity as an entry point for the reconception of agriculture and food systems guaranteeing autonomy of farmers and food sovereignty

2. Valorise knowledge diversity (local/traditional know-how and practices, layman and expert knowledge) in the definition of research problems, the definition of people concerned, and in finding solutions

3. Work on agroecosystems with a perspective of fostering agroecological transition in the long term, giving importance to properties of adaptability and resilience.

4. Promote participatory research driven by the needs of society and practitioners, while at the same time guaranteeing scientific rigor.

From organic production to integrated farming, passing by conservation agriculture or integrated pest management, agroecology covers many sets of practices. They all have in common to rely on ecological processes dynamics and on the maximization of the use of natural resources. These different practices contribute to address issues such as environmental degradation, adaptation to climate change and food security, while giving opportunities to farmers to be more autonomous from seed and input sellers. ALiSEA has put a specific focus on the 6 most commonly found set of practices in the Mekong region.

Figure 3: main agroecology practices in the Mekong region

3 ALiSEA: taking stock of agroecology experiences in the Mekong region

Agroecology is not new in the Mekong region: farmers have been practicing integrated agroecological farming for centuries, combining crops, livestock and trees in their farming systems, and adapting their agriculture practices to a changing agroecological environment. Such adaptation process of family farms over generation has created a wealth of ecological and traditional agronomic knowledge (Ferrand, 2015). The diversity of the populations, customs, along with the diversity of landscapes in the Mekong region result in a unique richness of traditional agroecological knowledge. In addition, if agroecology has been historically practiced, one should not underestimate the unlimited potential for agroecological innovations.

ALiSEA has emerged as the first innovative attempt to network all the insteqd of these in agroecology nationally and regionally, and to value and disseminate traditional knowledge. The objective of the network is to form a strong coalition of stakeholders at different levels – from farmer organizations up to national and regional research centers and including the private sector – that is capable of feeding public policies and advocating stakeholders for stronger support to the wider dissemination of successful alternative agricultural practices. The Network gathered in September 2018 115 organizations working together for the dissemination of agroecology approaches and techniques. ALiSEA is facilitating knowledge generation, aggregation and dissemination through its online agroecology platform (https://ali-sea.org) and social media accounts (Facebook and YouTube), conducting scientific studies, organizing national and regional multistakeholders' workshops and has set up a Small Grant Facility to co-fund actions promoting agroecology.
This later has supported 26 initiatives in agroecology over the past 3 years. These initiatives have been implemented by a great diversity of stakeholders and covered a broad range of interventions to facilitate the transition toward agroecology – from field to policy level, from farming unit to regional scale. ALiSEA considers that these different initiatives have participated to increase the visibility and the credibility of agroecology approaches in Vietnam, Myanmar, Laos, Thailand and Cambodia, planting the seeds for wider scaling up.

This book therefore highlights some of the successful initiatives supported by ALiSEA through the Small Grant facility combined with other collective actions and research that were undertaken with some members of the network. This publication results from a capitalization process of all knowledge products elaborated and shared by the organizations implementing the Small Grant initiatives in the field.

Compiling and sharing all these innovative actions and successful stories across the Mekong region is aimed to inspire other agriculture stakeholders to embark on a much needed transition toward agroecology.

Pierre Ferrand, ALiSEA Regional Coordinator

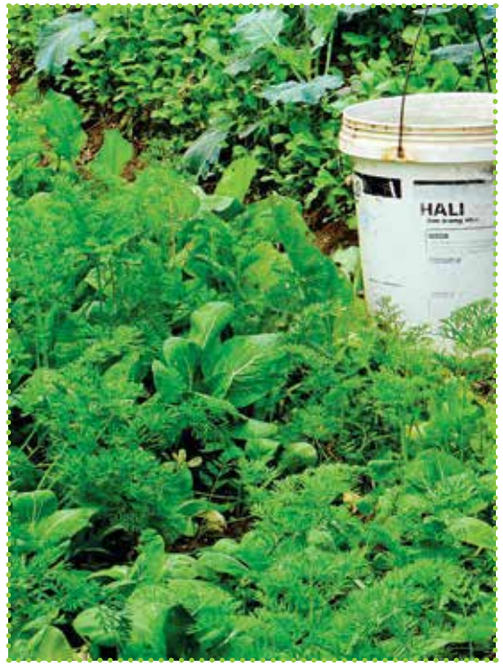


Figure 4: Organic farming in Tam Dat cooperative, Vietnam

Figure 5: Rice terraces in the uplands of China's Yunnan Province

Part 1

Agroecology in the Uplands

Southeast Asia's uplands - lands above 300 m - cover about one-half of the mainland in Lao PDR, Myanmar, Cambodia, Thailand and Vietnam (Fox et al., 2014). Uplands are characterized by a steep and elevated topography with small-holding and subsistence farming being the main agriculture system, based on shifting cultivation, agroforestry and tree plantations.

In the uplands of the Mekong region, the agriculture landscapes mixing cultivated land and forest patches were shaped by the traditional use of **shifting cultivation practices.** Shifting cultivation - or swidden agriculture" - consists in farmers cutting and burning small forest areas to create new farmlands, while benefiting from the fertilization of the soil by the decomposition of forest's organic matter. Traditional "slash and burn" practices have been designed to be compatible with the longstanding health of ecosystem and societies (Ziegler et al, 2011), as it integrates a fallow period for restoring soil nutrients, home gardens characterised by high biodiversity, and the practice of agroforestry based on nitrogen-fixing trees (FAO Symposium, 2016). However, the intensification of cultures through the generalization of input intensive cropping practices has led to permanent land use of cleared land. This intensification process combined with the emergence of large commercial plantations as rubber are driving deforestation in the Mekong region uplands (Fox et al., 2014).

Deforestation in the Mekong region uplands is threatening upland local populations' livelihood as they are heavily reliant on forests to collect wood, wild vegetables and spices (Yasmi, 2017). Furthermore, the decrease of forest cover in mountainous areas leads to drier conditions at the local level plus surface erosion, loss of soil quality, sedimentation and disruption of streams, and risk of landslide (Fox et al., 2014). Deforestation is therefore a key challenge to be addressed in the uplands of the Mekong region – and agroecology approaches such as agroforestry can bring solutions for a fair and sustainable development adapted to these territories.

Uplands' farmers are also facing other challenges in the Mekong region. The **infrastructure and access to urban resources** vary between regions but are often limited, which impacts life conditions of local communities and reduces market access to small holder farmers. Water access and availability have always been complex and fragile in uplands: minimal water holding capacity, flooding and water pollution are common environmental problems. Finally, **climate change** is having strong impacts on the uplands, including droughts, floods and landslides. In Laos for example, upland villages in the eastern mountainous areas of Salavan and Xekong Provinces in Laos are the only places to even experience all three - flood, drought, and landslides (Atlas of Agriculture Lao PDR, 2016).

However, mountains being among the most challenging landscapes on earth, species and farming communities have shown being very adaptive for centuries, and such environment has allowed the emergence of a **diversity and richness of cultures and local wisdoms.** Indeed, the uplands in Laos, Myanmar, Vietnam, Cambodia and Thailand are home for most ethnic minorities of the five countries, where more than 398 languages are spoken (Lewis, 2009). This diversity of peoples and the adaptation process of communities have allowed the emergence of rich and inventive indigenous knowledges that are adapted to specialized ecosystems of the uplands.

Agroecology offers a range of techniques and development approaches adapted to the specificities of uplands. By combining innovative solutions to local agroecological traditional knowledge, many initiatives have been effective in improving sustainable local livelihoods and in ensuring productive agroecological conditions. This first part will give an insight on stunning agroecology initiatives facilitated by ALiSEA in the uplands of the Mekong region.

Figure 6: uplands in Laos, Luang Prabang Province

1 Bridging Agriculture to ecology conservation among indigenous people communities in Mondulkiri Province, Cambodia

Figure 5: Location of the Mondulkiri province

The Mondulkiri Indigneous People's Association for Development

MIPAD is an indigneous people-group member-based organization located in Mondulkiri province. The main activities of the association are:

1- Research and documentation of Bunong indigenous people's culture, livelihood, weaving and other tradtional practices

2- Empowerment of tradtional Community Based Organization (CBO) of Bunong Indigenous People on their traditional rights to match to current legal and rights standard

3- Introducing high commercial value crops instead of traditional low value crops

4- Working with indigenous people to improve their livelihoods through trainings on sustainable agricultural practices and agro-forestry. In recent years, MIPAD in partnership with WWF started to introduce conservation agriculture for hilly –located communities

5- Working to advocate for equal opportunity for indigenous children in Mondulkiri province at primary education level.

More information on MIPAD on:
https://mondulkiricentre.wordpress.com/

1.1 The challenges of Bunong communities: environmental degradation and low agriculture yields

In Northeast Cambodia, near the Vietnamese border, lies the province of Mondulkiri, which shows an exceptionally high diversity of fauna and flora (Waltson, 2001). The largest ethnic group of the province is the Bunong indigenous, who are considered as one of the first group of the region's inhabitants. The Bunong indigenous share a strong relationship with the environment and have extensive knowledge on local plants that they use for medicine, food, and construction work.

Bunong people mainly rely on agriculture and harvesting for their livelihoods. Unlike the Cambodian population living in lowland, who have designated permanent location for farming land, the Bunong indigenous people have been changing location for their farming land. Shifting agriculture and agroforestry remain their main agriculture practices. Indeed, the Bunong people are used to plant their rice crops in forests' hills. Some large families in need of higher yields to feed their children may also cut and burn a small forest land to clear new farming lands. This practice allows them to benefit from improved soil fertility resulting from the decomposition of burnt organic matter. Within a few years, the soil would become less fertile, and Bunong farmers would abandon the site and move to new fertile areas. Practiced with parsimony, the traditional shifting agriculture does not severely affect the biodiversity as the forest is taking over the previous farming land in a few years. In addition, such practices provide families with a sound source of fuel wood as indigenous people can collect cut trees from nearest shifting agriculture sites.

However, some harvesting practices of Bunong people may affect their environment. On their way to collect food in the forest, Bunong people bring their hunting and cutting tools and use them to clear new walking paths toward sources of vegetables and spices. As a result, small trees and spiky or thorny plants that block their way are cut. Part of the local flora is damaged or permanently lost. Even though shifting agriculture is a traditional technique, it can also impact negatively the agroecosystem of the Mondulkiri province when the population clears more forest lands

to increase their production. The collection of trees for fuel wood is also affecting the forest cover as Bunong people tend to cut down the whole tree, let it dry for some time and fetch the dry wood, instead of cutting only branches.

The Mondulkiri Indigenous People's Association for Development (MIPAD) is familiar with the challenges the Bunong people are facing in the Mondulkiri province for cropping and harvesting. The association has a long-lasting experience in documenting the Bunong indigenous people's culture, livelihood, weaving and other traditional practice. MIPAD considers agroecological practices and forestry smart agriculture methods as a chance to increase yields and harvests while protecting the environment and local customs. In the context of its project "Bringing agriculture to ecology conservation among the indigenous people communities in the Mondulkiri province", MIPAD worked to introduce environmentally friendly, productive and water and time saving farming methods for indigenous communities in the Dak Dam commune.

1.2 Supporting Bunong people's livelihoods and preserving their environment through the introduction of agroecology practices

The first axis of intervention of MIPAD under the ALiSEA funded initiative focused on introducing Bunong people of the Mondulkiri province to agroforestry practices, conservation agriculture and permaculture. The association selected motivated households, developed and shared toolkits in local indigenous language on agroforestry or conservation techniques. As a result, MIPAD gave trainings on permaculture and conservation agriculture to 21 indigenous families. MIPAD also worked on creating home gardens to domesticate wild vegetables and spices consumed as daily food by the households. Home gardens can indeed help households to have a sound source of daily food, to save time by making it available at home, and to preserve the environment.

All along the project, MIPAD organized group reflection meetings to discuss on the methodology of the project activities in order to get the community actively engaged in the activities. During these meetings, MIPAD and Bunong farmers agreed on two principles the project activities should focus on:

(1) Promoting strategic crops – meaning fruits and vegetable with long life such bamboo shoot, coconuts, jack-fruits, moringa, and that can be planted around their land,

(2) Promoting short cycle cash crops, which are vegetables with short life cycle that need to be replanted after harvests.

The benefits of agroecological home gardens; a story from the field

The story from Mrs. Keu Peub, a native of Bunong indigenous community and mother of a child, illustrates well how agroforestry practices can help household to develop sustainable livelihoods. Mrs. Keub was interested in following MIPAD trainings on the transition to agroforestry. The activities implemented by MIPAD led her to think that some farming practices that she thought were productive, such as forest clearing, had limited benefits. From the project, Mrs. Keu Peub also understands that forests play a key role for the livelihoods of the Bunong people and need to be preserved. Convinced of the benefits of agroforestry, Mrs. Keu Peub agreed to take part in the project and volunteered to serve as local forestry smart farmers. With the support of MIPAD, she analyzed and listed the vegetables and spices that her community needed to collect from the forests. She also worked on the identification of plants that could be domesticated and planted in home-gardens and listed the one that could be substituted by regular garden vegetables or spices.

Mrs. Keu Peub also followed trainings from the project on permaculture and domestication of wild cooking spices. She now has a variety of vegetables and cooking spices in her home garden. She does not need to go to the forest to collect wild plants anymore, and she reports saving time for her family. At the same time, she starts having opportunities to sell vegetable surplus on local market. As for fuel wood, she is now collecting only wood from natural fallen-trees or cuts branches. By the end of the project, she managed to develop her home garden activity, to produce food and surplus, and to save time for other livelihood activities as animal husbandry.

Figure 7: MIPAD training on permaculture for Bunong farmers in Dam Kam commune

Figure 8: A home garden in Dam Kam province, developed with MIPAD's support

1.3 From forest based medicinal plants to a domesticated medicinal garden

The second pillar of the project "Bridging agriculture to ecology conservation among indigenous people communities in Mondulkiri province" focused on supporting the transition of forest based medicinal plants to garden based medicinal plant. MIPAD and Bunong farmers worked together to select key medicinal plants and to domesticate it in a medicinal garden.

The Bunong people of Dam Dak commune, where the MIPAD project was implemented, have traditionally used plants as traditional treatments for different types of illness as malaria and fevers and as food supplements during maternity. For instance, Bunong people are using tuber plant by grinding and mixing it with rice wine to serve as application on bones injuries. Another traditional method for application consists in cutting the medicinal plant into small pieces and to boil it for 15 minutes. The patient drinks this remedy four to six time a day until his condition has improved. Medicinal plants used to be the main health remedies for the community, but the emergence of local health centers and private medicine has led to a certain decrease of their use. However, although the Bunong medicine has never been a clinical-approach, indigenous people still value it as a good treatment to heal fever, diarrhea and for supporting women maternity needs.

As studied previously in the case of wild vegetables and spices, the Bunong households and traditional healers usually go to the nearest forest to collect medicine plants. To a lesser extent, some households have engaged in collecting medicinal plants in the forest, as tuber, to replant it at home. Therefore, MIPAD decided to capitalize on the community's knowledges and practices for medicinal plants use. Supported by the funding of ALiSEA, MIPAD worked with traditional healers and the Bunong community to set up a medicinal plant forest land, inside the local protected spirit forest and close to the community. Traditional healers and villagers collected important medicinal plants from the state-protected forest that they might need often for treatment. These plants were replanted inside the new community plant forest, large of 2500m^2, located very close to the Bunong village of Pu Treng, in Dak-Dam commune.

In total, 139 plants from 52 different types were replanted and have grown well. For the moment, people have a limited access to collect the domesticated plants for treatment, as plants need to be fully grown before being harvested. However, the activities have been a good success at the level of community; gradually, households will be able to harvest the plants they need. The community will implement later a record to list people who want to have access to the forest garden. Out of the 459 people of the community, a growing number of villagers are interested in benefiting from the medicinal forest they have created. The close location of the medicinal forests also facilitates knowledge-sharing between traditional healers and the young generation. MIPAD also supported the computerized documentation of information on characteristics and usages of medicinal plants. This documentation can be accessed and completed by the community, and specifically by young people who can read and write.

Figure 9: planting the medicinal forest

Conclusion

The Bunong indigenous people from the Mondulkiri Province were successful in developing agroecology models for home garden activities and for settling a domesticated medicinal forest. The activities allowed them to benefit from a sound source of food and traditional medicine, and to save time and money. The success of the transition of forest based medicinal plants to cultivated plants also inspired MIPAD for future activities on research and domestication of medicinal plants. The association is planning to collaborate with WWF for a joint research on domestication and on-farm production of medicinal plants for the marketing commercialization of healthy tea drinks. Future activities should also focus on the establishment of a Bunong traditional comity.

This part was based on MIPAD's case studies "Bridging Agriculture to Ecology Conservation Among Indigenous People Communities in Mondulkiri Province - Case study: Forestry smart agriculture and livelihoods" and "Bridging Agriculture to Ecology Conservation Among Indigenous People Communities in Mondulkiri Province - Case study: The transition of forest based medicinal plants to garden based medicinal plant", available here

https://bit.ly/2R0HRB4

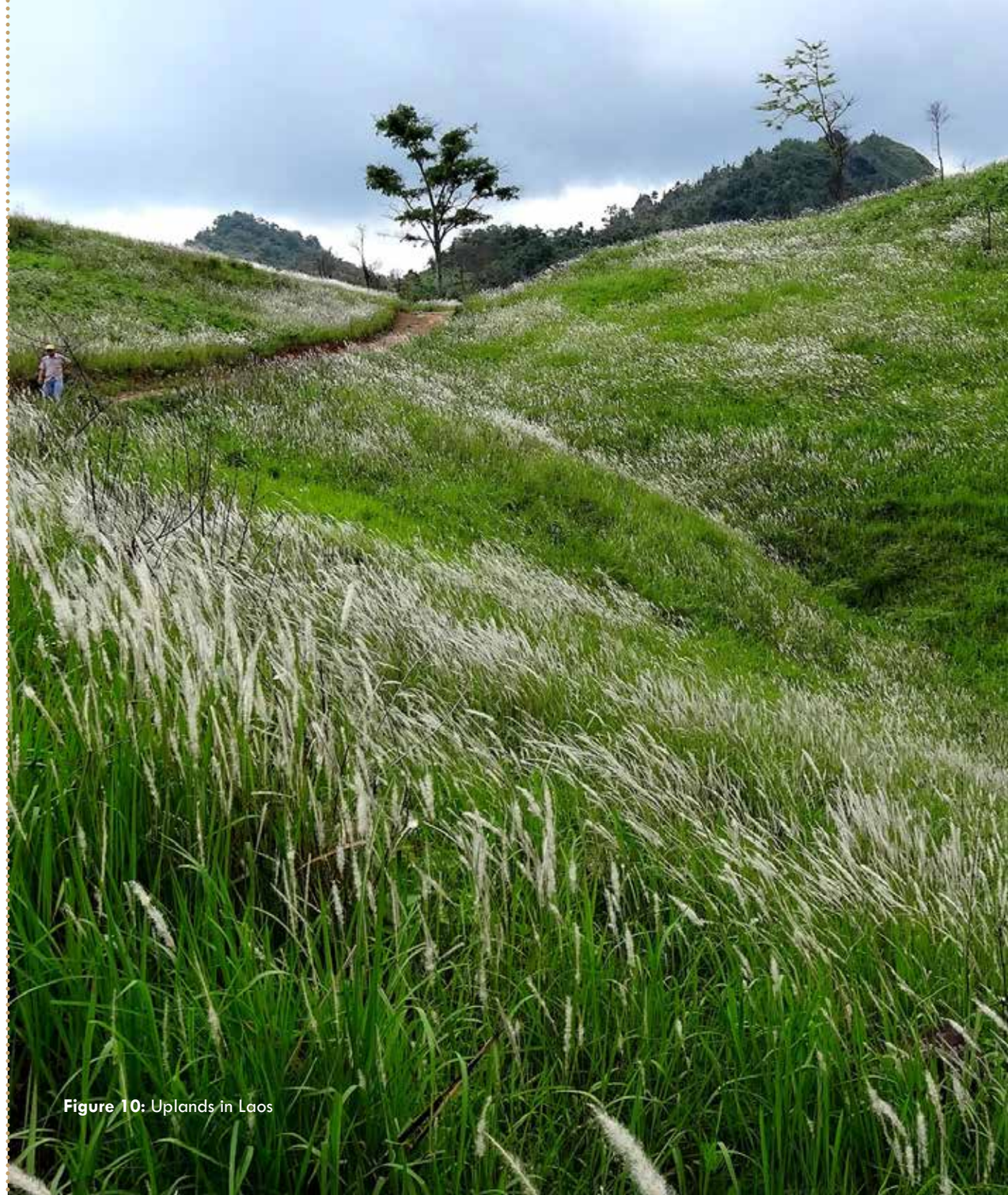


Figure 10: Uplands in Laos

2 Promoting agroecology farming for self-reliant livelihood of local upland farmers in Long Lan village, Luang Prabang province

Figure 11: Location of Long Lan village, Luang Prabang province

Watch the video:
Eco-vegetable cultivation in Long Lan village by SPERI

The Social Ecology Research Institute

Social Policy Ecology Research Institute (SPERI) was founded in 5 June 2006 as a merger of several organizations: Ethnic Women (TEW, 1994), Centre for Human Ecology Studies of Highlands (CHESH, 1999) and Centre for Indigenous Knowledge Research and Development (CIRD, 2000).

Social Policy Ecology Research Institute (SPERI)'s vision is to work towards a society where indigenous people and ethnic minorities in the Mekong sub-great region have equal access to social justice, gender equity, natural resources and fair social economic systems.

SPERI's vision towards the indigenous ethnic minority communities in Mekong region is determined by five fundamental interrelated rights:

1) the right to Land;
2) the right to performance one's own religion on one's own land;
3) the right to practice one's own knowledge in daily farming;
4) the right to decide what to grow on one's own land;
5) the right to co-government of one's land.

More information on SPERI on:
http://www.speri.org/

2.1 Long Lan village: promoting agroecology-based livelihood sovereignty

Long Lan village is located 45 kilometers north-east of the UNESCO Cultural World Heritage City of Luang Prabang and is bordered by 12 neighboring villages of different ethnic groups including Lao Loum, Kho Mu, Hmong and Lu. The village is located in uplands, at approximately 1,200 meters above sea level, close to the watershed of Phou Sung mountain. The climate is quite harmonious and cool, with an average temperature of 22°C. The soil is porous with a large and fertile cultivating layer. The local conditions are suitable for cropping and plant growth, especially vegetables. At present, Long Lan village is home to Hmong families from 7 clans, including Zang, Ly, Ho, Tho, Mua, Song and Vang. In 2017, Long Lan population was 511 inhabitants with 74 households. Villagers rely on cultivation of eco-vegetables, cattle raising and poultry for their livelihoods.

"Xong Pi Ham, Xam Pi Khop" meaning "two years of fallow, one year of cultivation", is the traditional mode of rotational cultivation of the Hmong people in Long Lan village. This method of cultivation does not exhaust the soil fertility because the ecosystem, including soil fertility, forest trees and other natural conditions, are recovered after the fallow period.

However, since the 1970s and 1980s, the government of Laos implemented policies aiming at limiting shifting cultivation with the objective of protecting forests' resources and stabilizing people's lives. These policies were influenced by the common image that shifting cultivation is the main driver of 'deforestation' and 'low productivity'. Since then, policies prohibiting shifting cultivation and promoting conversion of native varieties to commercial plantations have been planned and applied nationwide. In addition, Long Lan population was affected by the ban on opium poppy cultivation in early 2000. Because the resettlement policies were not timely or properly supported by the government, Hmong populations were left confused in finding suitable activities to ensure their livelihoods.

However, the villagers of Long Lan implemented innovative solutions to stabilize and improve their livelihoods through the implementation of various types of agroecological farming. SPERI (CHESH) is working since 1999 to support the transition from shifting cultivation to rotational cultivation and small-scale commodity production in Long Lan village. The association has helped villagers for a gradual agroecology transition with techniques adapted to the cultivation conditions, ecology, soil, native species and customs of Hmong people. This approach allowed villagers in Long Lan to establish a position of self-reliance and self-determination, instead of a passive dependence on the outside, and to ensure the long-term sustainability of natural resources.

The Long Lan village has therefore become a destination for a wide variety of stakeholders, such as farmers, students, researchers, university lecturers, and policy makers from both within and outside the country, for knowledge exchange and studies on practical application of agroecology techniques. The Luang Prabang Provincial Government and the Lao Ministry of Agriculture and Forestry have adopted Long Lan as a special case for policy studies related to sustainable management of natural resources and rural economic development. Long Lan agroforestry products have now officially been recognized as safe forest-based products by both the Lao Ministry of Agriculture and Forestry and Nature Life-International.

Figure 12: cultivation lands in Long Lan; a diversified agriculture landscape

2.2 Principles of ecological vegetable cultivation in Long Lan: the example of growing chayote

Experiencing many changes due to the intensification of agriculture in the region, the Hmong people in Long Lan village have been searching and experimenting ways to produce and live in harmony with their environment. The farming system of Long Lan's farmers is based on seven principles that have been designed by farmers in accordance with their close relationship to their environment, their traditional customary law, and their ethnic knowledge in farming.

Ethnic knowledge's principles on growing chayote

1st principle: Maintaining the largest areas of land covered by natural forest to ensure the stability and sustainability of the production components.

2nd principle: Eco-vegetable cultivation areas are located in the most favorable soil and climate conditions.

3rd principle: Selecting the most suitable vegetable varieties for the climatic conditions and soil conditions in each production area.

4th principle: Integrating farming and livestock.

5th principle: No use of chemicals in cultivation.

6th principle: Practice fallow to restore the ecosystem and nutrients to the soil.

7th principle: Diversify species to ensure the safety of household income.

Following these 7 agroecology principles, Long Lan families have grown different types of native ecological vegetables. Chayote is one of them and its cultivation in Long Lan is a good illustration on how these principles can be applied to a certain type of culture. Chayote, or Chi Thai in Hmong language, is a temperate fruit specie which has climbing tendrils and a stalk divided into 3 to 5 branches.

Prior to 2000, most families in Long Lan were growing only one or two clumps of chayote close to their houses or at the forest edge, near the village. After the government banned shifting cultivation and the opium production, Long Lan villagers, with the support of SPERI, started investing in Chayote production. Indeed, the chayote cultivation showed good potential since the plant is well adapted to the climatic and soil conditions of the Phou Sung Mountain. Furthermore, chayote vegetable products are very popular in Luang Prabang and offered good selling perspectives. Finally, chayote fruits and shoots have high yields: it is possible to harvest fruits four times per months, the plant is productive 8 months per year and has a very long-life cycle - up to 10 years.

In the early days of the development of chayote cultivation in Long Lan village, the plant was grown close to houses and at the forest edge. Shady areas covered by the forest canopy are the most convenient locations for cultivation as they offer the humidity and nutrients needed for chayote cultivation. Places nearby the houses were also convenient for people to collect organic waste and animal dung to use as organic fertilizer. To facilitate natural pollination, as well as for convenience of harvesting, villagers created frames made from bamboo or timber materials for chayote to climb on, as wood material absorb the heat from the sun, especially during the dry season. As the demand for chayote increased in Luang Prabang, families in Long Lan gradually expanded their cultivation areas. Finding the good location for farming chayote was crucial for farmers to maximize the utilization of natural resources. The Hmongs from Long Lan extended their production in ravines and small valleys on relatively small lands – about 500 to 3,000m2. In such low locations, the water and the natural biomass flow from above to accumulate in the cultivated lands, which allows to set the good soil, climate and humidity conditions for chayote production. The temperature at low points is also relatively cool and stable. Cultivating in ravines and small valleys also allowed farmers to produce chayote on the same piece of land for a long period, without having to move to new locations, which minimizes the production's impact on natural forests. This cultivation extension was made carefully, based on traditional land rights and on community regulations for cultivating and managing forest resources.

Long Lan village's people made a second substantive progress in chayote production systems by dropping out the use of frames for their cultivation. Farmers in Long Lan are now letting chayote's branches grow on the ground. This new cultivation method emerged after the members of a family in the village started letting their chayote grow freely in their upland fields. Interestingly, they noted that their chayote grew very fast, with bigger branches and leaves. After one season, seeing the effectiveness of such method, other families in Long Lan village replicated it in their fields. The new technique allows branches and leaves to develop faster and with higher yields, which was beneficial since farmers started to grow chayote not only for their fruits but also for their leaves and shoots. By growing close to the ground, chayote benefits of the moisture and cool temperature. In addition, the chayote covering the ground limits grass encroachment and saves time and labor.

Figure 13: Hmong villagers harvesting in Long Lan village

Figure 14: Chayote cultivation field in Long Lan village

2.3 Integration of the ecological vegetables and community cattle breeding in Long Lan village

In Long Lan village, cows are not raised simply for the significant revenue or assets they provide to families; they are also of cultural and religious value. At the time of death, the soul of the deceased person can only return to his – her ancestors if the soul of the sacrificed cow accompanies it. In the annual religious festivals of the Hmong people, such as 'Tong Xenh' and 'Thu Ti', it is also compulsory to have at least one cow to sacrifice to the gods of nature. The meaning of the ritual is to pray the gods of nature for the peace and prosperity of the whole community. For that reason, from the early time when migrating to live in the Phou Sung Mountain, Hmong households have always accumulated economic sources to invest in cattle, especially cows and horses.

As a valuable livestock, households mainly kept their cows near their houses and around the residential village. However, the presence of cattle in the living area was causing health and sanitation problems. Therefore, the community decided to build fences around the village to keep livestock out, and the problem of hygiene was solved. However, the government opened a road crossing the village in 1980, which allowed cows to enter into the living area again and caused environmental and hygiene problems. Given the above issues, some elderly and village leaders organized village meetings to agree on the establishment of two community grazing areas, far from the residential zone.

Due to the abundant sources of grass and water as well good investment capacities of families, the cattle of households increased significantly in the 1980s. In early 2000's, after the program of community-based land and forest allocation, SPERI continued supporting families in Long Lan via saving-credit revolving funds to invest in animal husbandry. As a result, the number of cows increased again. However, this progressive increase was coupled with rising conflicts between families: as the cows of different owners were released in the same place, when a young cow was born, villagers were confused as to which family the young cow should belong to. This led to the situation of different families recognizing the young cow as their own. The community needed to implement community regulations on animal husbandry to solve the disputes.

Therefore, SPERI supported the community decision-making for zoning new grazing areas. The community chose to locate these areas on the top of Phou Sung Mountain, adjacent to the cultivation areas. 7 principles were elaborated by the community for the selection of new grazing areas:

1 - The land must be an **uninhabited area**, far away from the residential zone to avoid environmental sanitation problems and should not be a farming land.

2 - There must be a v**ariety of types of grass and plants** to feed the cattle. Bananas on the field can be a source of water during dry season.

3 - **Easy to track areas** with available materials such as bamboo, rattan and wood to make the fences surrounding the grazing area.

4 - The grazing field must be **easily accessible and safe** for cattle and owners.

5 - There should be **water available for cows to drink**, especially in the dry season, or at least bananas trees.

6 - It should be an area where cattle have **never been infected** by pests and diseases before.

7 - They should be places where the previous cattle had grown fast, with healthy caves.

Furthermore, the choice for the location of the grazing areas also took in account the possibilities for developing an integrated farming system with complementarity between livestock and cultivation. Animal manure is a significant source of nutrients for the growth and development of forest trees in the areas where cattle are raised. In return, this natural vegetation is a source of food for livestock. Therefore, areas for community grazing are selected in order to allow the fertilization of cropping fields through animal manure. As the grazing areas are located at higher than cultivation fields, it allows the livestock manure to flow down into the cultivation areas to enrich the soil with nutrients and humus. As a result, every year, 455 cows and horses of 55 families release about 982,800 kg of manure into the natural ecosystems (including forest and farms).

Moreover, a rotating community grazing method was implemented to ensure that the vegetation, especially grasses and plants for cows' feed, properly regenerate in each livestock area. Continuous livestock production in one area would result in a scarcity of feed for cow which would affect the growth and development of the herd. In addition, having livestock continuously in one area would compact the soil in the area. Therefore, organisms such as worms would not have a suitable environment for development and the regeneration of forest vegetation would be slowed. Finally, the rotation of cattle around different livestock areas helps to reduce the risks of disease infection, as continuous grazing of livestock in one area provides a suitable environment for the germination of diseases.

Conclusion

The people in Long Lan village have accumulated a lot of experience related to techniques and solutions in agricultural production in general, and local eco-vegetable cultivation and cattle grazing in particular. These experiences are the result of an appropriate and harmonious combination of local ethnic knowledge in upland cultivation and newly adapted techniques to ensure the sustainability of the production system. The Hmong population of the Long Lan village is now benefitting from sustainable livelihoods, through agroecological farming activities that does not harm the natural forest ecosystem, landscape characteristics and other natural conditions.

This part was based on the two SPERI's case studies "Promoting agroecology farming for selfreliant livelihood of local upland farmers – Case: Native ecovegetables of Hmong community in Long Lan village, Luang Prabang province, Laos", and "Integration of the ecological vegetables and community cattle breeding in Long Lan village, Luang Prabang province, Laos", funded under the SGF of ALiSEA available here:

https://bit.ly/2yMyqh6

Chayote garden in Long Lan

Figure 15: A chayote production field in Long Lan village

3 Supporting sustainable livelihoods and reclaiming degraded land by enhancing agroforestry in southern Shan State, Myanmar

Figure 16: Location of the MIID intervention in Southern Shan State, Myanmar

The Myanmar Institute for Integrated Development (MIID)

MIID is a non-profit institute based in Yangon, Myanmar, that aims to promote meaningful participation and inclusion of ethnic communities in Myanmar's economic, social and political transition by supporting a people-centered and sustainable approach to economic and social development.

MIID's values:

Partnership: development that is both sustainable and adaptable requires trust, respect for local knowledge and a commitment to maintaining relationships.

Inclusion: diverse systems are healthy systems, where the best decisions are the ones that are informed by hearing multiple perspectives.
Participation: People affected by decisions should have a voice in making those decisions.

Gender Equality: people of all genders deserve to have their voice heard and a right to human dignity.

Integration: dynamic and complex problems are best tackled with an integrated approach that recognizes complementarities and interactions between multiple aspects of an issue.

More information on MIID:
http://www.mmiid.org/

3.1 Shan State uplands in Myanmar: a region prone to strong climate change impacts

Smallholder farmers in Myanmar are particularly vulnerable toward climate change. Their production levels are heavily dependent on climatic conditions and they often lack backup solutions for their livelihoods when their agriculture livelihoods are impacted by extreme weather events. In Southern Shan state, a shorter monsoon with heavy rains is threatening family farming with floods, while the higher temperatures during the dry season induce more recurrent drought episodes. One of the main challenges for farmers in Southern Shan States is the poor and decreasing soil fertility. The soil is shallow and contains many stones and rocks. It has limited water holding capacity, lacks nutritional elements and can contain toxic ions. Soil erosion is also a critical issue that results from the high deforestation rates of the Shan State. Deforestation in the region has been driven by overexploitation of forests resources and to a lesser extent by shifting cultivation practices. Indeed, over time the ideal eight-year rotations between fallow and cleared land have reduced to three to five years, placing a strain on the sustainability aspect of this method. Other challenges in the villages include a lack of formal recognition of land tenure, poor quality housing and limited access to markets and infrastructure.

Since 2014, the Myanmar Institute for Integrated Development (MIID) has been working in ethnic Taungyoe villages in southern Shan State, Myanmar. The organization developed activities to build climate change resilience by promoting and implementing agroecology initiatives under the three-year project "Rural Livelihoods and Climate Change Adaptation in the Himalaya" (Himalica).

MIID responded local issues by reviving local knowledge and improving livelihoods systems to be more sustainable by supporting the development of organic home gardening, bamboo production and handicraft, and agroforestry techniques. These activities aimed at supporting climate resilient communities in Southern Shan State and ensuring sustainable and resilient livelihoods. MIID implemented its activities in a six-village cluster that straddles two hilly townships in southern Shan State, Inlay Lake region, with a total population

of 1,623 adults. The village altitudes are between 1,200-1,450 meters above sea level. Through the support of ALiSEA Small Grants, MIID has worked on documenting and assessing the impacts of these 3 key activities implemented by the organization.

Figure 17: Sloppy and eroded land in Shan State, Myanmar

3.2 Developing organic cultivation for home gardens

Home-gardening represents a sound source of daily food in a region prone to food insecurity. Most households in the project area were already cultivating small home garden plots containing vegetables and fruit trees mainly for household consumption, and which were managed primarily by women. Crops commonly cultivated include cabbage, cauliflower and kidney beans, and to a lesser extent butterfly beans, tomatoes, pumpkin, mustard, green chili and ginger. A variety of trees are dispersed throughout household areas including perennial orchard trees, bamboo and banana trees, in some cases mango, avocado, papaya and jackfruit trees are also found in village household areas. In 2014, MIID led a Land and Natural Resource Assessment to list several areas for improvement of the condition of home gardens in Let Maung Gwe:

To answer these challenges, MIID team engaged with mostly female farmers to set up home garden demonstration plots in each village, of about 0.25 acre in size. Different techniques were demonstrated in the plots and shared in Farmer Field Schools (FFS). The woman learned about organic fertilizer, compost creation methods, additional nutritious vegetables, seedbed preparation and nurseries for fruit trees. To increase access to water sources during the dry season wastewater harvesting techniques were promoted for herbs and spices. Bamboo pitcher irrigation systems were demonstrated for monsoon crops and winter crops in each village.

- Chemical fertilizer and buffalo manure are common for increasing production and there is unsafe excessive use of chemical pesticides
- Small plant nurseries are linked to home gardens, however many hybrid seeds are purchased from the local market
- Bamboo and banana trees are mostly left to self-propagate, whereas other fruit trees are grown from seedlings or through grafting
- Seedlings for perennial trees such as avocado, mango and tea are purchased from the market or have been provided by the Forest Department and UNDP
- Home gardens are rain-fed relying on seasonal rains from April to November. In the dry season they are largely inactive.

3.3 Increased bamboo cultivation, and handicraft capacity building

Tomatoes and bamboo pitcher irrigation were also introduced to a small part of the villagers. Bamboo irrigation method allows for slow release water in direct proximity to the plants' roots. Very few people adopted it, but most respondents that implemented bamboo pitcher irrigation reported it being a useful method.

Figure 18: Farmers using bamboo pitcher irrigation for home gardens

Bamboo is of multipurpose use in Southern Shan State: it is used for food, housing, furniture and other basic items. It contributes to soil and water conservation and to the reduction of hard wood consumption. Bamboo is accessible to villagers as it can be found in both forest areas and home yards. One third of the villagers who participated to MIID activities have been maintaining bamboo areas for generations. In addition, the villages are near Inlay Lake, one of Myanmar's most popular tourist destinations and a potential market for bamboo products. Bamboo thereby was assessed as a viable value chain product to improve sustainable livelihoods.

MIID implemented a value chain assessment and found several factors important to consider for scaling up bamboo cultivation and diversification for livelihoods in Southern Shan State:

- Lack of bamboo varieties resistant to pest and diseases
- An estimated 50 percent of culms are affected by pests and diseases
- The pit size was found to be inadequate, farmers rarely utilized fertilizer
- Lack of knowledge for best cultivation practices and bamboo management
- Buds were often damaged during extraction and transportation.

Figure 19: Woman cutting bamboo

To respond to these challenges, MIID worked with the support from the Forest Department and bamboo experts for input, training, and promotion and demonstration of new varieties resistant to pest and disease, cultivation techniques, and maintenance of bamboo plantations. These trainings were implemented through the establishment of "Bamboo nurseries". New bamboos species were distributed to the households who took care of them in the nurseries. Through these nurseries, beneficiaries could learn about land preparation for establishing a nursery, horizontal bamboo propagation, hormones for root development, duration of cutting for germination stage, and transplanting seedlings to field.

In addition instead of however, MIID found that it was necessary to accompany such measures by capacity building on bamboo handicraft. While farmers had worked with bamboo in the past, products were generally of a relatively low quality and value. Farmers were interested in holding social enterprise trainings and learning new techniques. A MIID's assessment concluded that trainings should focus systematically on improved product designs, marketing and establishing bamboo producer groups to promote collective sales, transportation, information sharing and market linkages.

In total, trainings on bamboo handicraft gathered more than 80 participants. Products included flowerpots, cups, trays, toys, teapots, ashtrays, phone holders and water jugs. MIID also implemented a women-focused bamboo handicraft training, which was held in Let Maung Gwe Village Tract for two weeks. MIID provided crafting tools and materials to allow the participant to make their first batches of products. The crafting training is only the first step; with business guidance and by working together, women will develop a new source of income.

In August 2016, bamboo craftsmen and women began selling their bamboo products with facilitation by MIID. Farmers participated to the visit of different markets and some farmers attended a major market in Yangon to experience the wide variety of bamboo and other handicrafts on display. As a result, there are now more than 30 active handicraft sellers from across the six villages, though this has increased as craft makers have involved their families.

3.4 Mobilizing support for agroforestry in Southern Shan State

Research commissioned by MIID found that villagers in Let Maung Gwe have relied on communal forest areas for livelihoods for several decades as a source for medicines, food items and for earning an income by selling firewood and charcoal. Maintaining and protecting certain forest areas with cultural and religious significance is important to the communities in Shan State. Some villagers continue to undertake practices to preserve threatened species which in the past grew in forest areas including medicinal plants, fruit and nut trees, and elephant foot yam. Nevertheless, since 1997-98, public and natural forest areas have been depleted due to clearing for cultivation, uncontrolled forest fires, illegal resin tapping, logging and encroachment. Despite several public policies to limit deforestation, forest areas have continued to diminish.

MIID responded to these issues by supporting communities to improve land conditions through introducing and demonstrating several context relevant agroforestry methods. The MIID team and villagers, in cooperation with the local Forest Department, developed long term participatory land management strategies to restore degraded lands and forest areas. Activities included reforestation, watershed protection, nursery training and addressing erosion of sheet, rill and gully areas. Demonstrations of good community agroforestry plots were initiated by planting a variety of tree species and establishing contour lines for watershed management in four of the project villages. Appropriate trees were selected through a combination of participatory and specialist assessment methods including community identified local ecosystem varieties, value chain analysis and recommendations from the government.

Figure 20: training in Farmer Field School in the Let Maung Gwe Village

Conclusion

Agroecology and agroforestry have been present in Myanmar uplands for decades in the form of home gardens, rotational agriculture, multipurpose trees and shrubs in farmlands, boundary planting, shaded tree crops and fallow areas. Such activities have influenced ecological processes and characteristics that are vital to biodiversity for the dispersal of flora and fauna, water and nutrient flows, microclimate, disease and pest control. However, several drivers of land use change along with climate change were found to have significant negative impacts on the villages in the project area generating a need for support. With the support of donor funding and government engagement, MIID has responded with well-informed interventions to improve agroecology systems combining local knowledge and science, contributing to an increase in access to diversified income sources, food and improved conservation practices.

This part was based on the two MIID's case studies " Addressing the challenges of upland farming in southern Shan state for climate resilience", and "Supporting sustainable livelihoods and reclaiming degraded land by enhancing agroforestry in southern SHAN state", funded under the SGF of ALiSEA available here:

https://bit.ly/2q0iTpW

4 Promotion of indigenous knowledge for climate change resilient and organic farming practices in the northen mountainous region of Vietnam

Figure 21: Location of ADC intervention, Bac Kan Province, Vietnam

Agriculture and Forestry Research & Development Center for Mountainous Region (ADC):

ADC is a leading non-profit organization, working in the field of research and technology transfers for the sustainable development of ethnic minority in the northern mountainous areas of Vietnam. The main working fields of the organization are:

1) Research, consultancy and agricultural technology transfer,

2) Natural resource management and biodiversity conservation,

3) Climate change.

4) Communication and policy advocacy.

More information on ADC on:
http://www.adc.org.vn/

4.1 Indigenous Knowledge for Climate Change adaptation approaches in Vietnam Uplands

Vietnam is one of the countries the most affected by the impacts of climate change (Dasgupta, 2007), which could highly reduce the agricultural productivity in the coming decades (Zhai và Zhuang, 2009). Climate change is also one of the most important challenges to sustainable development in the Northern mountainous region of Vietnam as local population mainly relies on agricultural production for its livelihoods. The specific physical factors of the region and its high poverty rates are making upland people especially vulnerable toward climate change. In Vietnam uplands, climate change impacts include increased or decreased in temperature, odd flood seasons, and high volume of abnormal rainfall. Considering these challenges, climate change resilience and mitigation must be at the hurt of development initiatives in the region.

The Agriculture and Forestry Research & Development Center for Mountainous Region (ADC) advocates for the integration of Indigenous Knowledge (IK) in agriculture development approaches. IK are knowledge systems based on traditional knowledge of local populations, that include knowledge of climate, soil, primitive varieties, farming techniques, irrigation and water management, plant protection, harvesting and preservation methods. In Northern Vietnam, numerous ethnic people have lived in diverse landscapes and have adapted to specific environmental conditions over generations. These adaptation efforts resulted in a diversity of indigenous knowledge and resilient agriculture production systems tailored to local conditions.

The IK system has many advantages for sustainable agriculture development and adaptation to climate change. The diversity of plant and animal systems in the IK system contributes to the improvement and maintenance of ecosystem services, enhances the adaptability to climate change, and reduces vulnerability in the community. Indigenous plant and domestic animal varieties tend to be more resistant to diseases and require less investment in time and money. Furthermore, the use of IK in agricultural production prevents the loss of plant genetic materials having high disease resistance. In addition, IK is crucial for self-sufficiency and self-determination of the indigenous people. By helping people to be less dependent on external factors, IK participates to reducing the vulnerability of the communities to impacts of climate change (drought, flood, etc.).

In Vietnamese Uplands, many traditional techniques have been applied for a long time to limit soil erosion or store water: people have been building terraced fields, arranging stones to create contours, intercropping to cover the ground… However, such knowledge tends to be lost with the adoption of intensive farming practices. There is therefore a great need for valuing and sharing indigenous knowledge adapted to climate change.

Figure 22: Rice terraces in the uplands of Vietnam

4.2 ADC interventions in Vietnam Uplands: documentation and knowledge sharing on the integration of IK to development approaches

ADC has worked for years to support the documentation and the adoption of indigenous knowledge. From 2013 to 2016, ADC implemented a project to help ethnic minorities in Bac Kan province to cope with climate change. This project included trainings on local agroecology techniques adapted to climate change in Nothern Vietnam and showed good results in term of adoption of practices. ADC capitalized on these two experiences to lead a new project on the promotion of indigenous knwoledge for climate resilient farming practices in the northern mountainous region of Vietnam, with a financial support from ALiSEA.

ADC worked on two types of interventions : documentation and sharing of IK adapted to climate change, and trainings on IK based and climate change resilient farming techniques in the Bac Kan Province.

In its effort to document and share IK based techniques, ADC elaborated a handbook presenting a strong and clear approach on how to identify IK adapted to climate change. The book proposes several steps for the implementation of IK based farming practices:

- Identifying appropriate IK of ethnic minorities in climate change adaptation;
- Evaluating the effectiveness and sustainability of IK to Climate Change (CC) adaptation;
- Testing and analyzing IK applied;
- Undertaking options using IK in CC adaptation.

ADC also proposed in its handbook a set of criteria for selection of relevant climate change adaptation models, that can be replicated in other development programs and projects:

- The effectiveness of climate change adaptation and mitigation;
- Involvement of local communities;
- Sustainability;
- Originality/ creativity;
- Replicability.

The handbook also focuses on four practices on indigenous varieties and techniques especially appropriate with the northern mountainous area, including medicinal plants intercropped with banana in sloping land, peanut intercropped with corn, squash intercropped with Tiêu Hông banana, and drought-tolerant green mung bean model. These agroecology practices are studied in the book based on evaluation criteria taking in account economic, socio-cultural aspects, as well as climate change and environmental aspect of the four practices.

The knowledge sharing activities of ADC for the integration of IK in climate change adaptation approaches for upland populations also took the form of the organization of events and meetings to gather local farmers who wanted to learn on IK adapted to climate change. Key farmers, Civil Society Organizations and local government officials from Thanh Van and Mai Lap commune, Cho Moi district, Bac Kan Province had the opportunity to attend learning and sharing experience study tours. These events allowed the participants to share experiences and knowledges on IK adapted to climate change and to learn about agroecological farming models such as banana intercropped with medicinal plants on slopping land, drought-tolerant green mung bean model.

Figure 23: Cover page from the ADC handbook on indigenous knowledge and good agricultural practices in climate change adaptation, available on ALiSEA online library

Figure 24: farmers supported by ADC with their banana harvest

4.3 Trainings on the adoption of indigenous based farming systems: a story from the field

In addition to its work on documentation of IK, ADC also implemented trainings to support the adoption of IK based farming techniques. Ethnic minorities from Bac Kran were supported through farmer field schools and had the opportunity to learn how to produce micro-organic fertilizers from micro-fungi and local agriculture wastes. The project supported the application of more sustainable farming practices for 200 households in Cho Moi district, Bac Kan province. The story of Mrs. Tran Thi Kim Phuong, a beneficiary of ADC activities, is a good illustration on how IK can help farmers to leave the poverty trap and develop resilient agriculture systems.

Mrs Phuong is 55 years old. Her family, as well as other families in Khuoi Dac village, in Bac Kan province, are Dao people from other provinces who immigrated to the village about twenty years ago. Mrs. Phuong was born in Cao Bang province. She married a man who was a soldier garrisoned in her living area at the time. Unfortunately, Mrs. Phuong's husband passed away in a traffic accident. She was forced to marry her husband's younger brother according to the local customs. However, Mrs. Phuong ran away from her husband's family to move to Khuoi Dac village in 2000, accompanied by her two children and one more to be born.

At the beginning, Mrs. Phuong's family encountered lots of difficulties: they had no residential and neither farmland. She built a temporary shack on the cattle grazing area as it was a public and unused land, located far from the residential area. She then took her mother from Cao Bang to live with her so that they could take care of each other. At the beginning, the villagers did not allow her to do any cultivation and farming activities as the land belonged to their ancestors. Gradually, the villagers felt pity and sympathy for Mrs. Phuong's situation. She worked with her family to turn 3,000m2 of wasted land into maize cultivated area. Maize cultivation was their first source of income for a long time because they did not have any land suitable for wet rice cultivation. With a limited income source for a household of five members, and her three children at schooling age, her family got stuck in the poverty trap.

Thanks to the Sedentarization program in 2006 – 2007, the communal People's Committee granted Mrs. Phuong with a land to build a house along with the land use right certificate. The public grazing area surrounding her house was allocated to local people and her family benefited from more than 10 ha of forest land. In 2011, thanks to the support of project conducted by ADC, her family obtained the Red Book for the 10-ha forest land area.

Figure 25: Ms Phuong in her banana-ginger plantation

Since the official issuance of land use right certificate, her family has concentrated their activities on cultivation and production. She started using agroecology techniques she learned thanks the ADC trainings and is now a pioneer in agroecological transition in her community. Instead of using fertilizers and pesticide as she did before, she applies minimum tillage methods to her own maize and banana fields, and in addition to that, she uses the bodies of maize trees to cover the soil to prevent erosion and keep the humidity. As a result, in 2011 fall crop her maize productivity increased by nearly 100 kg in the area of 3000m^2.

Being aware of her strength on sloping land cultivation, Mrs. Phuong and four households in the village voluntarily registered to implement the banana planting on sloping land model under the support of ADC on the Climate Change Adaptation project in 2011. She applied the model on one ha land area. Since early 2012 until now, she intercropped ginger and medicinal with banana trees. Being supported with the seedlings, provided with technical trainings using the farmer field school method, Mrs. Phuong and other households in Khuoi Dac village took good cares of the models in their own fields.

Mrs. Phuong shared: "I and the villagers are very excited with the support of ADC. At present, bananas are growing well with some are blooming and some are being harvested. Furthermore, the soil is protected from erosion thanks to ginger and medicinal plant layers. The bananas intercropping ginger and medicinal plant model brought my family steady income around 40 million VND/year. Hence, my family has escaped from the poor household list since 2014. I was able to build a new house and my children also got better studying conditions".

In 2016 and 2017, with the income resource from the banana model, Mrs. Phuong continued to build fruit models with persimmon and tangerine on the two hectares land cultivation area. She continues to apply IK in planting and maintaining these plants. There is a new inter-commune road that has just been build close to her farm, so besides members of the village or commune, many other people travelling across and noticing her model farm are coming to get information on her activities. Mrs. Phuong is sharing all of her experience enthusiastically, without hesitation and with a hope that everybody, especially women and poor families can have higher income. She also wants to scale up the agroecological transition model on the rest of her land and advocates other households in the commune to follow her in order to help all villagers to escape from property.

For all her efforts, sharing and solidarity, in recent years, Mrs. Phuong received many certificates of merit from the authorities. She managed, from a woman living in poverty, to become a successful woman in the community. She was elected as Farmer Council president of the village. She represents the villagers and farmers to contribute to the socioeconomic development planning of the village and commune. She also represented the women of the Dao community and shared her experiences during the "Round table conference on the role of Ethnic Minority women in Climate change Adaptation" organized by the United Nation and participated in the "Poverty reduction initiatives" program at national level.

Conclusion

ADC activities aimed at supporting dissemination of good IK practices in the Vietnam uplands – from documentation of different IK to training on IK based farming approaches in the field. The combination between indigenous knowledge and innovative knowledge and techniques can show good results for climate change adaptation. Efforts for documentation and elaboration of IK based approaches must be continued by development organizations and research centers in Vietnam and abroad. It is also necessary to have specific supportive policies, financial resources for practice, research, documentation, storage, and replication under appropriate conditions.

This part was based on two documents from ADC, the success story "A story of Mrs Phuong ", and the book "Promoting Indigenous Knowledge and Good Agricultural Practices in Climate Change Adaptation", funded under the SGF of ALiSEA available on:

https://bit.ly/2QVvKFs

Figure 26: Lowland of Myanmar, Irrawaddy Delta

Part 2

Agroecology in the Lowlands

Lowlands designate lands situated at low altitudes, close to the sea level. The lowlands in the Mekong region include the broad river valleys between the upland and wide deltas reaching out the seas and the ocean. These landscapes are often fertile alluvial basins which have been cultivated as gardens for a long time. Rice cultivation remains the main agriculture production in South East Asia (FAO, 2017), counting for more than 31 percent of the global world production (FAOSTAT, 2012). The rice production is concentrated in lowland areas: as an illustration, more than 50 percent of Vietnam's rice production is grown in the Mekong Delta, with another 17 percent in the Red River Delta (IRRI, 2008). In turn, lowlands alluvial plains are also the most populated areas in South East Asia (Greater Mekong Sub-region, 2010). However, the diversity of lowlands must also be underlined: while tropical forests are covering a large part of lowlands in South East Asia, lowland landscapes also include the Dry Zone of Myanmar – a large dry plain in the center of the country. These different landscapes are however united in the common challenges they face.

In lowlands and floodplains, rice production can be increasingly constrained by water scarcity and climatic events. Due to their location, river valleys and deltas are strongly affected by **floods**, which are becoming stronger and more frequent with Climate Change (Loo Yen Yi, 2017). Frequent **drought episodes** are also a growing concern for lowland's population and farmers, who must deal with repeated water shortages. In addition, a 70 centimeters **sea levels rise** as modeled by IPCC in its 4th Assessment could inundate low lying coastal areas and lead to deep-water salinization issues (ADB, 2009). High dependency on energy, technologies, engineered landscapes, and infrastructures may also increase the fragility of the rice farming systems.

Public policies and development agencies have tried to answer the lowland challenges with several approaches aiming to respond to food security, growing population and climatic challenges at the same time. Between 1970 and 2000, agriculture policies in lowland supported **rice production intensification** through facilitating the dissemination of hybrid rice species and through the generalization of input-intensive rice farming practices (Castella et al., 2015). Such policies have had reverse effects on people's health and on the environment. The dissemination of hybrid rice species has also fostered the dependence of farmers toward seed companies, while decreasing the use of native rice species and impacting the biodiversity of agriculture lands (Price et al., 2014).

Agroecology offers numerous techniques and approaches to respond to the dual challenges of delivering sufficient and nutritious food for a growing population and overcoming environmental issues. In the lowland, the System of Rice intensification is a good illustration on how innovative techniques based on the rationalization of the use of natural resources can help farmers to get higher yields while limiting the environmental impact of rice production. Agroecology techniques are also a source of inspiration for innovative water saving methods for cultivation in drought-prone areas. This part will give an insight into several agroecology techniques and approaches adapted to lowlands and supported by ALiSEA.

Figure 27: Mangrove degradation and rice cultivation in flooded post Nargis cyclone Ayarwaddy Delta, Myanmar, 2008

1 Developing an ecosystem approach for drought resistant home gardening in Central Dry Zone

Figure 28: Location of the Central Dry Zone, Myanmar

Terre des hommes
Let's protect children together

Terre des Hommes Italia

Terre des Hommes Italia (TdH It) is a non-profit organization, part of the Terre des Hommes International Federation with headquarters in Geneva and Brussels. Terre des Hommes International Federation is a network of ten national organizations working for the rights of children and for the promotion of equitable development without racial, religious, political, cultural or gender-based discrimination.

TDH Italia carries out humanitarian relief and international development projects in the sectors of education, health, livelihoods, WASH and protection to benefit thousands of children, their families and communities. It currently operates in 20 countries around the world.

More information on TDH on:
http://www.terredeshommesitalyjo.com/who-we-are.html

1.1 The Dry Zone of Myanmar: agriculture under heavy natural constrains

The Dry Zone of Myanmar is one of the most climate sensitive and natural resource poor regions in South East Asia (WFP, 2011). It consists in a large and dry plain in the center of the country, including parts of the Magway, Mandalay and lower Sagaing Division. The Dry Zone covers about 13% of the country's territory, and accounts for about a third of the country population (WFP, 2011). The climate is arid and irregular and scarce rainfall leads to water shortages and constitute a regular threat to rural livelihoods.

Watch the video:
Terre des Hommes Italia in the Dry Zone, Chapters 1

Watch the video:
Terre des Hommes Italia in the Dry Zone, Chapters 2

Climate and soil type in the Dry Zone make vegetable cultivation and availability extremely difficult, especially during the dry season. From December to April water shortages constrain most farmers of the area to wait for the rainy season to begin. The most common soil type of the Central Dry Zone is Luvisol (Htwe, 2015), a poor soil characterized by high sand content, relative high pH and low nutrient content. These conditions make the soil particularly subjected to soil erosion and degradation (Tun, Shrestha, & Datta, 2015), increasing farmers uncertainties on future yield. As a result, the food insecurity levels in the Dry Zone are particularly high, especially during the dry season. According to the WFP survey in 2011, about 38% of households have poor or borderline food security levels (WFP, 2011).

Environmental constrains are worsened by Climate Change. Reports indicate that there has been reduced frequency and amounts of rainfall over the last decades (CGIAR, 2015) which increase the occurrence of droughts and water shortages. While the mainstreamed use of agrochemicals by farmers in the Dry Zone might have given initial benefits on crop yields, it deepens the environmental problems of the area by fostering soil erosion and desertification. Not Conservation Agriculture but Agroecology, however, can help farmer to cultivate vegetables all year round without relying on excessive chemical inputs, and to improve nutritional intake and decrease expenses on food. TDH Italy therefore worked on improving the livelihood of the inhabitants of the Dry Zone through sustainable and agroecology home garden vegetable production.

Figure 29: Cultivating in the Dry Zone during the Dry season is difficult due to climate constrains

1.2 TDH work: developing home gardening to foster food security in the Dry Zone

TDH has been working for a long time on supporting agroecology techniques adapted to the Dry Zone of Myanmar. The organization has worked to introduce simplified hydroponic horticulture and innovative water saving technologies to remote villages in the Dry Zone since 2014 through the project "Soilless horticulture and other water-innovative technologies for landless and marginal farmers". TDH was therefore familiar with the specific challenges of the Dry Zone and with the needs of the population before starting its collaboration with ALiSEA.

Figure 30: a home garden supported by Terre des Hommes Italia

In the villages where TDH worked, the initial situation was the absence of cultivation of vegetables during the dry season, due to the climate constrains. This resulted in food shortages and negatively affected people's diet, especially during dry season. The initiative funded by ALiSEA and implemented by TDH aimed at testing, fine-tuning and spreading an innovative approach to home gardening for the Myanmar Central Dry Zone, adapted to the strong constrains to vegetable production. Agroecological home gardens are complex systems that can allow the maximization of water efficiency and both soil and plant biodiversity. Terre des Hommes therefore worked with villagers of the Dry Zone to document, develop and share conservation agriculture practices and water saving techniques for home gardens.

Figure 31: vegetables growing in a home garden in a village supported by Terre des Hommes

The activities implemented on the field first focused on demonstrating and teaching the positive effects of agroecological practices to villagers, thanks to knowledge sharing meetings, training on conservation practices and technical assistance. Demonstration plots were developed in 28 villages in Magway and Natmauk townships, along with control plots based on conventional agriculture practices for comparison. The NGO's staff constantly assisted the villagers to manage their plots during growing period in order to support the good development of plants and to take samples. Villagers that participated to the activities showed high interest in home gardens: Terre des Hommes Italia initial objective was the construction of 60 agroecological home gardens in 5 villages. At the end of the project, 115 people had been provided with the systems in 28 different villages. Biochar and natural mulching, for instance, are two techniques widely adopted by villagers in the home gardens.

The work of Terre des Hommes also consisted in assessing the efficiency of conservation and water saving techniques for home garden production in the Dry Zone. The research findings strongly support the implementation of conservative practices in the region, as soil moisture was significantly higher in experimental plots than in conventional ones. Soil biodiversity was also enhanced by the adoption of the agroecological techniques, and so was the productivity in terms of fresh weight. The findings of the assessment led by Terre des Hommes on the efficiency of home gardens advocate for the development of agroecological home garden in the Dry Zone, but also in other areas affected by adverse soil condition and drought.

Terre des Hommes, through its ALiSEA funded activities, also worked to develop an "On-Soil Home Garden Manual" to present and explain relevant conservation practices. The dissemination of manuals has given the opportunity to many villagers, in Myanmar and beyond, to know more on the strategies needed to promote vegetable growth in adverse climate condition. It is also a knowledge sharing tool on agroecology techniques for universities and scholars. Some elements of the book will be studied in the third part.

1.3 Terre des Hommes' guidelines to develop on soil Home Garden in dry land

The handbook published by Terre des Hommes aimed at providing the necessary information for the construction and management of a home gardens in dry lands using agroecological practices. The different steps of the elaboration of the home garden are explained in the book - from location selection to construction of dipping irrigation systems – along with agroecology practices. Two of these agroecology practices will be presented here, namely biochar and mulching., as both are central in the elaboration of home gardens in dry lands and were broadly adopted by farmers of the villages where TDH worked.

Biochar preparation.

Biochar is a mixture of manure and carbonized organic matter, used to fertilize the soil in the home gardens. The carbonized organic product can have different origins but should be made from an easily accessible local by-product. In the Dry Zone, rice husk and groundnut pods are the most common options, and the most available animal manure is cow dung.

For a home garden characterized by 3 beds of 20 ft. x 3 ft. each, the amount of amendment needed is 50 Kg. Within these 50 Kg, 20 Kg should be cow dung and 20 Kg biochar. At least 10L of water will be also added during mixing and preparation. Water quantity might vary depending on the cow dung stage. It is recommended to use fresh manure, but as it is not always available, a higher amount of water can be needed. The production of biochar will result from slow combustion process. The most common processes include:

- the use of a chimney burner (especially efficient for rice husk);
- the use of a perforated metal tank (where a slow combustion is occurring directly).

Chimney burner

1. Choose a safe place where to start a fire.
2. Start a fire and wait until it is burning well.
3. Cover the fire with the metal chimney.
4. Check the combustion is still going on, checking that smoke is outgoing and temperature is high.
5. Cover the chimney with 5-6 bags of Rice Husk forming a pyramid (each bag is generally around 5 Kg).
6. Let the rice husk carbonize for more or less 3 hours. Move the rice husk from the distance sides closer to the chimney to ensure uniform carbonization.
7. When carbonization is complete, spread the rice husk, remove the chimney and water the biochar with abundant water using a water tank, this will stop the burning process.

In the case of a chimney burning, the organic materials outside the chimney slowly carbonize while combustion takes place in the burner.

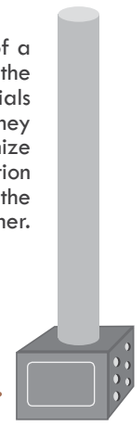
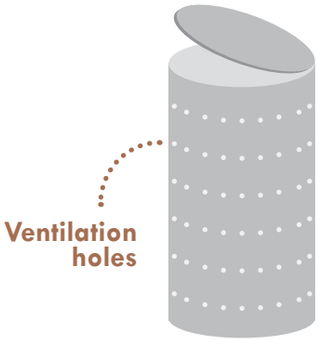


Figure 32: combustion process for biochar preparation (from TDH handbook)

Hollow tank

1. Choose a safe place to position the tank.
2. Fill the tank with dry groundnut shells up to ¾ of the tank capacity.
3. Start a fire on top of the groundnut shells using wood sticks and straw.
4. When the fire is on, cover the tank with a lid, leaving a little space for aeration.
5. Let the groundnut shell to carbonize for more or less 3 hours.
6. Stir the groundnut with a bottom up movement, starting after 2 hours of carbonization.
7. When the result is uniform, empty the tank turning it over and removing all the carbonized pods.
8. Use abundant water to stop combustion.

Using a metal tank, the organic material is inserted directly in the container and combustion is performed insinde using straws as a starter.



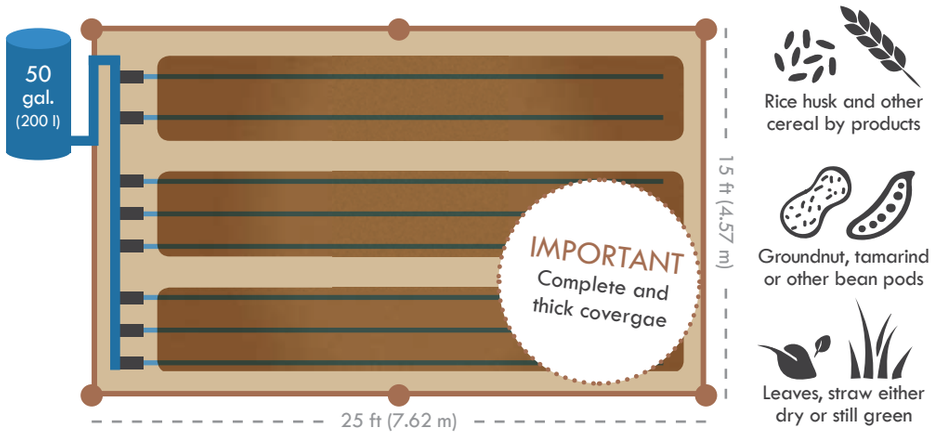
When the carbonized material has been produced it can be mixed with fresh cow dung at a proportion of 1 to 1. Water can be added to facilitate the mixing. The resulting mixture should be black, uniform, and wet but should not release water when pressed within hand. When the amendment is ready, it should be placed in a large container and covered for at least one week before proceeding with soil amendment.

When the ground has been levelled and the mixture of cow dung and manure has been produced, it is time to form the beds. The beds allow less compact and extra fertile soil for the plants and promote a better roots growth with water and nutrient uptake. The TDH standard design includes 3 raised beds 3 ft. wide and 20 ft. long. Then, the beds are formed by mixing the local soil with the biochar and, if needed, with limestone powder or dolomite rock. For a single home garden is generally applied half Viss (0,7 Kg) of limestone. Beds height should be between 6 and 8 inches.

Mulching

Mulching is an easy conservative technique to perform, which ensures water retention in the soil and at the same time reduces weeding time. It simply consists in covering the beds with either natural or synthetic material. The use of natural mulches in recommended, and they are available locally. In the dry zone, the two most commonly accessible mulching materials are peanut pods and rice husk. Dry leaves, shredded palm leaves, and straws can also be used. Similarly, green mulch (such as green leaves resulting from pruning) is a valid substitute, and it is also a source of nitrogen for the plants. However, groundnut shells are the best natural mulch, due to its long decomposition process and sterility, which is important since green mulch can also be a pest vector. All of the previously mentioned materials can be easily found within the village perimeter in the Dry Zone, and it is generally cheap or free.

Figure 33: process for natural mulching on plots, and possible products to be used as mulch



Conclusion

Cultivating in the Dry Zone of Myanmar is becoming even more challenging for farmers as Climate Change is worsening the natural constraints in the region. However, agroecology gives solutions for increased production yields in such a challenging environment. Through conservation practices and water saving techniques, agroecology home gardens can provide farmers with fresh vegetables all year round, even during the dry season, when food shortages are common. TDH therefore worked on guidelines and training to support the development of agroecological home gardens in the region. Later, farmers will be more likely to extend this approach to their production fields and to share their experiences with other farmers.

This part was based on the TdH Manual "On-Soil Home Garden Manual: Ecosystem approach for drought resistant home gardening in Central Dy Zone, Myanmar", available on:

https://bit.ly/2CQoc3X

Figure 34: Between land and water, rice cultivation in Ayeyarwaddy Delta, Myanmar

2 Collaborative research: linking science and policies into agro-biodiversity conservation and development in the context of floating rice-based farming systems in the Mekong Delta

Figure 35: Location of RCRD activities on floating rice, Vietnam

Research Center for Rural Development (RCRD) – An Giang University

The Research Center for Rural Development (RCRD) is a research unit of An Giang University. It was established according to Decision No. 672/ QĐ–UB–TC, dated July 5th 2003, by the People's Committee of An Giang Province. The objectives of RCRD are to design, organize and perform research in the fields of rural development, environmental management, and in order to meet the challenges of climate change, in the Mekong Delta. The results of this research work, in the form of advanced science knowledge and techniques are to be made available to further the goals of socio-economic development in An Giang province and elsewhere in the Dela.

More information on RCRD on: http://rcrd.agu.edu.vn/?q=en

This scientific article was written by Dr. Nguyen Van Kien, PhD and its elaboration was supported by ALiSEA, thourgh the Small Grant "Conservation of the floating rice based agro-ecological farming systems in the Mekong Delta".

2.1 Supporting the recovery of floating rice-based farming systems in the Mekong Delta

Floating rice or deep-water rice, grown in flooded conditions by long stalks and maintaining foliage on top of the water, was a major dietary component for populations in Asia and West Africa prior to the 1980's.0s. According to Castling (1992) there were 5.0 million hectares (ha) of floating rice grown in Ganges-Brahmaputra basin of India and Bangladesh, 1.28 million ha in the Irrawaddy of Burma (now Myanmar), 0.76 million ha in Chao Phraya of Thailand, 0.57 million ha of Vietnamese part of the Mekong Delta, 0.41 million ha in Cambodia part of the Mekong Delta, and 0.16 million ha of Central Niger of West Africa during 1970s. Floating rice was found to be cultivated in Stung, Siem Reap province of Cambodia in the eight century (Liere 1980). Floating rice remained as the most important rice variety produced and consumed until the 1980s, when the green revolution introduced different rice varieties that outperformed floating rice production (Biggs 2003; Võ Tòng Xuân and Matsui 1998; Vo Tong Xuan 1975; Brocheux 1995).

Since the1960s, high yielding varieties (HYV) rice were introduced into the Mekong Delta, and cultivation of floating rice reduced significantly (Chiem 1994; Kakonen 2008). For example, by 2012, the Vinh Phuoc commune estimated that only 41.2 ha of floating rice was produced with 20 ha in Luong An Tra commune of Tri Ton district, 46 ha in Cho Moi district of An Giang province, and 43 ha in Thanh Binh district of Dong Thap province (Nguyen Van Kien et al. 2013). Consequently, floating rice has not been depicted in current Mekong delta land use maps, very few local people know the existence of floating rice in the flooded prone of the Mekong Delta. Floating rice production has not been included in the annual socio-economic reports by the Department of Agriculture and Rural Development in either An Giang or Dong Thap provinces.

The Research Centre for Rural Development at An Giang University conducted a three year research program for the recovery of floating rice-based farming systems (Trung

tam Nghien cuu & PTNT (Research Centre for Rural Development) 2013). Both research and development activities have been implemented and an economic analysis of the floating rice-based farming systems follows. RCRD established a multiple research team within An Giang University and collaborated with regional and international researchers to undertake this long-term research and development project. The conservation of floating rice-based farming systems provides alternative options for living with floods while adapting to climate changes. Because of its elongate ability, the rice can reach up to 25 cm per day during the flood season, so it adapts well to the rising water in Asian Delta. Farmers often rotated dry season profitable vegetables crops that used less water thank to the remaining mulches from the rice straws (Nguyen and Huynh 2015). Additionally, the floating rice-based systems provided habitats for freshwater wild fish and other aquatic animals that are rich protein sources for rural people in the Mekong region. Finally, floating rice is perceived as safe, chemical free, and nutritious for local people in the Mekong region.

2.2 Socio-economic background of the floating rice growers in the Mekong Delta, Vietnam

Figure 36: A thick layer of remaining floating rice straw provides a natural cover for upland crops – e.g., cassava in Vinh Phuoc Commune, Tri Ton District of An Giang province, Vietnam. @ Van Kien Nguyen.

Researchers from RCRD at An Giang University have discovered that floating rice was still cultivated in Vinh Phuoc and Luong An Tra commune. The research team found that there were about 17 floating farmers live in the remote village of Tri Ton district who continued cultivating this crop in 2013. The average of land ownership is 3.6 ha per household (min is 1.0 and max is 10 ha). Only one female households' head is cultivating floating rice among 17 households. Some of the farmers have grown floating rice over 30 years. Most of them have cultivated over 20 years. Only one farmer has just planted for five years. Most of those farmers were immigrants from other districts or provinces in the Mekong delta arriving more than 15 years ago. Earlier, pioneer farmers came to reclaim the melaluca forest for cultivating rice. However, the soils were so acidic, and farmers on sold the land to immigrants. Currently, cultivation is by third or fourth generation immigrant farmers. There are still some unused land areas which are unsuitable for rice cultivation in this village.

2.3 Floating rice and its adaptation capacity

Rice growing areas in the Mekong River Delta (MRD) are vulnerable to the impacts of anticipated climate change. Wassmann et al. (2004) estimated that 2.3 million ha (60 % of the MRD) was highly vulnerable, while 0.6 million ha (15%) and 1 million ha (25%) experienced medium to low vulnerability due to sea level rise. Wassmann et al. (2004) concluded that these adverse impacts could affect all three rice cropping seasons in the delta. It is predicted that in the next century, with a sea level rise of one meter, about 10.5 per cent of Vietnam's population or about 20 million people will be displaced (Dasgupta et al. 2007).

Recovering the floating rice based agroecological systems is a real option for adaptation to climate change. The current approach in living with the floods should be re-examined in order to enhance ecological – social resilient farming system (Nguyen Van Kien 2013). Floating rice adapts well to shallow and deep seasonal riverine flood events in Southeast Asian Delta (Cuny 1991; Catling 1992). The growth of rice initially depends on rainwater, providing moisture until flooding occurs in mid-August. The flood water level usually rises gradually, and the rice plants follow the rising water through stem elongation at approximately 25 cm/day, though long stubble elongates by~1.5 – 3.0 m (Kende et al. 1998) (Figure 37). When the water level recedes in November (lunar calendar), the rice plants lay flat on the ground and the flower during May to December following (lunar calendar). According to a group of floating rice growers in Tri Ton district of An Giang province, each rice plant can produce around four tillers each with two or three panicles (personal communication with Mr Hao on 10 Sep 2013). Xuan Tong Vo (1975) claims the average yield of floating rice to be one ton/ha, though yields can be greater in the deeper region. However, the average yield is estimated from 1.50 - 2.0 tons/ha in Luong An Tra commune of Tri Ton district, 2.5 to 3.0 ton/ha in My An commune of Cho Moi district and Tan Long commune of Thanh Binh district (personal communication, 28/02/2013). In December, farmers harvest rice, store rice seeds for future crops and begin vegetable cropping A special feature of floating rice-based farming systems is varieties' ability to adapt well to floods and requires less investment for dikes and polders designed to prevent flooding of rice crops.

Figure 37: Floating rice is elongating during the flood peak in Oct 2013, in Vinh Phuoc Commune, Tri Ton District of An Giang province, Vietnam. @ Huynh Ngoc Duc.

2.4 Dry season drops were rotated in the harvested floating rice paddy fields

The seasonal calendar of floating rice varies by locations. An example of dry season vegetables crops in Vinh Phuoc and Luong An Tra communes of Tri Ton district (An Giang province, Vietnam) where farmers start sowing rice seeds in June and harvest floating rice at the end of December or early January. Farmers immediately grow one crop of leeks followed by chili or pumpkin. Alternatively, after harvesting floating rice in early January, farmers can grow cassava, to harvest in May (Figure 36). The rotation is repeated yearly. However, Tan Long and My An communes (Cho Moi District, An Giang province) are located near the Mekong River and land is more elevated. Farmers sow floating rice in June and harvest it in early December (a month sooner than that of in Tri Ton district). After harvesting floating rice farmers usually grow chili crops in Tan Long commune and rear cattle round year. Each family can rear up to 4 or 5 cattle. The floating rice-based farming system in My An commune is more diversified. After harvesting floating rice in early December, farmers grow one crop of traditional sticky corn, followed by two young corn crops integrated with cattle rearing. The by-products from young corn are used to feed cattle.

Since cultivating floating rice fields, almost local farmers apply its rice straw on vegetable farm in order to reduce weed and watering. On the other hand, it declines fertilizer due to having rich alluvial soil which benefits to cultivars. As a result, farmers can save much money for hired laborers, invest low input and obtain high profits.

Figure 38: a floating rice field

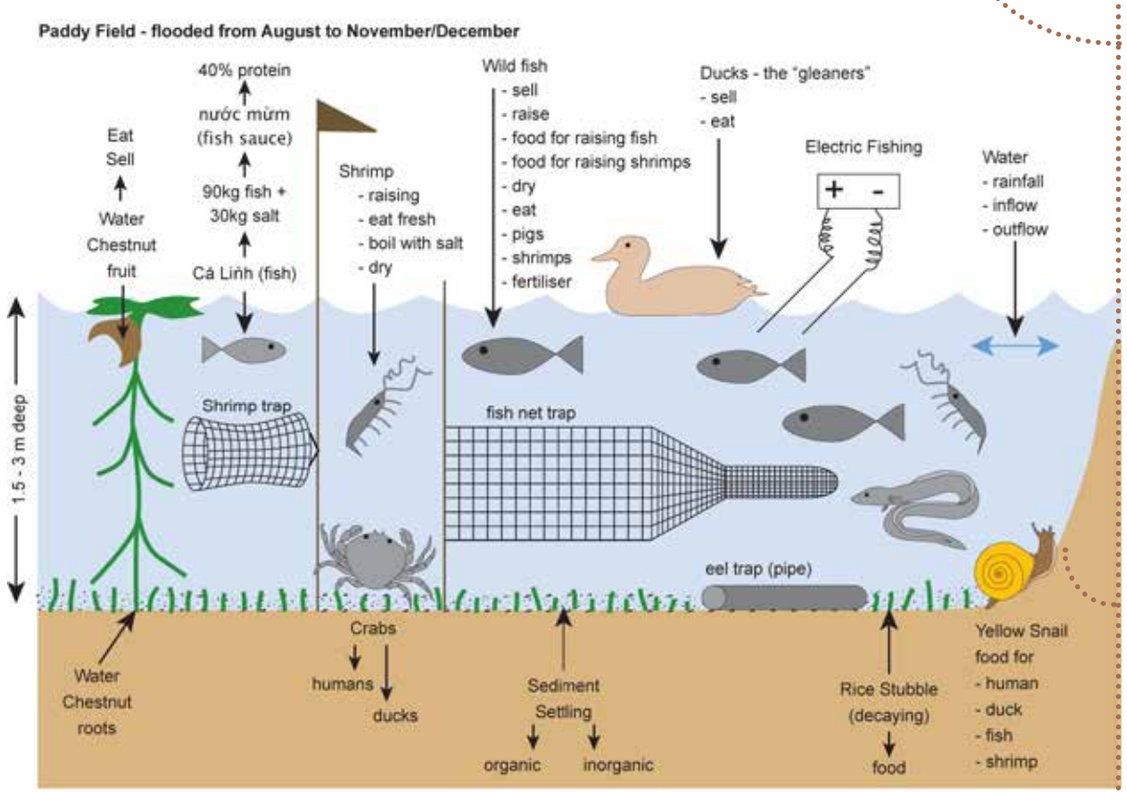


Figure 39: Fish, aquatic animals in the flooded paddy fields. Source: (Howie 2011)

2.5 Floating rice and its ecosystem services

Floating rice does not only adapt to floods, but also provides habitat for fish, aquatic animals and wildlife (Nguyen and Huynh 2015). Farmers reported that there are diversified varieties of plants, fishes, and vegetables available in their floating rice paddy fields. These resources supply important nutrition for rural households' daily meal. The diversity of fish and other aquatic animals are illustrated in Figure 39.

Native fish resources on floating rice paddy fields

There are various kinds of native fish in the floating rice paddy fields, including white fish and black fish (Focus Group Discussion, Sep 2015). According to Mr. Nguyen Van Du, local farmers caught fish for daily meal while other professional fishers catch for sales of VND 100.000 (USD 05)/day (personal communication with Mr Triem in Tan Long Commune on 15 Sep 2015).

Vegetation in the floating rice paddy fields

There are also various kinds of vegetable to supply farmer daily meal, such as morning glory and water lily. Furthermore, different kinds of weed also appear on floating rice field (group discussion, 2015). Some herbals also appear in Thanh Binh district (Mr. Nguyen Van Phieu in Thanh Binh district, 2015). An illustration in Table 3 is as the diversity of vegetation community on floating rice farming in the Mekong delta during flooding.

Sediment

Since floating rice was cultivated, amount of sediment increased year by year. However, it depends on water levels (low or high), the amount of deposited alluvial will be more or less. Sediment is perceived good for soil and yields. With the benefits from rich sediment, farmers use less fertilizer to rice field and vegetable as well, about 20% (FGD Sep 2015).

Wild birds

When flooding level increase, many kinds of birds appear on the floating rice fields. In particular, thousands Anastomus oscitans from Tram Chim National Park in Dong Thap province fly to this area in 2012 and 2013 when rice was nearly harvested.

Floating rice is a safe and chemical free food for local people

The local farmers usually keep floating rice to eat in their daily meal because they trust it is safe, without using pesticides or chemical fertilizers (Personal communication with Mr Triem in Tan Long commune on 15 Sep 2015). Floating rice is now accepted in local and HCM market (VND95,000/kg).

2.6 Progress of floating rice recovery in the Mekong Delta and Mekong Region

The existence of cultivated areas of floating rice have not been of interest nor mentioned in annual socio-economic reports by local communes, districts and provincial government. Rice production is essentially the quantities of short term rice varieties and high yielding rice varieties produced in the Mekong delta, made possible by the introduction of massive canal systems and irrigation.

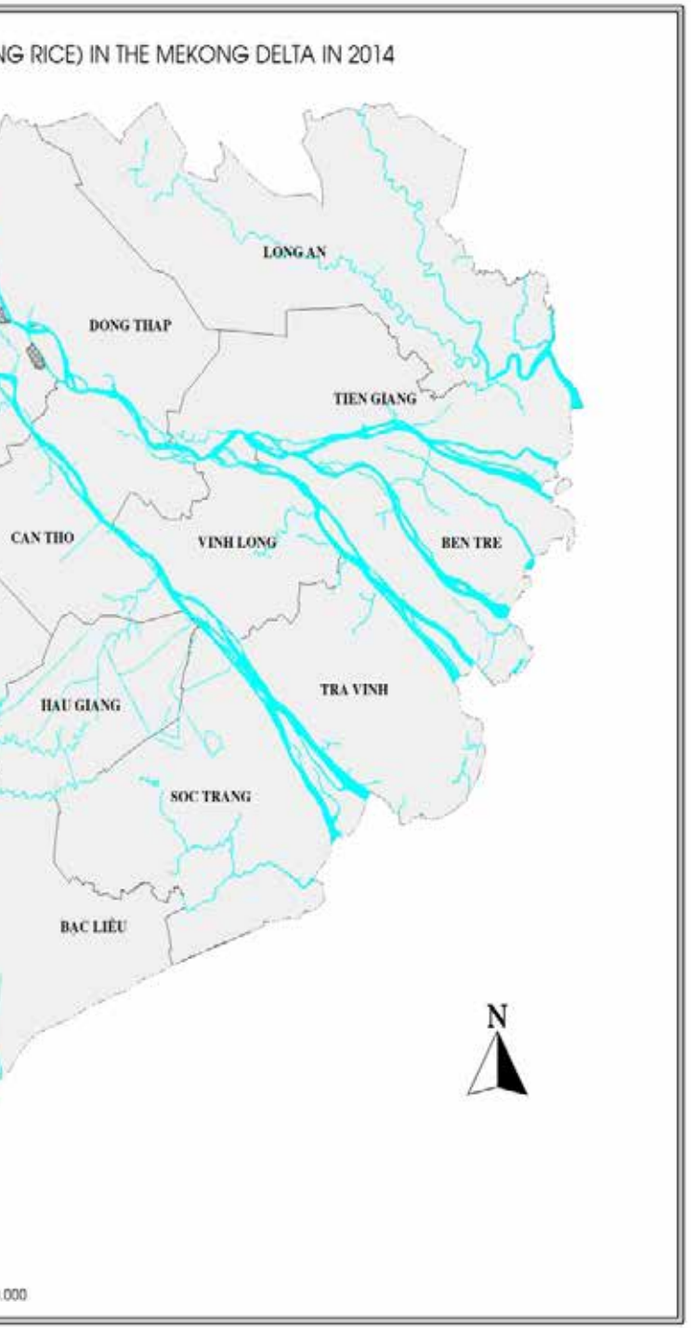
Since floating rice has not been depicted in current Mekong delta land use maps, very few local people know the existence of floating rice in the flooded prone of the Mekong Delta. Floating rice production has not been included in the annual socio-economic reports by the Department of Agriculture and Rural Development in either An Giang or Dong Thap provinces. Fortunately, researchers at An Giang University have discovered that floating rice were still cultivated in Vinh Phuoc and Luong An Tra commune. The research team found that there were about 17 floating farmers live in the remote village of Tri Ton district continues cultivating this crop. The average of land ownership is 3.6 ha per household (min is 1.0 and max is 10 ha). Only a woman households' head is cultivating floating rice among 17 households. Some of the farmers have grown floating rice over 30 years. Most of them have cultivated over 20 years. Only one farmer has just planted for five years.

Yet farmers still keep producing floating rice. Up to 46 ha of floating rice was cultivated in Luong An Tra and Vinh Phuoc commune by a group of researchers at Research Centre for Rural Development (RCRD) of An Giang University, southern Vietnam. The RCRD has started a preservation project aiming to maintain existing areas of floating rice in these two communes in 2013 which has interested local governments, NGOs, researchers and media. From 2013 to 2018, RCRD implemented 20 small research grants and six international research grants for floating rice farmers. The floating rice has been quickly accepted by local and urban consumers who are happy to pay more than 3 times the price of usual rice varieties. Farmers in Tan Long commune of Thanh Binh district, and My An commune of Cho Moi district have continued to cultivate floating rice during the flood season and grow upland vegetables crops during the dry season (Figure 4). In Tan Long commune, 53 households still cultivate floating rice which occupies 35 ha. My An commune has 46 ha of floodplain without high dikes, and there are more than 50 households engaging in floating rice production during the flood season, while growing young corn and sticky rice in the dry season, and integrating rearing cattle using the by–products for additional livestock feed (personal communication, January 2015).

After one year (2013-2014), several floating rice farming system benefits were recognized by farmers and local authorities. This opportunity promoted the first floating rice harvest festival to be organized in Vinh Phuoc commune on 11 January 2014 which attracted more than 200 visitors from local farmers, local authorities, research institutions, university students, NGOs, and provincial leaders. The festival was repeated each year since 2014.

In early 2015, ten farmers in Luong An Tra commune of Tri Ton district and neighboring farmers in Giang Thanh district of Kien Giang province intended to produce floating rice. The key reason for restoring floating rice production was the fact that farmers have received fewer benefits when cultivating two or three crops of short-term a year instead of growing floating rice and upland crops. When the market price of rice is getting low, some farmers get lost because the cost for summer-autumn crop is much higher. Therefore, more farmers are going to return to cultivate floating rice in 2015 and 2016.

Figure 40: floating rice area in Mekong Delta, Vietnam (2015). Source: Nguyen et al. (2015)



2.7 International and national concern about research and development of the floating rice in Mekong Region

From 2013 to 2018, RCRD received 8 international projects, one national project together with 20 small research grants funded by An Giang University for research and development of the floating rice based agro-ecological farming systems. RCRD led 5 projects, and co-partnered 4 projects with international researchers. RCRD has been very actively to seek for international and national research grants to undertake collaborative research and link science to policies for floating rice conservation and development. In the last two years, RCRD partnered with the Australian National University to extend the research and development of floating rice in the Mekong Region (Vietnam, Cambodia and Myanmar) under the Mitsui's project.

The research outcomes of the projects have been published in both national journal magazines, international journal articles and reports. The topic of floating rice was presented in many international workshops in Asia, Australia, Europe and the US.

Conclusion

Floating rice-based farming systems declined after the introduction of high yielding rice varieties and use of high dike systems in the Mekong Delta. Floating rice produces low yields but provides good opportunities for developing profitable upland crops when used in combination with rearing cattle. Financial returns of several combinations of floating rice-based farming systems can provide greater financial benefits than other intensive high yielding rice crops. Farmers diversify their cropping systems in the same land area for many crops and cattle round year. Farmers also benefit from the ecosystem services such as wild fish and other aquatic animals in the floating rice paddy, sediment and mulches for the vegetable crops. There is a sign that farmers are likely to return to floating rice in the Mekong Delta. International donors and researchers have considerable concerns about conservation of this unique agro-ecological farming systems in Southeast Asia. It is important to maintain and expand this area for sustainable agriculture.

This paper summarizes all research outcomes from nine research projects that RCRD received from both national and international donors and research partners. The author (Dr. Nguyen Van Kien, PhD) gives special thanks to all listed partners and donors, to Vinh Phuoc people's committee, My An people's committee and Tan Long people's committee for great support. Least but not last, the authors wants to thank the contribution of students and researchers of An Giang University for the data input.

More information on : *https://bit.ly/2R8jdP4*

Figure 41: Soil preparation in Ban Thongmang Organic farmers' group, Laos

3 Promoting agroecological skills among local community in Banteay Meanchey province

Figure 42: Location of Ockenden intervention, Banteay Meanchey Province, Cambodia

Ockenden Cambodia

Ockenden's main objective is to enhance livelihoods of vulnerable rural communities and indigenous ethnic minority communities. Ockenden Cambodia was created on 14th February 2007 in order to continue the implementations of projects and to take all responsibilities handed over by Ockenden International from 1st April 2007.

All key staff of Ockenden Cambodia were well – trained in a wide range of organisational and programme management skills. Ockenden characterises itself as a development organisation, tending to concentrate on areas where there are most vulnerable rural communities (including former refugee, displaced families, women headed households and handicapped people, families of demobilised soldiers) and indigenous ethnic minority groups.

The organisation is active in 5 Cambodian Provinces and works on natural resource management (Community Forestry), environmental mitigation, D&D, natural/ organic farming, Permaculture, capacity building in Dister Risk Reduction, Climate Change Adaptation, resilient farming, environmental mitigation, skills training, enterprise development, skills training and community mobilization.

More about information on Ockenden on:
https://bit.ly/2Oya2KU

3.1 Training farmers to agroecology techniques in Cambodian lowland of the Banteay Meanchey Province

Banteay Meanchey Province lies in the northwestern region the Kingdom of Cambodia, at the border with Thailand, 360 km away from Phnom Penh. It is mostly covered by extensive lowlands in the river basins of the Mongkol Borei and Sisophon rivers. The agriculture production in the region is dominated by lowland rice cultivation, and crop diversity is limited (NCDD, 2017). Commercial agriculture is developed in the Banteay Meanchey Province, especially lowland rice production. However, the intensification of rice cultivation through increased use of agrochemicals is affecting the environment and causes food safety issues. Other challenges in the region include rising inequalities, as Gini Index on smallholder farmers on agricultural land distribution in Cambodian shows high inequalities in land distribution in the region (NIS, 2015). The region is also vulnerable toward impacts of climate change: lowlands agriculture lands located in the river basins of the Mongkol Borei and Sisophon rivers are increasingly impacted by floods and droughts.

The Ockenden intervention aimed at responding to the challenges of environmental degradation and stronger climate change impacts through supporting the adoption of agroecology techniques by farmers in the Bantey Meanchey Province. The organization worked in 25 villages in 3 communes (Ta Lom, Shrah Raing and Kok Balang) of the Province with 25 villages in total. The grassroots intervention first aimed at providing the farmers agroecological adaptive farming skills to improve the resilience of the communities to cope with climate variability and hazards. Indeed, Ockenden values agroecology as the best approach to respond climate challenges by fostering ecological diversity, which makes food production more resilient to a changing and unpredictable climate. Agroecology techniques can also increase yields and help producing sufficient food to feed farmers themselves and local communities whilst limiting agriculture impact on the climate.

Ockenden also introduced farmers to the design of a **multi-purposed farm**, through field visit and training sessions. Farmers learned how to design an agroecology multi-purpose farm, starting from conventional farmlands or paddy fields. Multi-purpose farms consist in mixing a diversity of production and agroecology techniques at the level of the agricultural exploitation. In addition, Ockenden supported several farmers to **develop fish ponds** in their multi-purpose farms and supported them with the cost of digging and settling the ponds. Fish ponds, livestock were integrated in the farming system to support each other, in order to reduce de production inputs and increase productivity. As an illustration, in integrated farms supported by Ockenden, some surplus of vegetables from the gardens are used to feed chicken, duck and pigs, while animal manure is used for feeding plants and fishes. Family ponds provide water for irrigation in addition to supplying fish for households and sales. This complete integrated system has attracted many neighbouring farmers to come and visit the farm and replicate farming techniques.

Other activities led by Ockenden included **training on the permaculture** approach which involved 25 farmers for two days. This training was the occasion for farmers to learn about sustainable land management, improving soil and farming techniques to enhance productivity, and fostering biodiversity in agriculture land for climate change resilience. A film was produced by Ockenden team in Khmer language as a tool to introduce farmers to permaculture.

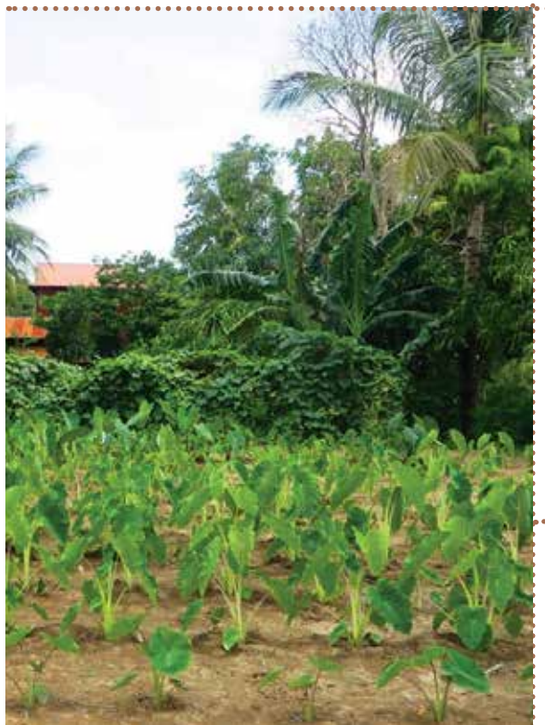
Technical trainings on agroecology techniques were also implemented, with three separated trainings on producing effective micro-organism (EM) for soil fertilization. Ockenden also invited 25 farmers to take part in training and practicing to make "old car tyres for garden containers" at one of the farmers' houses. All the participants made the garden containers from old car tyres (singled tire and doubled tires) and then practised to fill up the garden containers with soil and organic materials for growing vegetables.

Figure 43: Workshop on permaculture and related techniques by Ockenden staff

Finally, Ockenden also looked at market opportunities during the project, and gave advises to farmers for selling their organic products. The close access to Mongkul Borei town offers opportunities for farmers to sell their products on markets. Farmers also managed to develop strong relations with buyers and traders who are now coming regularly to their villages to buy products at farm sites. On average, farmers of the villages of the Mongkul Borei district are now confident about market opportunities as local consumers perceive that local vegetables are safer than imported products. The local farmers reported to Ockenden being able to get at least 10 to 15¨% higher prices than for non-organic products.

Watch the video:
Introduction to permaculture by Ockenden (in Khmer with English subtitles).

Figure 44: agroecological home garden in Mongkul Borei distict, Banteay Meanchey Province



3.2 A story from the field: how designing a multi-purposed farm can bring higher incomes

Ockenden collected testimonies of farmers who adopted agroecology techniques following the initiative. The story of Mr. Vun Ream illustrates well how designing a farm land as a multipurposed agroecology farm can help farmers ensuring sound livelihoods.
Mr. Vun Ream, 61, and his wife, Mrs. Nut Chanrath, are living in Chong Kouk village, in Mongkul Borei district, in the Banteay Meanchey province. They have two children. The Vun Ream family has around 2 ha of village land and 3 ha of paddy field. Before participating in the project, Vun Ream was rearing a total of 30 chickens, around 20 pigs and 5 cows. His family encountered difficulties in animal rearing as the livestock has a high death rate because of animal diseases. The high production cost also limited its profits. Mr. Vun Ream cultivated rice on 3 ha and was able to keep enough rice for family consumption. He made an income of $1,500 from the rice production per year. His family also grew some vegetables and fruit trees for household consumption and sold production surplus for income. They were able to make around $40 per month from vegetable and fruit tree sales.

When Ockenden team first met with him in 2017, Mr. Vun Ream said "I really need skills and some complementary support to make my land to become more productive! Being a farmer, I always work hard and commit to learning new techniques to improve my family's living condition." Mr. Vun Ream was then selected to join the project "Promoting agroecological related Skills Among Local Community and Key Actors" supported by ALiSEA and received training courses on agroecological farming techniques. These trainings focused on permaculture principles, farm design, indigenous micro-organisms (IMO) production, insect pest management, fish rearing and short-term rice production.

Besides the training courses, he received production inputs of $300 from the project for developing his farm by digging a large fish pond. This money was also invested in mixed crop production activities (for seeds, seedlings and agricultural materials/ tools).

Following the trainings and after having received inputs from Ockenden, he focused mainly on redesigning his 2 hectares village land. He changed it into an integrated and diversified farm to get a high productivity. He and his wife allocated the land into five different land use areas:

1- A residential area (25mx25m) on which his home is located. His family rears 60 chickens, 25 ducks, 10 pigs and 5 cows.

2- A home garden (7mx7m) with diversified vegetables: long bean, pakchoy, kangkong, luffa, pumpkin, chili, lemon grass…

3- A family pond (40mx30m) in which his family rears up to 30,000 fish (carps and Java barb).

4- A field for cultivation of perennial cash crops (100mx100m) on which he plants organ, banana, mango and corn.

5- Along the boundaries of the land, plants and fruit trees were planted to create living fences.

Figure 45: Mr. Vun Ream feeding his fishes in his fish pond

The family of Mr. Vun Ream is now well-known for the redesign of village land following permaculture and agroecological principles. Taking stock of agroecological concepts and practices, Mr. Vun Ream has managed to design his land in a productive and sustainable way. He is now able to do integrated farming by combining the production of diversified organic vegetables and fruit trees with the production and rearing of fish, poultry and pigs. He makes compost, uses animal dung as fertilizer, and give vegetables surplus to feed animals. Mr. Vun Ream said "I am more than happy: with this system, in about one year, my family's livelihoods have significantly improved. I harvest many kinds of products as fish, vegetables, and fruits. My family makes a regular monthly income of around $250. Some months, we even make up to over $500 per month. We struggled a long way and now we've found out the best way forwards in doing the farming business."

Mr. Vun Ream shared his skills and knowledge on fish, vegetable seeds, seedlings and basic relevant practical skills with four peer farmers.

3.3 A story from the field: the agroecology farm of Ms. Pich Sean

Ms. Pich Sean, 55, lives with her husband in Kouk Balaing Village, Banteay Meanchey province. Her family was unemployed, landless, and survived a long time with day-to-day labours. Ms. Pich Sean and her husband then left Cambodia to spend several years working as day-to-day workers in Phnom Penh. They then had migrated illegally into Thailand where they spent four years as labor workers and managed to make some money. In 2008, as they both were becoming old and could not get legal work permits in Thailand, they decided to return to Cambodia, and bought a plot next to the land of their sister in Kouk Banlaing village. They have settled on the land so far and started building their lives from nothing.

Ms. Pich Sean said that "I have joined the project supported by ALiSEA in 2017, after I attended a meeting run by Ockenden team to promote the project in my village. Since then, I have participated in several trainings on permaculture and agroecology farming skills. With other farmers from the village, I got the chance to visit and learn from successful agroecological initiatives in other districts and in Thailand. I have gained lot of experience, skills, and confidence in putting them into real practices. More importantly, I received $300 from the project for digging a family fish pond and another $100 for building a water pump. I also received some seedlings and seeds. I now rear fishes in the pond and I plant mixed vegetables — eggplant, long bean, winter melon, cucumber, luffa, pumpkin, papaya, sesbania and herbs in a home garden. I also plant cash crops- cassava, banana, sugar cane, mango and custard apple on a plot of my farming land."

Ms. Pich Sean also reported producing organic fertilizers and pesticides for her cultivation. Her family has been very interested in what she did and was inspired by her innovative approach. Together, they implemented multiple farming activities to increase production while maintaining low production costs. She now has 30 ducks, 15 chickens and several hundreds of fish in the pond.

Besides benefiting from a daily food available at home, her family has increased its earnings, reaching an income of 80 dollars per months with vegetable sales. She can now access water all year round and feels self-sufficient. Her family finally stopped migrating elsewhere, and now stay in the village to run the farm to become more productive.

Figure 46: Mr. Pich Siem started a rice straw bale gardening

Conclusion

Ockenden has been working with farmers to develop agroecology farming systems combining vegetables cultivation, livestock rearing and fisheries in an integrated approach. Farmers have learned agroecology techniques and had the opportunity to redesign farm lands to create multi-purpose farms. The local and regional market opportunities allowed farmers of the 25 villages engaged in agroecology to sell their products with a premium price. The agriculture model proposed by Ockenden therefore combines food security, increased revenues, adaptation to climate change, and environmental preservation, in a region where Climate Change effects, social inequalities and environmental degradation are getting more significant. In these 25 villages, active agroecology stakeholders are now ready to share their knowledge and experience on integrated farming.

This part was based on the 3 case studies on Ockenden intervention "3 Case studies from Ockenden", funded under the SGF of ALiSEA available here:

https://bit.ly/2CrdvUd

Figure 47: Lowlands in Rural Myanmar

Figure 48: Green Organic Farm, Luang Prabang Province, Laos

Part 3

Agroecology & cross-cutting regional challenges

The challenges the Mekong region is facing are specific to the landscape characteristics of its diverse territories – from delta regions to mountainous areas. However, the regions also undergoes regional changes and challenges driven by the rising international competition for large scale food production, intensification of farming practices and climate change. These rapid changes in the agriculture sector changes are exacerbated by the regional and global financial- and commodity-markets, the specialization of large agriculture concessions in boom-crops production (Mekong State of Land draft, 2018) and the rising power of seed production (and more broadly agro-inputs) companies. The Mekong region is now at a cross-road, with a current trend toward intensification of agriculture and adoption of unsustainable practices that are causing environmental, health and economic issues (Castella et al., 2015). This part will focus on three main common regional challenges including decreasing **soil fertility, pest and disease occurrence, and seed biodiversity losses.** Integrating agroecology knowledge to development programs can help addressing these challenges through training farmers on innovative agroecology approaches or by informing development action with local agroecology knowledge.

Figure 49: Farmers on the Irrawaddy Delta, Myanmar

Figure 50: Soil erosion and deforestation due to maize monocropping in Xieng Khouang province, Laos

1 Implementing innovative agroecological approaches for soil fertility in the Mekong region

1.1 The issue of land degradation in the Mekong region

Land degradation refers to land which, due to natural processes or human activity, is no longer able to sustain its natural ecological functions or economic function (Eswaran et al., 2001). The degradation process results in a decrease of the fertility and the water holding capacity of the soil. Soil fertility losses can reduce crop yields and can even turn farming lands into uncultivable lands. In the Greater Mekong Sub-region – Laos, Myanmar, Cambodia, Vietnam, Thailand – about one quarter of the total area is degraded, and another quarter has moderate degradation (Shrestha et al., 2008). In Myanmar, which is considered as the country the most impacted by soil degradation in the Mekong region, about 55.5 percent of land has a low fertility status with medium to strong degradation (Mekong State of Land draft, 2018). Soil degradation in the region is highly related to unappropriated agriculture practices (Shrestha et al., 2008). Indeed, the disappearance of fallow periods in "slash and burn" systems, the absence of rotational cultivations in intensive farming systems, unappropriated soil tillage and the use of chemical fertilizers in the region are limiting nutrient cycling, crop nutrient acquisition, and long-term productivity of the soil. The high degradation rates may also add upon the issues of land shortages and land access that are already stressing inequalities in the region (Mekong State of Land draft, 2018).

Agroecology, by relying on ecological processes to foster the productivity of the agriculture ecosystems, gives a range of techniques to boost land fertility. Conservation agriculture, for example, consists in no tillage, crop rotations and permanent soil cover, and can be very effective in improving soil properties and other biotic factors (Scopel et al., 2012). ALiSEA supported two initiatives to boost innovation for soil fertility, the first related to the use of **efficient microorganism products** to foster soil fertility in rice fields, and the second focusing on the development of **earthworm farms** for organic fertilization of the soil.

1.2 Recycling of rice plant residues through elaboration and utilization of microorganism products for enriching land with organic matter

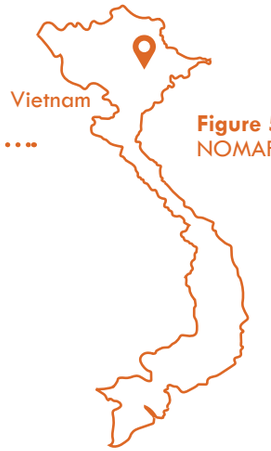


Figure 51: location of NOMAFSI

The Northern mountainous Agriculture and Forestry Science Institute (NOMAFSI)

NOMAFSI is a research institute affiliated to Vietnam Academy of Agricultural Sciences and is mandated to undertake scientific research and technology transfer in agriculture and forestry to serve the agricultural and rural development in the midlands and mountainous regions of North Vietnam. In the Phu Tho head quarter, the Institute has 250 ha land for scientific research, keeping a genetic collection with 170 tea varieties, 273 fruit varieties (13 species), 300 aerobic rice varieties, around 150 rubber varieties and a large number of rare and precious varieties which collected internationally and domestically. The institute is also involved in numerous research programs in Vietnam.

More information on NOMAFSI on:
https://bit.ly/2P7TYis

Answering the challenges of decreasing soil fertility, high agrochemical uses and rice straws wastes.

Each year, around 50 million tons of rice straw residues are produced in Viet Nam, but most of it is burnt in the fields or along the roads. This results not only in wasting a valuable carbon source, but also causes air pollution and generates greenhouse gas (CO2). Another solution to deal with rice straws in the region is to spray herbicide on these plant residues, directly in the field. However, by doing this, farmers waste nutrient, pollute air, water and soil. Over the past years, NOMAFSI has worked in Vietnam to develop techniques for "quick composting" of rice plant residues in the field right after the harvest, using an efficient microorganism product (EM). The EM used by NOMAFSI has been approved by the Ministry of Agriculture and Rural Development for commercial use. This "quick composting" technique is simple enough for farmers to apply at small and large-scale plots. After harvesting of rice, the EM is sprayed directly over the plant residues in the field and the next rice crop can be cultivated when they are sufficiently degraded. Furthermore, rice straws, instead of being wasted, can be gathered in small piles of in the field and sprayed with the EM. Once rice straws have been degraded enough, the plant matter fertilizes the soil and is a great source of nutrients for the plants. Decomposed rice straws can also be used as organic fertilizers for other rice and crops fields.

Figure 52: Over tillage practices of rice fields can lead to decreasing soil fertility

On farm-experimentation on EM effectivity

With the support from ALiSEA, NOMAFSI implemented an on-farm experimentation to assess the effect of the EM product on rice field productivity. This experimentation took place in 25 villages in two Provinces of Vietnam - Phu Tho and Yen Bai provinces. All the experiment sites were about 1 hectare large and were divided in two parts. One part was sprayed with EM product and the other did not receive any EM. All other cultivation practices were applied the same way in the two parts of the field. The parameters of observation chosen consisted in the number of panicles, the number of filled grain and the grain yield. All these parameters showed higher results in the EM sprayed fields:

- The number of panicle per square meter was 3.96 to 7.5 percent higher in EM sprayed lands compared to lands without EM.
- The umber of filled grain per panicle was from 3.6 to 11.1 percent higher in EM sprayed lands
- And grain yield was 3.38 to 5.76 percent higher in fields were farmers applied EM product (figure 3).

The experiment also compared pest and disease occurance between the two types of plots. Results showed that there was no difference on pest incidence between plots with EM spraying and control plots. However, the disease incidence was lower in plots sprayed with EM and control in locations. This could be explained by the possibility that EM not only decomposed rice straws but also killed diseases at an early stage.

The experimentation work of NOMAFSI showed that the use of an efficient micro-organism product (EM) to quickly recycle rice plant residues can help improving rice production and reducing greenhouse gas emission. Application of EM product on decomposing rice straw in the field helps rice to grow better by producing valuable organic fertilizers to restaure the productivity of the soil. It also limits the use of herbicides and chemical fertilizers. Before, farmers used to apply herbicide to kill rice straw, which was affecting the health of the population and animals, and was distrurbing soil structure. Building upon these positive results, NOMAFSI will support on the elaboration and diffusion of this EM for large-scale adoption in paddy production in the Northern mountainous region of Vietnam, and possibly beyond.

To go further: *https://bit.ly/2ysC3cC*

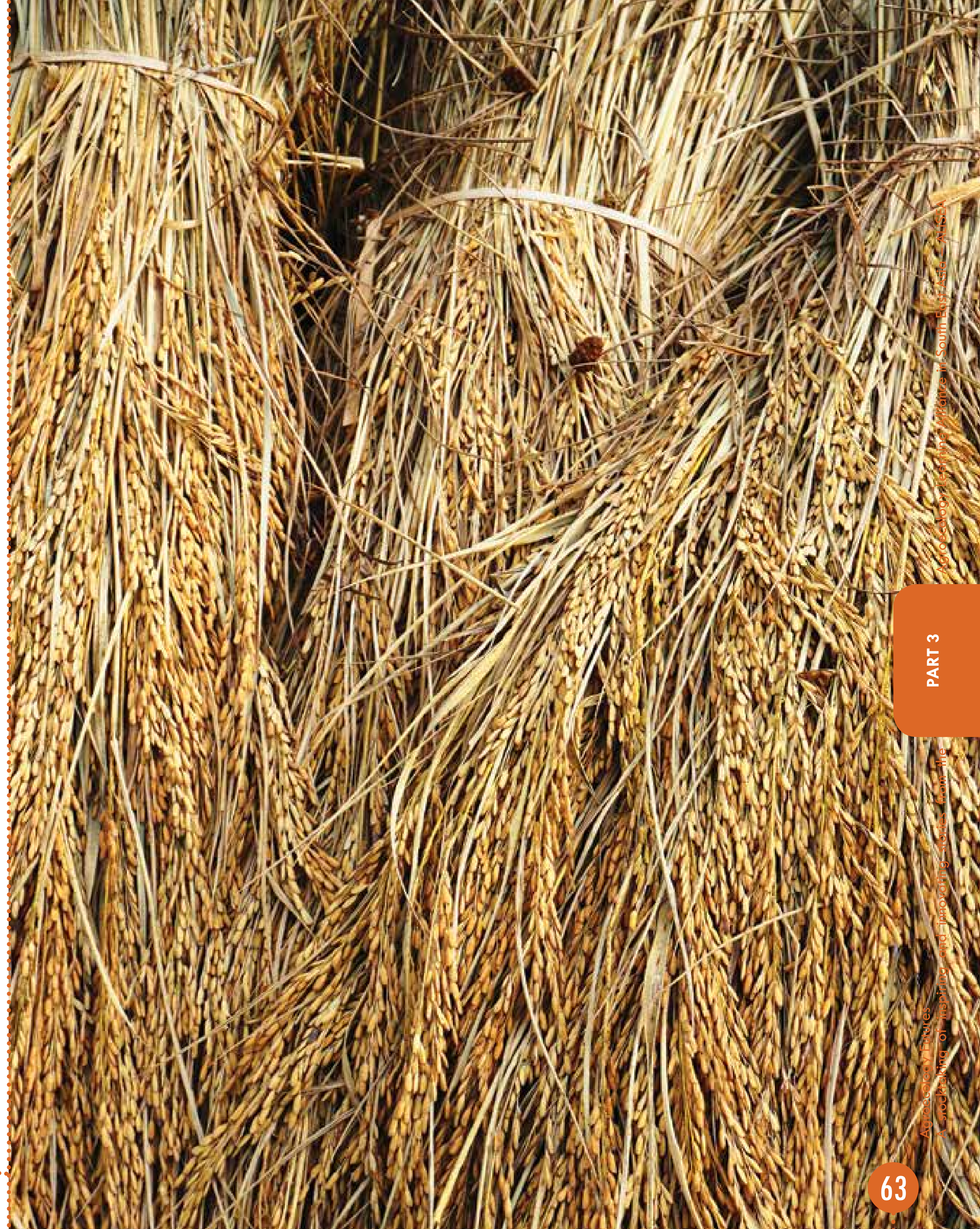


Figure 53:
rice panicles

1.3 Sharing experience and replication of earthworm production models for soil fertility and integrated agriculture

Figure 54: Location of CGFED's intervention, Nghia Hung district, Vietnam

Research Center for Gender, Family and Environment in Development (CGFED)

Started in 1993, the CGFED has been working to achieve gender equality in Vietnam. During the past 24 years, CGFED has been following the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the International Conference on Population and Development (ICPD) frameworks to shape its activities on research and intervention to support women's health, livelihoods, education, sexual and reproductive health and rights, and to fight against violence against women. CGFED focuses on three ares of concern:

1) Gender Equality and Sexual and Reproductive Health and Rights;
2) Gender Justice and Sustainable Environment; and
3) Gender Sensitiveness in Law and Media.

More information on CGFED on:
http://en.cgfed.org.vn/

Earthworm raising and soil fertility

Earthworms are central in the fertilization process of natural agroecosystems. By ingestion of soil along with plants debris and subsequent excretion of casts, earthworms process huge quantities of plant litter and liberate nutrients needed for plant growth. Their burrowing activity in the soil participates to reduce soil compaction, improving permeability and aeration. Earthworm humus dry in the soil and their presence helps improve soil structure, retain nutrients that might otherwise be leached, and reduce the threat of erosion (Werner, 90). However, deep tillage is generally harmful to earthworms and certain pesticides can decimate earthworm populations (Werner, 90). Earthworms' production can therefore bring benefits in terms of fertilization through the use of earthworm's humus as organic fertilizer.

Since 2014, CGFED has collaborated with the Hai Hau District Women's Union to build up a group of pioneering female farmers to develop earthworm production for limiting the use of pesticides in agricultural production. The earthworms are used as a source of organic fertilizer and as food for livestock. This ecological agriculture model in the communes helped enhance soil fertility without using agrochemicals. On the other hand, the model also helps increasing incomes of household members (30-50%) as earthworms raising allows to reduce expenses for animal feeding and chemical fertilizers.

Watch the video:
Modeling of earthworm breeding in Nghia District, Nam Dinh Province, by CGFED

The model implemented by CGFED showed good results in Hai Hau district. Following this experience, the Nghia Hung District Women's Union and the Agricultural Extension Station requested the support of CGFED to develop a closed-loop agriculture model based on earthworms raising for women of the Nghia Hung district. Women in this district are facing difficulties as men go to work far away from the villages and need to take care of the rice and vegetable production. Many women are suffering from pesticide poisoning such as red

back, lumps, itching and aches. Besides, it is difficult for local women aged 35 to find jobs in companies, as they are already working actively on rice and vegetable production. The activities of CGFED therefore supported women to foster their agriculture and livestock production, while benefiting from a healthier environment.

Developing a closed-loop system based on earthworm raising

The activities consisted in supporting 30 women from the Nghia Hung district on earthworm raising. Four groups were settled in two villages. Each group gathered five to seven members who shared the responsibility of a collective earthworm production. The production groups raised funds amounting for about 50.000 Vietnam Dong (about $2,50) per member, in order to share expenses and to give a chance to members to get a loan. Group meetings were organized each month for members to share their experiences in earthworms raising. The four different groups benefited from technical trainings on earthworm raising, on making worms-based food for livestock and on team building skills and management of women's producing groups.

Through these different activities, the farmers learned how to use worm humus to fertilize their rice fields and vegetables cultivation while reducing their use of chemical fertilizer. As a result, the rice and vegetable production grew healthy with limited chemical pesticide spraying. The use of earthworms for organic fertilizer production resulted in cost savings, as less money was spent on buying chemical fertilizers. It also improved humans' health and environmental protection in the Nghia Hung district. Furthermore, the earthworms are used to feed chicken, fish, pigs, birds as they are a sound source of protein for livestock. Earthworms can also be mixed with corn flour or rice bran to produce feed pellets. Such process allows households to save money as the production cost of feed pellets from earthworm is 15% cheaper than for industrial pellets. Therefore, earthworm's production gave important benefits to the four groups of women in terms of soil fertility, cost savings, environmental services, and human's health.

Ms. Do Thi Hai was one of the pioneers successfully applying the model of earthworm raising in Nghia Hung district. She reported to CGFED: "Since raising earthworms, we have used the earthworm humus to fertilize vegetables. I recently grew onions, tomatoes, garlics using earthworm humus as fertilizer. The vegetables grew very well, and I don't have to use any nitrogenous fertilizer anymore or to spray pesticides to prevent pests. Furthermore, in my group, we have replicated 32m2 of earthworms to produce foods for 245 chickens. Since raising the earthworms, we press together earthworms, corns, rice and vegetables to make foods for pigs and chickens, which reduced the price compared to industrials food. In addition, chickens raised with earthworms are very sweet and tasty and the surrounding communes often buy my chickens."

To go further: *https://bit.ly/2yrszhY*

Figure 55: Earthworms in food pellets can be a healthy source of food for poultry (photo from Cambodia, APICI project)

Conclusion

The decreasing soil fertility in the Mekong region results from unappropriated agriculture practices combined with Climate Change impacts on the region. A mainstreamed adoption of conservation agriculture practices, the broader use of earthworm's humus or animal dung as organic fertilizer, and a dynamic research for innovative microorganisms to improve soil fertility are some of the existing solutions to address this key issue in the Mekong region.

Figure 56: Upland rice and legume crops, Northern Laos

2 Supporting the adoption of alternative approaches to pesticides

2.1 The overuse of pesticides in the Mekong region: a concern for human health and environment conservation

The broad use of pesticides in the Mekong region has been pushed since the 1950s by the GMS countries as a solution to expand agricultural land and increase output per acre. This approach of the agricultural development, based on the principles of the Green Revolution, aimed at responding to the challenges of a growing population and poverty reduction. Today, the production, sales and use of pesticides in South East Asia are still awaited to increase sharply. Assessments and forecasts predict that global chemical sales will grow by about 3 % per year until 2050, and the major part of that increase will take place in Asia (OECD, 2012). As an illustration, a dramatic increase in pesticide use was observed in Laos over the past years, as official statistics on pesticide use in Laos show an increase of 236% over the past decade (Rassapong, 2017). Furthermore, the trade of hazardous pesticides has gradually shifted from Europe to Asia, with chemical manufacturing and processing activities steadily expanding into developing countries. China and the rest of Asia (excluding India, South-Korea and Japan) have almost tripled their part of world chemicals sales from 2005 to 2015 and now account for 51.8 % (Cefic, 2016). In addition, some of the most dangerous pesticides that are restricted in the United States or Europe are still permitted for broad use the Mekong countries, such as Paraquat, and continue to cause diseases and malformations to the Mekong region's population. Pesticide Action Network for Asia and the Pacific (PAN-AP) and their partner in Laos, SAEDA, also observed that some highly hazardous pesticides (HHPs) banned in Laos and Cambodia are illegally brought in, mainly from neighboring pesticide-manufacturing countries, across porous borders (PANAP, 2013). This situation greatly limits the capacity of the countries of the Mekong region to handle chemicals management issues.

Because of past policies and current trends, pesticides have widely contaminated the Mekong region, including the soil, the air, the water and the food. This progressive poisoning by pesticides has been documented in numerous studies led by researchers and organizations. In Thailand, in 2016, the Thailand Pesticide Alert Network (Thai-PAN) tested 130 samples of popular fruits and vegetables across the country and discovered that more than half of them had high levels of harmful pesticide residues, despite being certified for quality by the government (SciDevNet, 2017) (Chiang Rai Times, 2017).

In Laos, in the framework of the Lao Upland Rural Advisory services project, the Provincial Health Departments, Rural Development Sole and Xieng Khouang Provincial Agriculture and Forestry Office (PAFO) led a study through blood samples collection to test the pesticide level of consumers, farmers, and school children. Out of the 1000 farmers, consumers and school children tested, 35% had unacceptable – risky or unsafe – levels of pesticide in the blood. Of the 422 primary and secondary school students tested, 33% were exposed at unacceptable levels, while 34% of the farmers tested were risky or unsafe.

Research works in the Mekong Delta in Vietnam also highlighted worrying pesticides pollution levels (Pham Van Toan, 2013), with different source of drinking water in the Mekong Delta being polluted with pesticides. Even in harvested rainwater or purchased bottled water in the Mekong Delta, up to

Figure 57: Pesticides use in the Mekong region causes severe health and environmental issues

12 different pesticides were detected at concentrations exceeding the European Commission's parametric guideline values for individual (Chau and al., 2016).

Food safety concerns over pesticides are rising in the Mekong region as people are increasingly aware of their negative chronic health effects, including cancer, neurological effects, diabetes, respiratory diseases, fetal diseases, and genetic disorders (Andersson, 2014). Pesticides' adverse effects also include loss of biodiversity and associated food sources, declining productivity related to the rising development of insecticide resistance, unnecessary costs to farmers, and costs to government agencies. All these negative effects should be studied in a cross-cutting approach in order to considerate food safety as a development issue, with diverse and high socio-economic costs.

Alternate pest control methods, by limiting pesticides usage, can help minimizing the adverse effects of pesticide (Soundararajan, 2012) while limiting pest and disease occurrence. Agroecology gives a range of solutions that allow to replace chemicals by ecosystems-based approaches to pests. While conventional pest control tends to ignore the causes of pest infestations and always gives the same solutions, ecosystems-based approaches work with information on the life cycles of pests and their interactions with the environment (EPA, 2018). This part will give an insight on one alternative pest management approach, which consists in the use of net houses to protect crops from pest and diseases, while limiting the use of pesticides.

Figure 58: Agroecology offers a range of solutions to preserve cultures from pests and diseases without using pesticides

2.2 Economic, health and ecological benefits through application of net house and organic fertilizers in vegetable production

Svay Rieng University

Svay Rieng University SRU is a public university located in Svay Rieng province in the southeast part of the Kingdom of Cambodia.

SRU was inaugurated on January 25, 2006. The institution vision is to provide education, research and community service with national quality standards and internationally recognized. Bachelor and Master level programs are provided by the univeristy. In addition, research is one of the main activities where university aims at contributing to the current need of the government and rural people in the area.

More information on Svay Rieng on:
http://www.sru.edu.kh/

Royal University of Agriculture

Royal University of Agriculture RUA, as the leading agricultural university in Cambodia, shall progressively achieve an international level of quality in education, research and extension of agriculture, related sectors and sustainable use of natural resources. The mission of the institution is to contribute to the development of agriculture and related sectors and to the sustainable use of natural resources by providing higher-education programs, research and extension in line with national and international development issue and job market needs.

More information on RUA on:
http://www.rua.edu.kh/

Assessing the effectiveness of net houses use for organic production

Physical barriers as net house can be used as alternatives to pesticides for excluding insects from host plants. In addition to prevent the entering of insects and pests in the fields, nets are commonly used in crop production for reducing excessive solar radiation and weather effects (NACAA, 2011). However, net houses can also have some adverse effects if not managed well. Moderate temperatures, high humidity levels and diffused sun light under protected structures can benefit to plants growth but can also attract pests. There is therefore a need for assessing the benefits of net house cultivation and sharing good practices.

The Royal University of Agriculture (RUA) has a long-lasting experience with the practice of net house application. In RUA's past experiences, cultivation under net houses has shown to be an effective way in pest management as well as in increasing yields in natural vegetable production. Originally, RUA supported some farmers to grow organic vegetable using net house, while another group supported by the project was using net house with control pesticide application.

Building on these past experiences, RUA and Svay Rieng University, with the financial support of ALiSEA, led a research project aiming at assessing the economic, health and ecological benefits of the use of net houses for organic vegetables production. This research was led through an in-depth study comparing different production models. In addition, the research also introduced the use of manufactured organic fertilizers in order to assess the possible benefits of the local-made organic fertilizers.

Figure 59: local fertilizers used in Svay Rieng and RUA activities

For the research study, **four production models** were elaborated: conventional vegetable production (Model 0), vegetable production using net house with pesticide application (Model 1), organic vegetable production using net house (Model 2), and organic vegetable production using net house in combination with local manufactured organic fertilizer (Model 3). These four models have then been compared using in-depth study of those families where weekly activities (expense and income) and observations were recorded to be analyzed through a comparative analysis.

These four models were separated in **three field sites:** Svay Rieng, Kandal and Battambang provinces. In Battambang province, good agricultural practice (GAP) using net houses were assessed. In Kandal province, organic vegetable production with net house under the project of RUA and Natural Agricultural Village (NAV) was studied. Conventional vegetable production was studied in Kandal Province. Finally, in Svay Rieng Province, the model introducing net house, organic production and local manufactured organic fertilizer was assessed.

In addition to the comparative analysis of the four models, RUA and Svay Rieng University worked on the **closed monitoring** to both organic producers and conventional producers in order to capture their constraints, applications and expenses during the production process. This helped the research team to analyse the economic benefits of net house use and organic fertilizers application for all production groups.

Finally, the research also aimed at **facilitating the adoption of organic agriculture and IPM practices** by introducing the application of net houses and local manufactured organic fertilizers to vegetable growers in Svay Rieng Province. Other farmers who participated to data collection through their conventional and GAP production from Kandal, and Battambang province also learned about these techniques through the sharing of the research findings and case studies dissemination.

Figure 60: Net house under construction

The results of the research study - organic production and net house use, a successful combination

The introduction of net house application and organic fertilizers for the research work also gave **direct benefits to the stakeholders** involved in the activities, which included:

- **Adoption of net houses for vegetable production**

The project implemented by RUA and Svay Rieng was the first occasion for numerous farmers to get introduced to vegetable production under net house. In total, 10 net houses were installed under the project. Out of these 10 nets, three were built by farmers in nearby villages who had come to visit and decided to build their own net houses.

- **Higher income for farmers in Svay Rieng Province**

One of the main findings is a tangible improvement in terms of income for farmers in Svay Rieng province, who applied net house and local organic fertilizers to their production. Incomes were reported to have increased from 371,788 riels to 902,985 riels (77 to 187 EUR) in average This calculation does not include other benefits such as positive health effect and ecological improvement.

- **Experience for Svay Rieng University in introducing to net houses to farmers**

The research work allowed to gather data and knowledge on net houses, and to give experience to SRU in implementing net houses. Therefore, the research work helped to lay down the foundations for future research works of SRU. With this project, the future larger project that will be implemented by the same team will be much facilitated and will probably show good success.

The research study conducted by RUA and Svay Rieng allowed to **draw some lessons** from the project application on net house application to organic production:

- **Low quality net**

The net being installed in Svay Rieng was chosen by farmers. They decided to buy the the most affordable one. This led to a low-quality net which lasted for only one year. At the time of project completion, the nets were teared off already and farmers had to reinvest in new nets. The initial investment may be high, but it is necessary for farmers to invest more if they want to have their crops protected.

Figure 61: Net houses for vegetable production

- **Negative effect.**

The project has had some reverse effects on the poorer farmers. Those who had more economic means wanted to invest more in the same structure. Those with limited financial capital considered themselves being excluded from the production due to limited access to the benefits.

- **Plastic Roof**

The project introduced only net houses, but farmers showed high interests for plastic roofs, which seemed to give more benefit to them in growing vegetables.

A story from the field: the path of Mrs. Sor Sophy's family toward better livelihoods

Mrs. Sor Sophy and her family have been growing vegetables since 2000. Mrs. Sor is also a committee member of Svay Rieng Agricultural Cooperative (SAC) and has achieved to be an active and leading farmer in the community.

Building on this production in 2017, she and her husband have agreed to start getting involved in net house construction under the Project entitled "Economic, Health and Ecological Benefits of Organic Vegetable Production through Introduction of Net House and Organic Fertilizer" implemented by Svay Reing University in cooperation with RUA. Mrs. Sor Sophy was therefore able to share her view on the benefits and challenges of organic production under net house.

Net House – The benefits

The Sor's family keeps on expanding their organic production under net houses. Being successful farmers, they were excited about sharing their experience. According to Mrs Sor Sophy, the benefits of having net house are the following:

• Time

With net house she indicated that much time has been saved as farmers can grow vegetable at any time. After coming back from her work at the cooperative, Mrs Sor Sophy and her husband can now start working within the net house without disturbance from mosquitos which is not possible under conventional growing conditions.

• No Direct Rainfall

With plastic house on top of the net of the house, Mrs Sor Sophy's family found that

they could protect the soil from getting direct rainfall, while heavy rains can destroy crops.

• Less Water More Production

The soil will be preserved from water saturation during the rainy season. Consequently, the family is now able to grow more circles all year round.

• Higher Productivity

The net house also protects crops from pests and diseases if they are well managed. The family could benefit from higher productivity thanks to the decrease of pest and disease occurrence.

• Higher Income.

Finally, the family was able to rise income with the use of net houses. The family declared having increased their income by 30% compared to the previous production without net house. Currently, Mrs. Sor Sophy's net income from vegetable production is about 1,500,000 riels per month (311 EUR), far higher compared to the 800,000 riels (166 EUR) at the time she had settled the net house. It was the first time that the family produced vegetable under net house. The program was also a first experience in supporting the adoption of net houses for SRU. Therefore, Mrs. Sor Sophy found some challenges that still need to be addressed in the future.

• Poor Quality Net

The investment cost in the net house was quite high for the family, and an affordable net was bought. Afterwards, Mrs. Sor Sophy realized that the quality of the net was very poor, and it lasted for only one year. The family had to purchase a second net, which induced high a second investment.

• Not Appropriate for Fruits

The net is not convenient for pollination and therefore could not be used for fruits production. Farmers need to be well-aware of this issue to avoid the waste of time or investment.

• Watering Needed

The family needed watering all year long as the plastic roof protects the soil from rainfall.

• Carefulness

Carefulness is always a key for success in farming. It is even more true with net houses farmers must be careful when entering the net house, since pests will get into the house. Continuous maintenance is also required to ensure that the net is in good condition.

to go further: *https://bit.ly/2pXIX57*

Conclusion

The demand for chemical free products is rising in the Mekong region, as food safety issues related to food poisoning through pesticides overuse are growing concern among South Asia's consumers (Vagneron, 2018). Integrated Pest Management techniques, including net houses, allow to manage the pest and diseases outbreaks while limiting the use of pesticides in agriculture production. Svay Rieng University and RUA participated in assessing the efficiency of net houses for organic vegetables production and in documenting good practices and challenges related cultivation under net houses. The programs also allowed to disseminate their use in Cambodia and will be a strong foundation for future activities of SRU in net house use dissemination.

3 Saving seeds' biodiversity, and sustaining rural livelihoods in the Mekong Region

3.1 Seed biodiversity losses: a threat to the resilience of agroecosystems

Seeds are at the heart of farmers' work: they select certain crops based on economic considerations, choose varieties adapted to the agro-environment, exchange planting material freely amongst themselves, and select the seeds to keep for the next planting season. Over generations, the work of farmers for selection and storage helped creating a rich diversity of vegetable varieties, adapted to suit the local soil and climate. As locally adapted practices, seed selection and storage have been very diverse, but all relied on farmers seed exchange systems and techniques for farm-saved seeds (Pesticides Action Network, 2010).

However, these practices cannot be taken for granted anymore, as much numerous knowledge on how to save seeds have been lost as the seed production and distribution is being increasingly controlled by large seed producing companies (Access to seed foundation, 2018). In about 50 years, the policy and legal environment has changed toward more restriction on seed exchanges for small farmers and a more liberal environment for large-scale seed companies (Pesticides Action Network, 2010). It resulted in a progressive change toward seed homogenization and a higher dependency of farmers toward external seed distribution. The adoption of "Green Revolution" practices in the 1990s involved a systematically organized introduction of so-called High Yielding Varieties, which are highly reliant on chemical fertilizers for their performance.

As a result of these major changes, over the last two decades, 75% of the genetic diversity of agricultural crops has been lost in the world (FAO, 2014). The crop biodiversity losses decrease the function of other ecosystem services (Hajjar et al., 2008). Furthermore, genetic diversity is the basis of all crop improvement, through the selection of characters adapted to the changing environment. Genetic diversity has also shown to be useful in pest and disease management (Hajjar et al., 2008).

Farmer's seed saving systems are crucial to offer a diversity of seeds adapted to local conditions. They are a great solution to preserve underutilized species, which have significant untapped potential for commercialization. Seed banks, for example, are a tool for communities to store their seeds and to make it available for the next cropping season. Supporting farmers' capacity for storage of open pollinated seeds is therefore crucial for the future of the agriculture sector in the Mekong region. This part will go into different initiatives to protect the seed biodiversity at farm and at regional levels.

Figure 62: Seed biodiversity is a key for resilient farming systems

Figure 63: seeds in farmer's hands

3.2 Building regional and community level seed banks to save seed biodiversity in the Mekong region

ECHO Asia

ECHO is an information hub for development practitioners around the world. We gather solutions from around the world that are solving hunger problems and disseminate them to an active network. These solutions promote sustainable farming techniques, nutritional plants, and appropriate technologies.

The ECHO Asia Impact Center seeks to extend the services of ECHO to help those working with the poor in Asia to be more effective, especially in the area of agriculture. The ECHO Asia Impact Center functions primarily as a technical support organization helping community development organizations and workers operate more effectively.

More information on ECHO's work on:
https://www.echonet.org/

ECHO's engagement for seed biodiversity

Along its experience to equip people with agricultural resources and skills, ECHO Asia witnessed the value of saving open-pollinated seeds, shedding light on locally adapted and underutilized plants of merit and researching innovative low-cost seed storage technologies. These activities form the foundation of ECHO's ability to support and improve food and agricultural systems around the world. Building on a longstanding history of seed bank operations, first in Florida, and now Asia and Africa, ECHO continues to expand its capacity for placing seeds into the hands of those in need.

In 2009, with the establishment of Asia's Regional Impact Center and Seed Bank, the first step was taken in an ongoing process to house seeds of regional merit and local importance on location. To date, ECHO's first regional seedbank strives to meet a growing demand for locally-adapted, open-pollinated seed from within our network, and its success attests to the wisdom of its establishment.

Figure 64: location of the ECHO community seed bank in Pathein, Myanmar

Distributing over 4,600 trial seed packets in 2017, from a selection of 175 different varieties, the Asia Seed Bank serviced network partners in 29 countries, with seeds grown and produced in SE Asia. The growing challenge of moving seeds across borders, combined with tightening seeds laws, and continued debates over ownership of genetic materials, has led ECHO into thinking very intentionally to the future of its seed banking activities and how we might continue to serve our network in this critical realm.

A two-pronged approach to the aforementioned challenges forms the basis of ECHO's response and includes the:

(1) expansion of our regional seed bank,

(2) the formation of a regional network of community level seed banks (CLSB's).

This approach has recently been set in motion. The recent procurement of new land on the outskirts of Chiang Mai (just 25 minutes from the main office) has allowed for the expansion from the existing seed bank operation in Mae Ai, and the establishment of a Small Farm Resource Center (SFRC) to be used for training and research purposes. While this increased seed bank capacity will undoubtedly multiply the seeds that ECHO can grow and disseminate, the on-going challenges of the movement of seeds regionally and the need for additional local in-country alternatives are pushing ECHO to go further. Therefore, serving as a regional hub, this new Asia seed bank will support an emerging network of community level seed banks (CLSB's), located within countries of SE Asia and beyond.

Thanks to the generous support of the Presbyterian Hunger Program, the Agroecology Learning Alliance in SE Asia (ALiSEA), the Stewardship Foundation, and generous individual givers, this network is beginning to grow and expand, one seedbank at a time. ECHO Asia, serving in a directed training and capacity building role, and leveraging the efforts of partnering seed bank staff, will work to empower each CLSB to be adequately equipped to independently produce, store, and distribute seeds of local significance. Doing so successfully will result in:

(1) locally available seeds should access to our seeds become obstructed,

(2) greater sharing of seeds of merit among the network,

(3) safeguarding of varieties should disaster strike one seed bank or region, and

(4) the slowing of crop biodiversity loss locally and regionally.

Figure 65: the new Echo Asia Small Farm Resource Center site, 25 minutes outside of Chiang Mai, Thailand

Figure 66: A local maize variety being grown out at the ECHO Asia Seed Bank

Figure 67: Saw Moo Pler in front of the Kahelu seed bank, Myanmar

A Network Grows Out of Myanmar

On a spectrum from developed and sophisticated to simple and appropriate, a seed bank can look very different depending on the context and its desired function. On ECHO's Global Farm, the seedbank is equipped with an impressive walk-in cold-storage unit capable of precisely controlling temperature and humidity. On the other hand, the seed bank located in Thailand operates with a less sophisticated seed storage room using a split unit air conditioning system and is designed to be more replicable and affordable for those within ECHO's network of partner organizations. Further still, for those on a lower budget and lacking access to the necessary technologies, ECHO experimented with other appropriate seed bank options for local communities within the region. These include earthbag building techniques and buried clay cisterns for temperature stabilization, bicycle vacuum sealing technologies, and locally available desiccant materials for drying down seeds.

Working in Myanmar, in the Irrawaddy Delta region, alongside with the Myanmar Baptist Convention, ECHO began the initial stages of a seed bank network. In 2017, several prospective seed bank managers were hosted in Thailand at the ECHO Asia seed bank and trained for establishing, operating, supplying, and maintaining a community level seed bank. Upon returning to their respective communities, the first seed banks of the network were established.

A Look Inside of a Community Level Seed Bank

After spending two months learning the ins and outs of our seedbank operations in Thailand, two of these Managers, Saw Moo Pler and Naw Doris, national staff of the Pathein Myaugmya Association (PMA) in Myanmar, returned to the Kahelu Small Farm Resource Center. They worked there to establish their own community level seed bank, aimed at serving the surrounding communities with an alternative source of quality seeds. Applying the training received from seed bank staff in Thailand, a modest seed bank 'cold room' was constructed using earthbag building technology, used to lower and stabilize temperature. Raised bed production plots have been planted for growing out seed and supplying the seed bank, and plans are in progress for using local partner farmers to grow out various seed varieties. Just six months later, upon returning for a follow-up visit to Kahelu, ECHO staff were amazed at the progress this seed bank had achieved.

The Kahelu seed bank is one example of an emerging network of community level seed banks. It is joined by several additional sites in Myanmar, Cambodia, and the Philippines. ECHO hope is to continue to assist local organizations establish, connect, and build the capacity of community level seed banks throughout the region.

This part was based on article from ECHO Asia written Patrick Trail (Agricultural Staff Member at ECHO Asia) "the value of a seed: growing a network of community level seed banks in Asia", available here: *https://bit.ly/2q0CMgN*

Figure 68: Naw Doris (seed bank staff at the Kahelu Farm) standing next to a newly built solar seed drying rack

3.3 Saving seeds by building connection between farmers at community level

Toward Organic Asia (TOA)

TOA is a partner-driven network, managed by the coordinating team based on School for Wellbeing, studies and research Secretariat Office in Bangkok, Thailand. Towards Organic Asia begins as an initiative of Vandana Shiva, a leading environmental activist, to strengthen and move forward the existing movement of agroecology in Asia. Inspired by the Bhutanese's "100 percent Organic Country" policy and global movement of Gross National Happiness, School for Wellbeing Studies and Research started Towards Organic Asia (TOA) Programme in 2011 in collaboration with CCFD – Terre Solidaire, Thailand Green Market Network and Suan Nguen Mee Ma social enterprise.

More information on TOA on:
http://schoolforwellbeing.org/toa

Watch the video:
Journey of Hope – Natural seed, our common mission to save life by Toward Organic Asia

Toward Organic Asia: Highlight on the leading role of the Youth in agroecology

Toward Organic Asia, with the support from ALiSEA, documented the work of innovative young organic farmers in Thailand, Cambodia, Myanmar and Vietnam. The network produced four short films that allow the young organic farmers' voices to be heard by larger international audiences. Numerous young people want to develop innovative farms but are afraid to start their activity due to fear of failure, lack of technical knowledge, or doubt in organic farming. TOA produced these videos to show how young organic farmers can be innovative and productive. They highlight that small-scale farms working in harmony with nature and run by young farmers can be a key solution to many global crises. Agroecology farming offers opportunity for climate change adaptation and mitigation, creates sustainable and healthy local food systems, keeps young people in rural areas, prevents urbanization and stop the loss of cultural diversity and traditions. Young organic farmers are a leading force toward agroecology transition.

A story from Thailand: the local initiative of Ms. Pavinee to save seeds biodiversity

The story of Ms. Pavinee is taken from one of the first films of Toward Organic Asia on Young farmers. The work of Ms. Pavinee is a great example of a local initiative to save seed biodiversity at community level. Her hard work and engagement for agroecology are remarkable.

Ms. Pavinee Chaipak, is a former activist who later engaged herself into farming without planning it. Her decision was partly due to a personal illness, a tumor that may or may not develop into cancer. Ms. Pavinee was aware of the seriousness of maintaining a good health, and so she turned towards living a more nature-dependent lifestyle with an emphasis on homegrown food. Ms. Pavinee is indeed convinced that "Nowadays, if we don't grow our own food, we won't survive… Food these days are contaminated with too many chemicals."

Pavinee admitted that when she first started, she didn't know much about agriculture, but that she learned progressively from nature. She explained that agriculture is a learning process: many agriculture knowledges can be learned from experience and not through a book. Her garden is flourishing now. With her farming activity, Pavinee was soon able to develop treatments for herself by using her herbs. When she returned for a check-up to the doctor, she discovered that the tumor had largely diminished. This event led her to believe that nature-oriented diet can help her maintaining a good health.

Ms. Pavinee works to assist other farmers and her neighbors to turn towards home-grown crops. One of her ways to do so is by providing seeds for the farmers of her community. Once her knowledge and collection of seeds grew, Ms. Pavinee started a 'seed bank' where she goes and meet up with friends to exchange different varieties of seeds. Currently, her seed bank network comprises about 50 members who regularly exchanged over 300 types of seeds each year. Pavinee managed to turn the seed bank into a social enterprise that is opened to public and private investment. This seed bank is also part of a network of 14 seed banks located all over Thailand.

Ms. Pavinee believes that exchanging seeds is supporting plant biodiversity and allows her to keep control over her food choices. By choosing and exchanging seeds between them in a seed bank, farmers as Ms. Pavinee do not need to buy crops from large companies. They can re-use of collected seeds and do not need to buy new seeds for each cropping. To Ms. Pavinee, these seeds are the promise of a better future, a future where everyone works together for the benefits of everyone. If people started to care more about crops, they would also care more about the land, the water, and agriculture as a whole, Ms Pavinee believes.

Ms. Pavinee also works in collaboration with the Volunteer Project of Prince of Songkla University in creating an organic food restaurant. The restaurant has been opened for 4 months, holding about 30 customers a day with the total of 4 staffs - it provides not only homestyle organic dishes but also knowledge about the ingredients. The restaurant has its organic garden, managed by the young volunteers in the community that allow the 'in-house' organic ingredient to be over 50% when combined with their CSA scheme (Community Supported Agriculture).

From a woman who simply wanted to improve her health, Ms. Pavinee had gone far beyond. She became the spearhead of the changes in the food system that allows the small-scale farmers and the consumers thrive in this market of sharing.

This part was based on a success story elaborated by Toward Organic Asia with the support from ALiSEA, available here: *https://bit.ly/2QYgg3m*

Figure 69: Ms. Pavinee, young organic farmer in Thailand

Figure 70: Ms. Pavinee shooting a video on her story with TOA

Conclusion

Seed biodiversity losses are driven by the standardization of agriculture systems, including agriculture inputs and techniques. The large-scale distribution of non-pollinated seeds deprives numerous farmers from their capacity to choose what they plant and to adapt their production to the changing environment. Supporting proper seed collection and seed storage is a great tool to protect seed biodiversity, which is at the heart of the resilience of agroecosystems. Storing different types of local adapted seed also allows to preserve underutilized species, which have an underestimated potential for future cultivations. Seed banks at regional, country, community and farm level allow farmers to protect the biodiversity of seeds, along with their independence and their decision-making power.

4 Integrating agroecology knowledge to development programs for improving the resilience of small scale farmers to Climate Change

Chalmers University of Technology,
Department of Energy and Environment,
Division of Physical Resource Theory

Chalmers University of Technology is located in Göteborg, Sweden, and was founded in 1829 through the will of William Chalmers. It is consistently ranked among the top 100 Engineering Universities in the world. Chalmers occupies a prominent international position in education and research in engineering for sustainable development. The University has 13 departments, eight Areas of Advance and six national competence centers in key fields like Mathematical Modelling and Environmental Sciences.

More information on Chalmers University on:
https://www.chalmers.se/en/education/Pages/default.aspx

4.1 Agroecology and small-holders' resilience

Rural people in South-East-Asia have, for centuries, adapted their livelihoods to cope with natural disaster risks. But climate change and transition from traditional to industrial modes of farming have changed the vulnerabilities of these people and their communities. Farm reliant households, in Myanmar and across the Mekong region, are increasingly exposed to market forces and disruptive impacts of extreme weather events. Many rural households in South East Asia cannot buy expensive seed varieties, or large amounts of industrial farm inputs, such as synthetic fertilizers and pesticides. And communities who adopt farming practices that rely on access to such external inputs are vulnerable to unexpected trends in global food markets or shifting climate regimes. These farmers usually face high upfront costs to purchase inputs at the start of the farming season, which they plan to recover when they harvest and sell their crops. But price fluctuations for internationally traded cash crops, or unusual weather events, can push households into crisis, if market prices are low or harvests fail. Negative impacts of climate change, such as severe landslides and floods in the aftermath of heavy or prolonged rainfall, are anticipated to further enhance such climate related vulnerabilities of rural Asian households. There is thus a need for alternative approaches to the conventional industrial farming model, to address rural households' vulnerabilities, and increase their ability to cope with and recover from natural disasters.

Agroecology is such an approach (Pimbert, 2015) that gains increasing recognition, because it can help to (i) improve the livelihoods and food security of rural people; (ii) enable rural communities to avoid dependence on industrial farm inputs, and (iii) increase households' resilience in the event of natural disasters. Many agroecological approaches combine normative aims for social justice and equity, with grounding in scientific understanding of ecosystem processes (Pimbert, 2015). This combination fits well with goals of programs that seek to reduce vulnerabilities and improve rural livelihoods in consideration of social, economic

and ecological sustainability dimensions, and the practical knowledge of rural people. Indeed, agroecological innovations often build on traditional land use practices and collaborative work of researchers, extension staff and rural communities, who bring complementary knowledge to local innovation settings – such as FFS. In addition, local agroecology knowledges have an untapped potential for informing development programs on agroecological local characteristics and on vulnerabilities of the communities, and should therefore be studied in the context of development programs.

Figure 71: Challenging agriculture landscape in Taakmual, Chin State, Myanmar

4.2 Supporting the adoption of innovative agroecology knowledge for increasing farmers' resilience to extreme weather events

STRONG project: supporting the adoption of innovative agroecology practices through farmers' field schools.

The STRONG project's approach to farmer field schools (FFS), promoting agroecological practices for poor, rural households in western Myanmar, is an example of efficient approaches to promote agroecology. In 2016, Ar Yone Oo – Social Development Association and Welthungerhilfe partnered to initiate the STRONG project – in response to severe landslide and flooding events that devastated rural communities in Myanmar during the 2015 Monsoon season. The project supports disaster affected households to recover their livelihoods and build long-term resilience, through a portfolio of complementary disaster risk reduction and rural development interventions.

Farmer field schools (FFS) have become a prominent mode of adult learning about agroecology in rural development settings (FAO, 2018). Joint learning through dialogue, practical exercises and experimentation form the heart of such approaches. FFS may span one or several cropping cycles, ideally from the initial selection of seeds and farmers' preparation of plots for cultivation, until crops have been harvested and sold, or stored for subsistence use. During the realization phase of farmer field schools, selected members of targeted rural communities meet regularly with a specifically trained extension agent, e.g. an agricultural technician, who facilitates each session.

Figure 72: farmer field school, closing ceremony in Kimlai village, Chin State, Myanmar

Importantly, the role of the facilitator is not primarily to teach FFS participants about new farming practices in a conventional, top-down style. Rather, the extension worker acts as a facilitator, encouraging community members to take charge of their own learning process – through dialogue and exchange of ideas and experiences. In addition to classroom session, FFS groups usually work jointly on demonstration and experimentation plots. These plots are small sections of farmland that FFS participants set aside to try out new farming techniques, and to compare outcomes of traditional and new agricultural practices. This set-up enables groups to experiment safely and to learn from mistakes and successes. Unexpected results from trials thus do not cause big impact on participants' overall yield and livelihood security.

The STRONG project developed its approach to FFS in response to extreme weather events that devastated farming communities across Myanmar during the 2015 Monsoon season. Heavy rainfall triggered severe landslides in the uplands of northern Chin State, while

floods hit communities in lower lying areas in the Chin foothills and neighboring Sagaing Region. The STRONG project responds to this situation, with a diverse portfolio of activities, thus supporting communities to cope with and recover from natural disaster impacts. This response includes the provision of commercial seeds, fertilizers, pesticides and rat poison, which enables some communities to address the outbreak of a rat plague, and quickly reengage in farming activities, under changed agroecological conditions in lowland villages. The projects' FFS focus on the correct use of these inputs and promote agroecological practices for healthy plant growths and soil fertility, integrated pest management, and the promotion of diverse seeds and cultivation techniques.

Figure 73: Demonstration plot for FFS for the STRONG project

Promoted practices: the example of agro-ecology for productive crops and fertile soils

Rural households in the STRONG project area - northern Chin State and Kale Township, in western Sagaing Region - produce a great share of their food through subsistence-oriented farming. Some lowland farmers additionally sell cash-cops in local markets or to regional traders. Communities' livelihoods thus strongly rely on fertile soils for productive crops and good harvests. But many households cannot afford to purchase commercial fertilizers, especially since they lost many of their assets during the 2015 natural disaster. The land of upland farmers, who mostly rely on traditional swidden practices to restore the fertility of their cropland, was less affected by the extreme events. But some farmers have lost entire plots to landslides, and now search for alternative ways to maintain the fertility of their soil – as the remaining cropland that they can access has become too small for rotational farming.

Many households in the lowland, in contrast, struggle with thick layers of infertile mineral deposits that cover their farmland since the 2015 floods. FFS participants are encouraged to address these challenges through the cultivation of new crops for more diverse production systems. They also learn to use agroecological inputs, including foliar fertilizers, to provide developing plants with a boost of nutrients at critical times in the cropping cycle. Organic compost is used to enrich soils with nutrients and organic matter from decomposing plant materials.

Figure 74: Compost making through FFS for the STRONG poject

Lessons from the STRONG project

- Poor households can be reluctant or unable to make foliar fertilizers from fruits, which could instead be consumed by family members. "Siam weed" (Chromolaena odorata) and other wild plants can be used as a substitute for edible fruit crops.
- FFS groups may wonder how to transport foliar fertilizers to remote swidden plots. Preparation of fertilizer sprays at the site of their use can be suggested in such cases.
- FFS participants may lack access to all desired ingredients for organic compost, e.g. livestock dung. To address this challenge, facilitators can explain that households may use many different "green" and "brown" materials to make organic compost.
- Farmers may struggle to produce large amounts of compost. Facilitators may thus encourage to apply compost selectively to high value cash crops, or home gardens to produce nutrient rich vegetables for subsistence use.
- Participants may struggle to recall exact ratios for the dilution of foliar fertilizer concentrates with water. Facilitators should thus restate this information during several different classroom sessions and translate "abstract" measures of quantities to "easy to use" units – e.g. bottle caps.

4.3 Integrating local agroecology knowledge to inform development programs

How can local knowledge inform rural development interventions?

In addition to introducing local communities to innovative agroecology techniques, the STRONG project also worked on documenting local agroecology knowledge in order to better inform its activities on addressing vulnerabilities. Indeed, rural development actors increasingly recognize the complementary nature of expert knowledge held by extension agents and academic researchers, and local agroecological knowledge of rural people. To integrate this local agroecological knowledge of rural communities in development planning and implementation, participatory research and monitoring tools have been used and refined for decades – and inspired the approach presented here (Dixon, 2001), (Geilfus, 2008).

Now, such tools become increasingly important for rural development actors, who work to support disaster affected communities to recover from disaster impacts. Many good interventions to address climate change challenges are already underway and could be scaled-up and adapted to local livelihood and farming system contexts. But to target the right communities with the right interventions and address the unique realities of rural households, organizations require detailed knowledge about local climate vulnerabilities and farming system challenges.

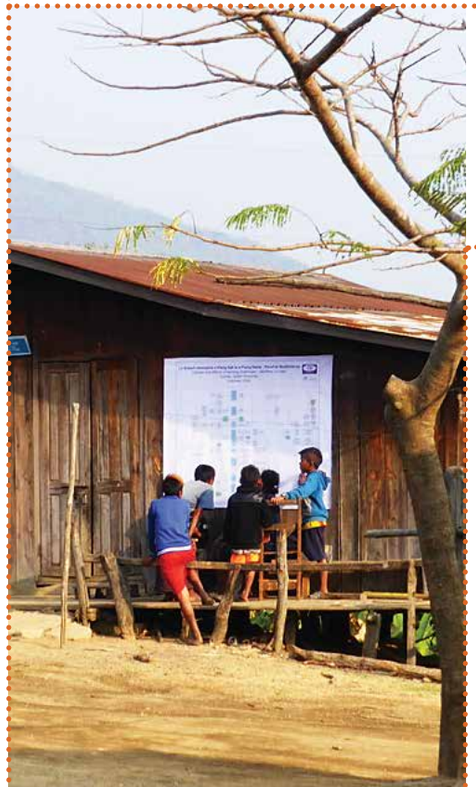
Figure 75: Landscape in Chin State, Myanmar

Residents of local communities make a large share of their living from the land – through farming and the collection of e.g. fodder, fuelwood or construction timber. Through practical experiences and years of daily observations of their local environments, these people thus gain detailed knowledge about different types of local plant species and crop varieties, agroecological conditions and processes, and locally adapted farming practices (Pimbert, 2015). Communities experience local climate conditions and can witness changes in climate patterns if they occur. And, most importantly, households are the greatest experts of their own livelihood realities, aspirations, needs and the constraints that limit their decision making and activity space. Through participatory research, organizations can mobilize this rich knowledge for the conception of their own activities.

Exploring local agroecological knowledge – a practical example

The participatory approach to collaborative research by Ar Yone Oo and Chalmers university combined systems thinking with participatory exercises, to learn about climate vulnerabilities and farming system challenges of STRONG project communities. This part presents this approach summed up, as a practical example for other initiatives who would like to integrate participatory research and local agroecological knowledge in their program activities.

Figure 76: children from Gamlai village Myanmar, looking at the causal diagram presented as a poster



Identifying knowledge gaps

The first step of the participatory research process was to identify topics of interest to Ar Yone Oo and Chalmers University, and knowledge gaps that could be addressed to further develop STRONG project activities or plan future interventions of Ar Yone Oo in the project area. Chalmers staff proposed initial research topics and questions. Meeting with Ar Yone Oo management staff, and small workshops during STRONG project staff meetings, were used to refine these suggestions and capture additional ideas.

Defining research questions

Once these activities were completed, the research team organized and synthesized all ideas thematically. The project staff was interested to gain a deeper understanding about:

- Which specific impacts the 2015 natural disaster had on households' livelihoods, and farming systems, and how beneficiaries perceived respective STRONG project activities;

- How target communities experienced climate change, and which climate change impacts and extreme weather events they were vulnerable to;

- which other farming system challenges affected local livelihoods and food security.

Meeting local authorities

Informal meetings with local agricultural authorities from the district level office in Kalemyo were used to exchange knowledge and share information about planned activities. Staff of the agricultural department, in turn, shared reports about farming system challenges in Kale township and provided an overview about extension and material support that the department provides to local rural communities.

Involving target communities

Local agroecological knowledge about farming system challenges and climate vulnerabilities, was systematically captured during 11 focus group discussion with residents of six case study villages. Discussions centered around a causal diagramming activity and were facilitated in local languages by AYO's members of the core case study team, with support from Chalmers staff.

First, participants were asked to identify locally common farming system challenges that are associated with climate events, or other socio-economic and environmental factors.

Figure 77: causal diagrams being collectively elaborated

Next, beneficiaries were asked to identify all the different effects, of the previously identified challenges, on their farming systems and livelihoods.

Then, the groups added the causes of the farming system challenges and climate vulnerabilities that had been identified.

Finally, participants were asked to reflect on where STRONG project interventions, in particular agroecological practices promoted in the FFS, supported them in addressing or overcoming some of the mapped challenges. All these elements were noted on cards and organized to form a causal diagramming, which were shared with the villagers.

Deepening the inquiry

Qualitative, in-depths interviews with more than 20 individuals and groups from STRONG project target villages were conducted to further explore respondents' experiences with the STRONG project and their local agroecological knowledge.

A quantitative household survey was administered to a stratified random sample of 103 households from the six case study villages. The aim of the household survey was to statistically assess, in how far findings from FGD and qualitative interviews reflected beneficiaries' common experiences across the different case study villages. The finalised survey instrument captured information about households' basic sociodemographic characteristics, experiences with the extreme weather events of 2015 and associated coping and adaptation strategies.

Figure 78: respondent in Taakmual

Sharing results with communities

Small meetings with the administrative heads of villages, and other residents were arranged during the last fieldwork days in the area, to share initial findings with participating village communities. Village residents were encouraged to provide feedback on the collaborative research activities.
Chalmers presented this approach for informing development programs with local knowledge through participatory research with rural communities. This approach of a collaboration between Ar Yone Oo and Chalmers University can serve as a model for rural development actors, who seek to address climate vulnerabilities and farming system challenges in target communities.

Conclusion

Agroecology knowledges are a key for the improving the resilience of small-scale farmers to external events such as climate change impacts. Development programs are increasingly working on the dissemination of innovative agroecology approaches for climate resilience. New agroecology techniques are challenging to adopt for small-holder farmers and Farmer Field Schools are an efficient approach to minimize risks and encourage adoption through grassroot intervention and collaborative work. Local agroecology knowledges are also a great tool for informing development programs and disaster risk reduction. Chalmers, through these 2 case studies, did a key work to document processes to integrate agroecology knowledge to development interventions.

This part has been based on the two case studies from Chalmers University with the support from ALiSEA, "Agroecology for resilient and sustainable livelihoods of natural disaster affected communities in Myanmar" and "Addressing climate vulnerability and farming system challenges with local agroecological knowledge: Insights from collaborative research with rural communties in Chin State and Sagaing Region, Myanmar » available here: *https://bit.ly/2ypGZPI*

Figure 79: Organic Onion production

Figure 80: Rice terraces in Northern Vietnam

Figure 81: Organic vegetable group in Siem Reap Province, Cambodia

Part 4

Agroecology & People, Building the capacities of a new generation of agroecology promoters

The transition toward agroecology in the Mekong region requires the involvement of a great **diversity of actors**. Farmers organizations, research centers, government agencies, Non-Governmental Organizations, Civil Society Organization, private sector - all are playing a key role in the agroecology transition by implementing initiatives in the Mekong region (Castella et al, 2015).

Such diversity of actors can bring a fruitful dynamic toward the adoption of sustainable agriculture by offering numerous possibilities for cooperation in agroecology initiatives. However, it can also raise challenges and difficulties as these different actors need to share a **common understanding on what is sustainable development** and how they plan to achieve it together. The role of **Universities** through curricula and research programs is a key to build and share a common vision on sustainable agriculture based on agroecology in the Mekong region. Furthermore, a transition toward agroecology implies a progressive technical shift for all stakeholders. There is therefore a critical need to give guidance, to share knowledge and experiences for the transition of agriculture systems toward agroecology. Improving teaching material and learning approaches at university and field level will participate to capacity building on agroecology for a wide range of actors.

Furthermore, it is also important to support the effort of young people in developing agroecology initiatives. Although **the rural youth** are often seen as losing interest in agriculture (Sofie Mortensen, 2018), the young generation can play a leadership role in scaling up organic farming. a growing population of young people in the Mekong region are increasingly interested by sustainable agriculture and some are coming back to the roots of the food systems by starting sustainable farming activities. They may be the leaders of a new generation of agroecology stakeholders and their work and innovations in agriculture need to reach the visibility they deserve.

ALiSEA has initiated some work to **support the emergence of a new generation of agroecology stakeholders.** Several actions were carried out to **build the capacity of farmers and students** through supporting of the development and dissemination of teaching and learning material. This part will give an insight into the work on capacity building for key agroecology stakeholders – universities, young people and farmers – led by ALiSEA and its members to support the transition toward agroecology in the Mekong region.

Figure 82: Training on filming agroecology activities, led by APICI project, GRET, Cambodia

Figure 83: young farmer from PhoMaLok Farm, Laos

1 Shedding light on a new generation of farmers: youth and agroecology

1.1 Youth in agriculture: lack of interest or lack of opportunities?

Figure 84: Young farmers from Panyanivej farm, Vientiane, Laos

Figure 85: Bamboo shoots produced in PhoMaLok Farm, Vientiane, Laos

Youth is generally seen as having lost interest in farming in the Mekong region. Young people would not aspire anymore to be farmers, as such work would be associated with limited opportunities, little prestige, lack of independence and low returns (Sofie Mortensen, 2018). However, this common view on young people needs to be put in perspective. Agriculture is still a major working sector for the young population of the Mekong region: as an illustration, more than two thirds of young people in Cambodia are relying on agriculture for their livelihoods (OECD, 2018). Furthermore, the decline of the share of young people working in agriculture should not only be explained by a growing lack of interest of young generations for farming. Indeed, farmers are increasingly facing difficulties in the Mekong region – such as insecure farming livelihoods, land resources, decreasing environmental services – which limit the opportunities for young people to develop farming activities (Sofie Mortensen, 2018). The access to land for young people is made difficult by the demand for land of large-scale companies for industrial agriculture or hydropower projects, which are taking away land from smallholders. According to a study on Laos, young people are forced to emigrate as lands are acquired for large economic development projects such as hydropower and large-scale monocrop plantations (Barney, 2012). Other factors are limiting opportunities for young people to have secure livelihoods in farming, including climate change impacts, decreasing soil fertility, and declining environmental services driven by polluting agriculture practices, along with the lack of access to source of funding to start farming activities.

It is a necessity to address the issues that are pushing young populations away from farming. Indeed, migration of young rural population not only contributes to the emerging phenomenon of over-urbanization and growing unemployment in urban areas but is also expected to affect global food production by depraving the agriculture system from skilled workers (FAO, 2014). Investing in young people living in rural areas is a key to enhancing agricultural productivity, boosting rural economies and ensuring food security.

Although young people are facing difficulties, we also need to look at young farmers as a source of hope for the future of sustainable agriculture. The new generation is now facing issues and challenges inherited from the past development choices, witnessing the strong effects of global warming and environmental degradation. Such worrying trends in environmental degradation and climate change, combined with a rising sensitization on the benefits of agroecology have resulted in the emergence of a large group of young agroecology promoters. Numerous young people in the Mekong region are leading innovative agriculture initiatives. By settling up organic farms, sometimes combined with ecotourism or organic restaurants, young farmers get economic benefits along with the satisfaction of producing safe food and supporting local biodiversity.

1.2 Another way of farming is possible:
Focus on some innovative young organic farmers in the Mekong Region

Toward Organic Asia (TOA)

TOA is a partner-driven network, managed by the coordinating team based on School for Wellbeing, studies and research Secretariat Office in Bangkok, Thailand. Towards Organic Asia begins as an initiative of Vandana Shiva, a leading environmental activist, to strengthen and move forward the existing movement of agroecology in Asia. Inspired by the Bhutanese's "100 percent Organic Country" policy and global movement of Gross National Happiness, School for Wellbeing Studies and Research started Towards Organic Asia (TOA) Programme in 2011 in collaboration with CCFD – Terre Solidaire, Thailand Green Market Network and Suan Nguen Mee Ma social enterprise.

More information on TOA on:
http://schoolforwellbeing.org/toa

Watch the video: Journey of Hope – Film compilation by Toward Organic Asia

Video documenting young farmers' initiatives for changing the narrative towards agriculture

ALiSEA and its members consider that many inspiring stories of young people in agroecology exist across the region and deserve better visibility and support for enhanced networking (for mutual learning and experience sharing). In addition, it is necessary to disseminate such stories to help changing the negative and mainstream narrative towards agriculture in general (seen as backward and not attractive).

Therefore, the Learning ALiSEA supported the efforts of Toward Organic Asia to shed light on stories of young farmers in agroecology in order to show their effort, their successes and inspire others to get involved in agroecology.

Some people of the young generation of the Mekong region want to develop sustainable farming activities but are afraid to start due to fear of failure, lack of technical knowledge, or doubt in effectiveness of organic farming. Toward Organic Asia, with the support from ALiSEA, worked to document the initiatives of innovative young organic farmers in Thailand, Cambodia, Myanmar and Vietnam. This work resulted in 4 short films that allow the young organic farmers' voices to be heard by larger international audiences. TOA produced these videos to show how young organic farmers can be innovative and productive, and to picture how small-scale farms that work in harmony with nature and are run by young farmers are a key solution to global crises. These videos can be consulted on a dedicated playlist of the ALiSEA Youtube channel addressing Young Organic Farmers: Journey of Hope (*https://bit.ly/2pmnumj*).

Figure 86: Tho Narith young Cambodian farmer (2nd from the right) whose story was told by a short documentary from Toward Organic Asia

Luang Prabang Film Festival

The Luang Prabang Film Festival is a charitable cultural organization committed to the celebration of Southeast Asian film and to the growth and support of local and regional film industries and filmmakers.

The Luang Prabang Film Festival (LPFF) brings together the boldest storytellers and the most talked-about films in Southeast Asia, spotlighting them each year in December, in the World Heritage Site of Luang Prabang.

More information on the LPFF on:
http://lpfilmfest.org/content/about-summary2.html

Watch the video: Mr. Ken, by Sonepasith Phanphila, 1st Prize winner of the Youth and Agroecology contest at the Luang Prabang Film Festival

In addition, ALiSEA also organized a short film contest on Youth and Agroecology in the framework of the Luang Prabang Festival, on on 8-13 December 2017. The Agroecology network received more than 30 films that where reviewed by a jury consisting of film industry professionals, agroecology activists and development workers NGO members. 8 of these films were selected and screened during the Luang Prabang Festival, reaching a large and enthusiastic audience. Sonephasith Phanphila, a young lao video maker, won the first Prize with his stunting film "Mr Ken", the true story of Ken, a young man practicing sustainable organic farming in the countryside of Luang Prabang, Laos.

Assessing farm sustainability in the Mekong Region: from the concept to case studies about 18 innovative and agroecological farms from the Mekong region

In the framework of its work aiming at changing the negative narrative towards agriculture through innovative approach to attract the youth, ALiSEA launched a pilot research initiative to document some innovative farms.

It developed a Sustainability Assessment tool (combining and adapting different existing approaches) to gather information about the economic, social and environmental situation at farm's level. All the information collected was then translated into a spider web representing the three dimensions of sustainability.

Figure 87: Mr Ken, young farmer and owner of the Green Organic Farm, and his team, Luang Prabang Province

In collaboration with the Youth Farm Network (Y-Farm) in Vietnam and Kalyana Mitta Development Foundation (KMF) in Myanmar, ALiSEA applied this method to assess the sustainability of 18 farms across the Mekong region, all being led by young farmers aged under 40 years old. The table hereafter presents all the 18 assessed farms led by young farmers.

The case study aimed at clarifying the sustainable assessment methods through grassroot application, and at giving an overview of the sustainability results of each agroecological farm. In addition to that, these 18 case studies allowed to shed lights on innovative farms led by young farmers. Some of the case studies highlighted great success in combining agriculture productivity and sustainability. The different case studies on sustainability assessment can be consulted in the ALiSEA website, along with the presentation of the sustainability assessment method. https://bit.ly/2yt6saY

Alongside with the assessment, short video testimonies of young farmers and practical examples of agroecological techniques were produced. They can all be found on the dedicated playlist "Videos about Young farmers" on ALiSEA Youtube channel (*https://bit.ly/2QYSZhF*).

Figure 88: poster promotion for the Agroecology Market & Knowledge Fair, Luang Prabang, Laos

Country	Owner's name	Farm's name	Location
Laos	Lae	Phomalok Farm	Pakguam District, Vientiane capital
Laos	Soumboun	Soumboun Farm	Pakguam District, Vientiane capital
Laos	Kithong	Kithong Farm	Phonehong district, Vientiane province
Laos	Somchit	Panyanivej farm	Sikhotthabong District, Vientiane capital
Laos	Ken	Green Organic Farm	Phonxay district, Luang Prabang
Laos	Lee	Lee 7 Farm	Luang Prabang
Laos	Om	Mekong Eden Farm	Chomphet district, Luang Prabang
Vietnam	Vo Van Tieng	Tam Viet	Hong Ngu, Dong Thap Province
Vietnam	Thanh Dat	Ech Op	Ap My Phu, Phong My Quy, Long Xuyen, An Giang Province
Vietnam	Ta Thi Nguyen	Ta Thi Nguyen Farm	Vien Village, Tan Duc, Phu Binh District, Thai Nguyen
Vietnam	Hoa	Thanh Xuan cooperative	Hanoi
Cambodia		Farm of APICI project - GRET	Siem Reap
Cambodia	Davon		Takeo province, Prey Kabas district
Myanmar	Kyaw Myo Thu		Nyaung Shwe, Shan State
Myanmar	Tin Hla		Pe Khon, Shan State
Myanmar	U Khin Maung		Lwere Lone village, Pe Khon, Shan State
Myanmar	Ye Htut Aung		Tha Byay Kone village, Thanlyin township, Yangon Region
Myanmar	Saw Htoo Baw		Tha Bite Kone village, Hle Gu township, Bago Region

Watch the video:
Kithong Farm

Watch the video:
Panyanivej Farm

Watch the video:
Green organic Farm

Watch the video:
Lee 7 Farm

Watch the video:
Mekong Eden Farm

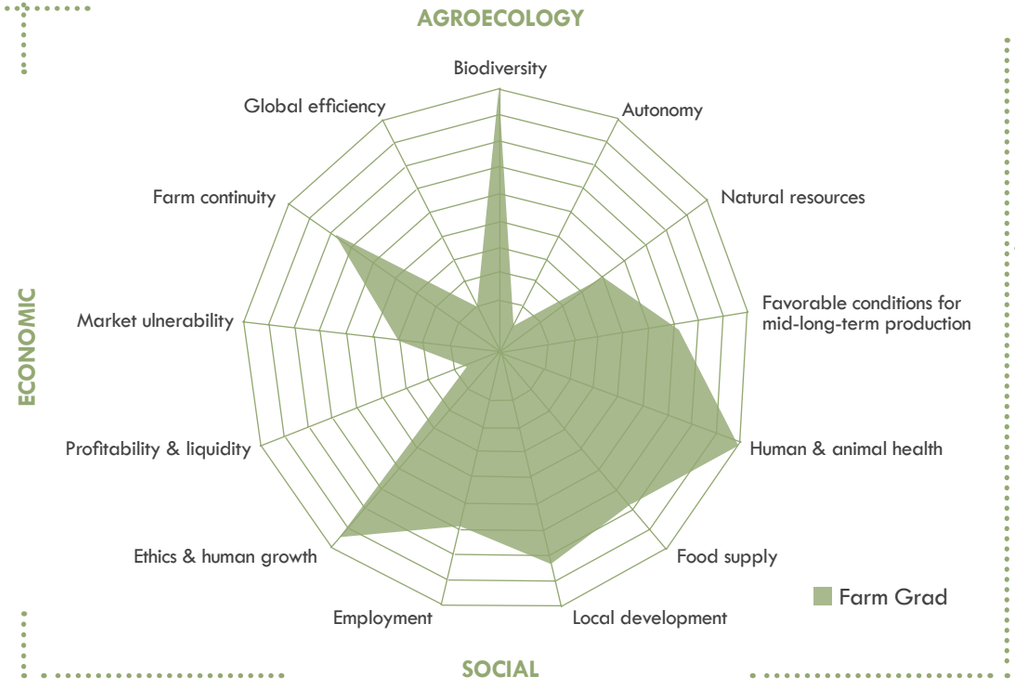


Figure 89: Spider Web of the Panyanivej farm, one of the 18 farms assessed by ALiSEA, located in located in Vientiane Capital, Laos.

The spider web helps in visualizing the sustainability level reached by each farm and to identify potential improvements. The use of this assessment tool reflects an ambition to invest time and capacities into a network of sustainable farms set as outstanding example of success in the transition towards agroecology and ready to be change makers.

Figure 90: young farmer, Vientiane, Laos

Conclusion

Young people are a key for the future of agroecology. While youth is increasingly being interested and involved in agroecology, there remain strong cultural, social and economic barriers preventing more young people to develop their activities in agroecological faming. Limited land access is one key barrier, but the relatively negative view of the young generation regarding farming activities is another. However, ALiSEA along with partners as Toward organic Asia worked to document numerous successful and innovative activities developed by young people in farming. In these amazing stories, agroecology has helped young farmers to increase their revenues, and gave them the satisfaction of participating to the transition toward sustainable agriculture. Sharing these stories may change the narrative on farming among young people by giving concrete examples of successful agroecology initiatives.

Figure 91: A family in their organic farm, Laos

2 Building capacity of students, teachers and farmers by putting agroecology on Universities' agenda

2.1 Integrating agroecology in University curricula

The need to integrate Agroecology to University curricula

The role of academia – understood here as universities and other secondary level education institutions – have an important role to play in the progressive transition toward agroecology. Sensitization of young generations on alternative agriculture approaches and the teaching of agroecology science can participate in building a new generation of agroecology promoters and professionals. During a long time, universities have largely supported an unsustainable industrial agri-food system. Such higher agricultural education has contributed to the growth and modernization of intensive agriculture, but it has often failed to adjust its curricula to respond to the environmental and social issues affecting agriculture and the rural space (Atchoarena and Holmes, 2004). There is a great need to integrate sustainable agriculture perspectives in the curricula of universities but, yet, very few agricultural colleges and universities in the world have incorporated agroecology into their formal curricula (Altieri, 2018). Indeed, universities' courses related to agriculture often focus on specific subject as the soils, the crops, the insects or the water resources. There is too little attempt to document the linkages among these components to represent the complexity of agriculture systems. The future courses and curriculum should represent the complex interactions within an ecosystem and its overall productivity. They should also integrate interactions between agriculture systems and the whole society – including the relation between agriculture production and social and environmental spheres (Altieri, 1987).

Figure 92: student in agroecology at KOMNAET school in Cambodia

Faculty of Agriculture of Laos

The Faculty of Agriculture (FAG) is one of the 10 institutions of the National University of Laos (NUOL). The NUoL is the first comprehensive or full-fledged university in the history of Lao PDR. Since its establishment on November, 5th 1996, the NUOL was established by amalgamation of the existing higher education institutions which were then operated under different ministries.

More information on the FAG on:
http://www.nuol.edu.la/index.php/en/faculty-of-agriculture.html

Figure 93: Location of the FAG, Vientiane

Developing teaching books for the students of the Faculty of Agriculture of Lao PDR

ALiSEA funded a project led by the Faculty of Agriculture of Lao PDR (FAG) to develop teaching material on agroecology for agriculture universities in Laos to support the implementation of agroecology practices at local level by future agroecology professionals. The project was coordinated by the FAG, which is the oldest agriculture education institute in Lao PDR as it was established in 1975, and which has played an important role in providing knowledge and technologies of agriculture for Undergraduate and Master students.

The FAG invited professors from four universities (FAG, Savannakhet University, Souphanouvong University and Champasak University) to work together to redesign the courses on organic agriculture, agroforestry and integrated agriculture for BSc & MSc students. The professors of these universities were already engaged in teaching some of the agroecology concepts in their respective faculties. However, teachers and students were lacking clear teaching materials on agroecology techniques and had had no relevant teaching material introducing the basics of agroecology. Therefore, the universities collectively worked on the elaboration of four dedicated teaching books on agroecology in Lao language, which have later been distributed to students in the Universities taking part to the project.

In order to produce these books, FAG University organized a 2 days meeting gathering faculty professors from the four Universities and two government agencies: The High Education Department, Ministry of Education, and the Department of Agriculture Extension & Cooperative (MAF). During the meeting, the professors discussed the needs for re-designing the existing contents of teaching manuals on agroecology. The participants also agreed on the process to write down the new books and shared the work for the redaction between them. It was decided that the redaction would be punctuated with monthly meetings to update all stakeholders on the redaction process. This two-day meeting was also a chance for teachers and government to revise the different syllabus for agroecology courses in order to harmonize them at national level. Such meeting gathering Government bodies and Universities was a great opportunity to discuss and map together policy gaps on agroecology and education and to foster the cooperation between the State and high-level education institutions.

After 6 months of intense writing, the work of the professors resulted in the publication of four teaching books. Three of them address specific sets of agroecological practices: organic agriculture, integrated agriculture, and agroforestry. These books will be relevant to foster the dissemination of agroecology techniques in the field. A fourth book presents the basics of Agroecology and will be very important to introduce students to agroecology principles.

To go further: *https://bit.ly/2Ai49ZD*

2.2 Fostering the role of Universities in supporting agroecology-based farmer extension services

The crucial role of university-based extension services in the transition toward agroecology

In addition to their role in teaching and formation, post-secondary institutions are also significant knowledge producers. They produce scientific knowledge through research bodies, but also work in the field with extension programs, for example with research farms or adult trainings. Today, about 6500 higher education institutions (HEIs) dedicated to agriculture exist in the Mekong region. Yet their capacity to serve farmers, rural communities and sustainable agriculture is not well understood. Little research so far has examined what HEIs do, the models of agriculture development they promote, research results they transfer, the scope and types of farmer-academic partnerships that exist, what may be considered best practices, or their long-term impacts on poverty reduction, environments, or food security. Governments, agriculture research centers and universities do not yet collect any common or uniform extension data that can be shared or analyzed. Moreover, post-secondary institution roles in contributing specifically to agroecological or organic agriculture teaching, research and service are poorly studied. There are still significant knowledge gaps and research needs.

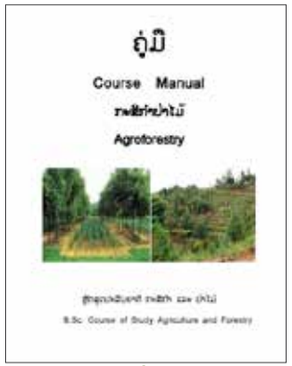


Figure 94: Teaching books developed through the collaboration of ALiSEA and the NuOL

Figure 95: Location of UNESCO regional workshop, Bangkok, Thailand

United Nations Educational, Scientific and Cultural Organization (UNESCO)

UNESCO works to create the conditions for dialogue among civilizations, cultures and peoples, based upon respect for commonly shared values. UNESCO encourages international peace and universal respect for human rights by promoting collaboration among nations. Its mission is to contribute to the building of peace, the eradication of poverty, sustainable development and intercultural dialogue.

More information on UNESCO on:
https://fr.unesco.org/

Chulalongkorn University School of Agricultural Resources (CUSAR)

The school was established by the Office of the Commission on Agricultural Resource Education in 2014 with the aim to produce graduates skilled in the management of agricultural resources. Students study about agricultural products, from the initial stages of production to the final stages of delivery to consumers. The curriculum, designed to integrate the science and art of plant and livestock production technology, food processing, food safety, agribusiness, and logistics, trains students to integrate traditional knowledge with new research, with the objective to resolve developmental problems in the local area.

More information on CUSAR on:
https://chula.ac.th/en/

Mapping the current role of University based extension in agroecology, and drawing policy recommendation to foster its support to the agroecology transition

In order to fill this knowledge gap, ALiSEA worked to support the project "Mapping and Assessing University-based Farmer Extension Services in ASEAN through Agroecological / organic lens", in collaboration with UNESCO and Chulalongkorn University. The objective of the project was to elaborate and disseminate case studies in order to contribute to some new understanding about the roles of university-based farmers' extension for agroecological transition in South East Asia. Researchers from all over the world worked together on elaborating case studies assessing extensions services in Laos, Cambodia, Myanmar, Vietnam, Thailand, the Philippines and Malaysia. These case studies were presented and disseminated through three national workshops in Vietnam, Myanmar and Cambodia, which were completed by a summative regional symposium in Bangkok. The collaborative work allowed to consolidate a strong knowledge base on the gaps and opportunities to support agroecology through university-based farmers' extensions and to draw policy guidelines. The collaboration also piloted the beginning of an informal but de facto ASEAN agri-food research and extension network, that may be the base of new research network.

Looking closer at the case study "Challenges and Opportunities for ASEAN Research Network on University-based Agroecological/ Organic Farmer Extension Services", presented by Dr. Wayne Nelles at the regional workshop in Bangkok, gives a clear overview on the current issues the region is facing regarding university based-extension in the region. These include the fact that agri-food systems in South East Asia are largely based on agrochemical-dependent production. Such systems require farmers to purchase high levels of chemical inputs from profit making companies, and these practices are being increasingly supported by public extension systems with institutionalized connections to universities. The ASEAN region also appears to follow a "pluralist" extension approaches which has increasingly allowed private sector advice and partnerships to problematically influence educational priorities and research goals.

The paper from Dr. Wayne Nelles, knowledge management coordinator at the Asia-Pacific Association of Agricultural Institutions, draws several recommendations for consolidating an approach toward university-based extension supporting agroecology:

- Co-design and secured funding with partners for multi-year regional projects to study enabling factors for adoption, strengthening, and mainstreaming of agroecology in university teaching, research and services
- Facilitate more science and evidence-based research about the benefits of AE combined with academic-government-farmer policy dialogue to change respective priorities
- Institutionalized regional University network of academics, farmers to study and apply agroecology in extension services.

These recommendations will hopefully be taken in account by Universities to build a strong involvement of Universities for the transition toward agroecology.

To go further: https://bit.ly/2Pc1VmA

Figure 96: regional Symposium on "Mapping and assessing University-based farmer extension services in ASEAN through an agroecological / organic leans" 23th of February 2017, Bangkok

Conclusion

Universities have an important role to play in building knowledge and capacity in agroecology through their curricula and their extension services. Until now, universities' curricula in the Mekong region have put limited effort in valuing agroecology in South East Asia. The work of the Faculty of Agriculture in Laos will participate in sensitizing the new generation to agroecology and to build capacity among future agricultural professionals. Building a common understanding on the role extension services in the transition toward agroecology has also been understudied, and the current mobilization to assess their role will allow Universities to get better understanding on existing possibilities to scale up agroecology through their extension services.

3 Supporting capacity building in agroecology for farmers through learning material and innovative learning methods

Figure 97: Location of Vivre de sa Terre's intervention

Vivre de sa Terre

Vivre de sa Terre designs tailor-made services which make sense in the Cambodian rural context. The mission of the organization is to empower farmers to be free of their techno-economic dependencies, and to increase their incomes and improve their living conditions. To do so, Vivre de sa Terre focuses on three main topics: research and farming innovation, agricultural training and local entrepreneurship.
The applied research gathers operational data which are useful to complete young Cambodians training. Strengthening local inhabitants is key to entrepreneurship development. In return, entrepreneurs' activities sustain agricultural innovation and enhance pedagogical contents.

Vivre de sa Terre approach on agriculture relies on the three pillars of sustainable development: Faire society; sustainable ecology; viable economy.

More information on Vivre de sa Terre on:
http://vivredesaterre.org/fr/accueil

3.1 Supporting young farmers' capacity building through developing online educational material

Responding to the lack of learning material on agroecology in Cambodia

Vivre de sa Terre observed a growing interest in agroecological practices in Cambodia, particularly from young people, but the dissemination of agroecology is starting very slowly in the country, despite the fact that agroecology seems an efficient way to increase local food production. Among many barriers to adopt agroecological practices, Vivre de sa Terre identified the significant lack of appropriate pedagogical resources to disseminate these practices to the Khmer-speaking community.

Vivre de sa Terre has a long-term experience in providing training for smallholder farmers and in teaching for young students in agricultural vocational training in Battambang Province. Based on the past experiences in these two activities, Vivre de sa Terre was able to gain a better understanding of the learners' profile of youth smallholder farmers for adapting the educational materials to their learning pattern.

Building upon its experiences in training and teaching agroecology in Cambodia, Vivre de Sa Terre started the **Khmer Online Meta-Network Agroecological Training** (KOMNAET) to support education to agroecology in Cambodia. The KOMNAET program has several components, the first one being a graduate program on agroecology developed by Vivre de sa Terre. The first class of student started in 2017 with 15 students. In addition, KOMNAET project team worked to create educational material on agroecology concepts and techniques for student and for farmers. With the support from ALiSEA, the association has developed different teaching supports, all adapted to the specific issues of the Mekong region and dedicated to the two types of public: young Cambodian farmers and students in agriculture in Cambodia. Looking at the high number of smartphone users among farmers, Vivre de Sa Terre first approach has been to make agroecology more attractive and to mobilize the potential of smartphones, popular among young people. All these knowledge material and teaching products fed the KOMNAET Facebook page

and YouTube channel, which allows today to disseminate audio-visual information on agroecology online.

The KOMNAET project was also a chance to foster international cooperation and intercultural exchanges. Six students from the French University AgroParisTech came to support the KOMNAET project by giving classes to the KOMNAET students and by helping them in the production of the different knowledge and teaching material.

Figure 98: a KOMNAET student registering her voice for the training videos

The elaboration of teaching and learning material for young farmers in Cambodia

The Team of Vivre de Sa Terre first worked to develop videos in Khmer. In total, more than 10 videos were produced, shared on YouTube and Facebook, while also being broadcasted on the Khmer Network News TV channel. The different 3 types of videos allowed young farmers and all other public to get good knowledge on agroecology techniques and approaches.

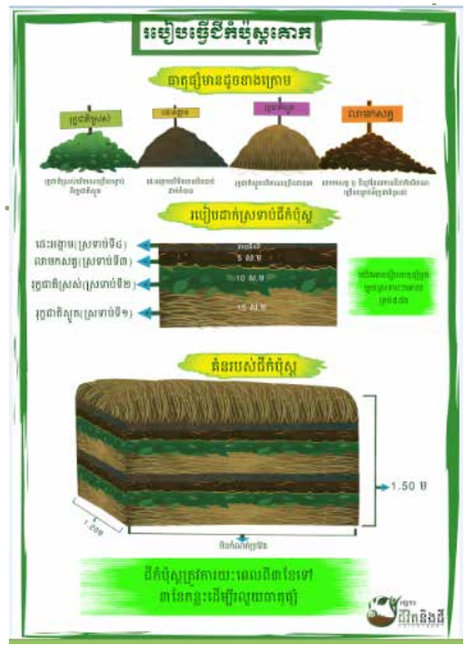
In a first time, Vivre de sa Terre started to work on **6 testimonial** videos which allowed the team to get an insight into the challenges farmers are facing in the Cambodia, and to build the sociological approaches necessary for the rest of the video making.

The different types of videos also included **tutorial videos.** These were produced by the students from the graduate program of Vivre de sa Terre. The students were trained in agroecology by the teacher's team and were then able to implement and explain agroecological practices. Based on their knowledge, they designed and created videos on the topic they freely choose among themselves.

The **educational video** made by Vivre de sa Terre focuses on explaining basic concepts of soil fertility through an offbeat and passionate presenter. This video has helped disseminate basic knowledge to a wide audience of young people by providing more understanding about organic matter decomposition and humus formation. It reached more than 20,000 viewers on Facebook.

Figure 99: shooting of a tutorial video by the students of KOMNAET program

Figure 100: KOMNAET posters on Dry compost



In addition, the awareness **animation short film** made by Vivre de sa Terre is not intended to bring knowledge but aims through an artwork to question and interest the viewer in the life of soil fauna still little known. This short film was prepared in collaboration with Phare Studio. It required an important production work of illustrations and storyboard animations done by 3 Khmer artists: Poy Chhunly, Lim Leang Chhay and Koeurm Kolab.

In addition to the creation of these audiovisual educational tools, KOMNAET also worked on the elaboration of **4 thematic posters** on agroecological practices and released two case studies presenting farmers' experiences and successes in adopting agroecology practices in Cambodia.

To go further: *https://bit.ly/2AilW1D*

3.2 Promoting agroecology transition via enhancing farmers' analytical and decision-making capacity through application of simulation games

Vietnam is undertaking a strategic transformation of agricultural sector, with strong direction from government towards improving quality of agricultural products and protecting environment. From technical aspect, application of agroecology friendly practices in to farming systems is the only way to ensure safe quality of the products and sustainable environment. The adoption of the environment friendly technologies and practices however has encountered numbers of obstacles. Among the hindering factors, the low level of acceptance and adoption of farmers towards agroecological friendly techniques is a bottleneck. There is indeed a lack of effective approaches in communicating and facilitating farmers, and consequently limited application and expansion of the good practices. Simulation games have been proved as an effective tool to facilitate farmers' engagement into the analysis and decision-making process, and to improve efficiency of capacity building activities for farmers.

Implemented in Tam Duong district, Lai Chau province, the project "Promoting agroecology transition via enhancing farmers' analytical and decision-making capacity through application of simulation games" is introduced to help address the bottleneck in adoption of different agroecology good practices, which is the perception of farmers.

The Consultative Institute for Socio-Economic Development of Rural and Mountainous Areas (CISDOMA)

CISDOMA is a Non – Governmental Organization (NGO), established in 2000. Through consultancy and co-operation in implementing sustainable development projects, CISDOMA's activities are aiming at:

- Enhancing capacity, increasing income, and improving life quality of the disadvantaged groups, especially ethnic minority people, women and girls, poor farmers and other vulnerable groups;
- Strengthening capacity of local organizations in planning and implementation of programs on poverty reduction, especially in rural and mountainous areas of Vietnam; and
- Providing inputs and feedbacks on strategy and policy development processes for sustainable socio-economic development of rural and mountainous areas.

More information on CISDOMA on:
http://cisdoma.org.vn/en/

Watch the video:
Enhancing farmers' decision-making capacity through simulation games by CISDOMA

In October 2017, the project started with a training to local agricultural and extension staff with the support from international and Vietnamese experts – Dr Patrick D'Aquino and Dr Doan Thu Thuy. Participants from this training were introduced to and coach on the methods of designing and facilitating simulation games. They then worked as the facilitators to facilitate application of simulation games into practices with farmers. Within 2 weeks, ten key facilitators trained on the games and were able to facilitate the simulation sessions at the villages.

Attended the training facilitated by the experts, Ms. Nguyen Thi Thanh Nha, a project staff, expresses her interest in simulation games: "This is the first time I know this tool. This simulation game helps farmers to find solutions to their difficulties and challenges in agricultural production. This is a completely new and exciting participatory analytical tool for me and other members of the class. I will apply this tool to my job, and I think many other participants have the same thought as me".

Figure 101: Training on simulation games for local agricultural and extension staff

After the training, facilitators conducted the simulation sessions with more than 100 farmers in 3 communes of Tam Duong district. The new board games developed for three selected topics. Being facilitated with the simulation exercises, farmers had the chance to actively go through a process of analyzing different aspects of the issues, particularly on the benefits, difficulties, challenges and conditions for applying the agro-ecological friendly practices. During the sessions, the players can talk and discussion each other for their problems without shame or hesitant; there were very exciting competition and argument on the issues. Through these exercises, farmers are able to analyze the issues and identify solutions to solve their difficulties; and consequently, they will have well-informed decision and preparation so that they can pursue appropriate practices sustainably.

Ms. Luong Thi Doi is a 30-year-old farmer from a poor family, living with her husband and two children. Her family now use traditional farming methods, produces just enough to feed their family and sometimes face food shortage in 1 – 2 months. "I was introduced new agricultural practice that increase yield while reducing inputs. Through the game, I now know to invest more wisely. I want to participate in self-governing group of the village to learn and share knowledge with others, then improve our income together", Ms. Doi shared after attending a simulation session.

This part was based on the article from CISDOMA "Enhancing farmers' analytical and decision making capacity through application of simulation games", To go further: *https://bit.ly/2CpeS61 & https://bit.ly/2yoj5E6*

Figure 102: Participants playing simulation games - boardgame

Figure 103: Young farmers testing mobile application for farm management in Vietnam

Figure 104: Organic salad mesclun in the making, Kokkoya Organic Farm, yangon, Myanmar

Part 5

Agroecology & food systems

A food system is a system that involves activities, social and institutional structures, and processes related to the production, distribution, exchange, and consumption of food (Vagneron, 2018). The progressive change toward a sustainable food system that brings agroecology to the market requires 1) farmers willing to change the way they do farming and the way they interact with the rest of the food chain, 2) consumers willing to buy products that have desired quality attributes and 3) a support from other stakeholders (government, associations, enterprises, etc.).

Throughout the world, food consumption patterns are changing as a result of rising living standards, urbanization, and growing health and environmental issues. This is observed in the Greater Mekong Sub-region (GMS), where consumer concerns about the quality and the safety of the food they eat have been growing since the mid-2000s. These concerns relate to the wide agricultural intensification in this region, which has been producing land degradation, biodiversity depletion and greater farmer vulnerability (Castella et al., 2015). Indeed, a rapid shift from traditional farming systems (mainly aimed at family consumption and local exchanges) to commercial agriculture went together with an unbridled and unsustainable use of chemicals. Thus, studies conducted on pesticide use in the region indicate a mainstreamed over use of pesticides (Preap, 2017) and blood tests of consumers in Laos show that a significant proportion of people are contaminated with pesticides above accepted safety levels (Rassapong, 2018).

Moreover, all countries of the GMS have been exposed to various food scandals related to the excessive use (and to the misuse) of pesticides, sometimes resulting in casualties. Organic and safe agriculture initiatives are spreading in all GMS countries, although at different paces. With a view to addressing these issues and sustain a sector which is of high importance in terms of GDP, employment and trade, governments are willing to impulse a transition towards the production of Safe and Environmentally friendly Agro-based Products – SEAPs. In each country, organic and safe vegetable initiatives develop through various mechanisms (e.g., private brands, public standards, short value chains), and with the involvement of different stakeholders from both the public and the private sector – Ministry of Agriculture, NGOs, supermarkets, specialty stores, consumer associations, social enterprises, etc. It results in a slow but progressive change in food consumption patterns toward a rising demand for high-quality products. These changes in demand are also driven by the increasing incomes in the region and the emergence of a middle class who has the means to pay more for healthy products (Vagneron et al., 2018).

However, **important barriers** are limiting the opportunities for the producers to meet the demand for organic and good quality products (Ferrand et al., 2018): the **lack of information** and transparency between farmers and consumers, resulting in a lack of trustful relations, the limited infrastructure and **market access**, and the limited support from the government bodies or funding institutions to support farmers taking the risk to shift to sustainable production. Other limits to the development of a sustainable food system include the often-**missing incentives** for farmers to get involved in agroecology. Indeed, the lack of tools to communicate on the origin and the quality of products deprives farmers from the opportunity to benefit from a premium price when selling their agroecological production.

In order to overcome these difficulties, agroecology stakeholders need to work on **3 key dimensions** (Ferrand et al., 2018). The first is fostering specific partnerships between farmer, market intermediaries, brokers and consumers. The second consists in developing incentive systems that value positive externalities of agroecology products and enable price differentiation between conventional and agroecology products. Finally, mitigating and sharing risks is also a key as innovation and agroecology in farming induce important risk taking as it involves taking immediate risks for hypothetical returns later (Vagneron, 2017).

Many initiatives have been implemented to create new forms of interaction between stakeholders to give more space for agroecology products in the food system. This part will give an insight on the opportunities for changing the food system and will present innovative tools and approaches to build a system that brings agroecology to the market.

Figure 105: farmers selling their organic products in Cambodia

1 Growing concerns over food quality in the Mekong region: an opportunity to scale up agroecological production

GRET and CIRAD, in collaboration with ALiSEA and Yezin Agriculture University (YAU) in Myanmar and CASRAD in Vietnam, carried out a study in 2018 with the objective of assessing the current trends in urban consumers' food safety perceptions and behaviours in relation to market transformations. The study, commissioned by the Asian Development Bank (ADB) aimed at supporting pathways for both expanding the domestic and regional markets for Safe and Environmentally Friendly Agricultural Products (SEAP) for local farmers and SMEs and ensuring access to food safety to all consumers. The study comprised a qualitative and a quantitative survey about the knowledge, perceptions and behaviours of consumers regarding organic and safe food products. They were carried out between April 2017 and March 2018 in Myanmar and Vietnam. Insights from two additional studies conducted in 2015 in Lao PDR and in Thailand on organic dynamics have been included to provide a more regional analysis of similarities and differences in how consumers across the region consider safety issues and SEAPs.

The study highlighted that **consumer concerns over food quality, safety and health in the Greater Mekong Sub-region (GMS) are growing** together with urbanization, living standards, and health and environmental issues. As a result, initiative to support Safe and Environmentally Friendly Agricultural Products (SEAPs) are developing in all Great-Mekong Region countries, and domestic retail sectors are transforming at their own paces but dramatically. Key results of the study will be given here.

Figure 106: Organic farmers can benefit from a premium price when selling their products

1.1 Insight into Vietnam and Myanmar situation

In Myanmar, urban purchasing and consumption patterns are still very traditional as 94% of the respondents buy food primarily from wet markets. Changes in eating practices are circumscribed to Yangon urban setting for households with health concerns or more educated and consist lowering unhealthy food. This contrasts with Vietnam where consumers increasingly shop at supermarkets (32,5%). In both countries, supermarket shoppers have much higher trust in their main outlet as being the best place to buy safe food (90%)

In Vietnam and Myanmar, food safety is a key feature of consumer buying decision, as 95% of Myanmar respondent declared that food safety is important, and consumers consider food found in Myanmar to be unsafe (79%). In Vietnam, the same trend can be observed as 89% perceives food as unsafe. However, by contrast, 96% in Vietnam and 83% in Myanmar consider managing to purchase safe food.

The study also found a high potential for agroecology product demand in Vietnam. In Vietnam 97% consider information on origin as important for food safety. Sources of information on origin are first product labels (56,5%) and store displays (50,5%) before the seller (38.5%), also manifesting a shift from traditional forms of trust towards formal guarantees. In Myanmar, there is also a large untapped demand for SEAPs on the domestic market. General awareness of organic agriculture (49%), chemical-free agriculture (27%) and GAP (7%) are low, though being much higher for educated people, whereas they could answer the food safety concerns of the population.

1.2 Insights into the Lao PDR and Thailand situation (organic agriculture)

In Lao PDR, the organic market is emerging while in Thailand it is fully institutionalized. Awareness about organic is significant among urban consumers (between 57% in Lao PDR and up to 92% in Thailand). Organic is firstly understood as and purchased for being safe from chemical residues in Thailand - with confusion however between terms “organic”, “hygienic”, “pesticide-free”, “GMO-free” and “hydroponic. Also, mainly purchased for safety reasons in Lao PDR (81%), organic is firstly understood as being good for the health, and then for the environment, with traditional information channels still being privileged, notably television. In Thailand, a varied range of organic food is purchased in a diversity of retail settings reflecting its more mature domestic market, with supermarkets being the most prominent one (35%), then specialized shops (21%), direct purchases from farmers (11%), organic/ green markets (9%) and online purchases (3%). In Lao PDR, purchases occur in organic markets and concern vegetables, herbs and spices. In Thailand, prices (30%) and lack of trust in certification (21%) refrain households from purchasing more organic food though 44%; and households place higher trust in international certification schemes. In Lao PDR, reasons for not buying organic are mainly lack of information about organic outlets (67%) and lack of availability (40%).

Figure 107: Organic production can answer the growing demand for safe food

1.3 Policy and investment recommendations to develop SEAPs in the Mekong region

The studies highlight that both in Myanmar and Vietnam, consumption and food patterns are evolving with the competition brought by modern retail to the wet markets. These evolutions, based on changes in the supply chain are more limited when consumers are massively faithful to traditional markets, as in the case in Myanmar. Consumer awareness regarding food safety is variable between countries and within countries. Their concerns over food safety are ranging from increasing (pesticides, food dyes) in Myanmar to confirmed as very high in Vietnam.

Building upon the findings of this research, a response to consumers’ expectations and preoccupations that would also contribute to building a market for SEAP could be organized on several levels.

Strengthen communication, consumer education and engagement in food safety and environmental issues. Ensuring a dynamic communication strategy based on both traditional (television, etc.) and social media on both food safety and environmental policies and issues, and on identifying SEAPs and their outlets. Engage consumers into value chain and policy dialogue through supporting the development of consumer associations and platforms and facilitating information sharing. Increase supply chain stakeholder accountability and coordination. This should be done by implementing effective risk management, control and traceability systems throughout supply chains. With origin being an important proxy for food safety and a vehicle for trust, and taking advantage of ICT spreading, support different approaches to managing origin in supply chains, i.e. varied traceability systems (barcodes, QR codes) but also geographical indication labelling as ways to add value.

Implement regulations for SEAPs. Such regulations should combine minimum requirements and consistent standard-based differentiation. Minimum quality standards should be set to ensure that only safe food is sold and at affordable prices, with voluntary standards serving differentiation purposes above it. This goes along with better defining, positioning and controlling the different existing standards, including consistent logos and claims such as safe, pesticide-free, chemical-free, organic, which implies public / private coordination.

Reduce trade barriers between GMS countries and harmonize standards at the regional level. This means aligning the different GAPs (MyanmarGAP, VietGAP, ThaiGAP) for example on ASEANGAP or encouraging their recognition by GlobalGAP. It would also require harmonizing organic standards, using for example previous work on the Asia Regional Organic Standard (AROS). Given the weakness of national certification bodies in many Southeast Asian countries, this could also mean reviving the Certification Alliance or CertAll, a collaborative network of organic certification bodies in Asia.

Promote short supply chains and community-driven food networks, and publicly endorse Participatory Guarantee Systems (PGS). Promoting local and domestic trade of SEAP could build upon consumers' proximity to farming and on the increased variety in the linkages between farmers and consumers such as social media-based purchases, e-commerce or organic markets and specialized stores. With their low cost and great potential for education and dissemination, PGS constitute powerful instruments.

Support traditional outlets in taking the SEAP quality turn. Ensuring that SEAPs are available on traditional wet markets and at street food stalls – through improving infrastructure and capacity and fine-tuning standard implementation at these premises - would boost demand for SEAPs and tourism, with these outlets being key socio-cultural features in the GMS.

Support local production of SEAPs in the GMS. This means helping farmers provide consistent and varied supply, thereby boosting demand. Shifting towards more sustainable agricultural and trade practices will require comprehensive support policies: technical support including post-harvest and marketing practices, tailor-made cross compliance linking tax exemptions or subsidies with standard enforcement and better risk-sharing tools in the value chains.

Set up a regional learning and R&D alliance. This will enable to design and mainstream agricultural and trade innovations: 1) drawing and sharing lessons from the variety of approaches to ensure food safety and promote SEAPs across the GMS; 2) fostering research at regional level: to improve SEAP productivity, notably R&D on seeds and pest control, and to shape SEAP markets, value chain and consumer analysis.

This part is based on the research conducted by GRET and CIRAD on "Consumers' perception towards agroecological food products in Myanmar & Vietnam" commissioned by ADB, written by Isabelle Vagneron, Estelle Bienabe, Pierre Ferrand, Theingi Myint, Pham Thi Hanh Tho, Damien Jourdain (under publication).

Conclusion

There is a growing demand for safe products in the Mekong region which gives opportunities to scale up organic and other agroecology production. However, some important barriers must be overcome, which include the limited access of small-scale farmers producing agroecology products to the market, the high price of third-party certification process and the limited economic and social incentives to shift to organic and agroecology products. The following part will give illustration of initiatives and market innovations to bring agroecology to the consumers.

Figure 108: Mekong Eden Farm manager selling his organic vegetable in Luang Prabang, Laos

2 Bringing agroecology to the Market: innovations for market access

2.1 The role of agricultural cooperatives in rural development

Farmer's association and agriculture cooperatives in South east Asia can give farmers stronger involvement in the value chain and help them increasing their bargaining power. Agricultural production cooperatives consist in private enterprises in which several farmers share production resources (land and/or machinery) and share profits. Such farmer's organizations play a key role in increasing the market-power of small-scale farmers by linking farmers to markets, providing a collective platform for negotiating with buyers, and offering processing services and by making distribution channels available. Cooperatives can play a positive role for increased capacity building by delivering training and facilitating experience sharing among their members. In addition, agricultural cooperatives are a great tool to answer the challenges of lack and asymmetries of information by making information more available for cooperative's members (Borzaga, 2012). Finally, by transferring the risks from the individuals to the organization, by allowing farmers to have a more diversified range of activities, or by providing social security arrangements, farmers' cooperative allow to mitigate risks linked to innovations and production process (Birchall, 2003). In this framework, ALiSEA provided a small grant to the NGO Aide au Dévelopment Grembloux (ADG) to assist the Udomsoriya Agricultural Cooperative to develop the production of Bokashi in Cambodia.

2.2 Developing innovative business model for agricultural cooperative to produce and collectively supply natural fertilizer to local producers in Cambodia

Setting up a collective production of Bokashi

For more than 15 years, the promotion of agroecological techniques has been the heart of ADG's activity in Cambodia. However, this transition faces various obstacles, such as farmers' access to quality natural fertilizers. First, the individual production of this type of fertilizer requires natural inputs which are sometimes difficult to access for farmers. Second, the production of the fertilizer requires considerable energy for any farmers wishing to market their products on a larger scale. Third, these "homemade" fertilizers are sometimes of low quality. Lastly, the natural fertilizers available on the market are expensive and sometimes also of poor quality. In order to overcome these problems, ADG in partnership with the FAEC (Federation of Farmer Associations Promoting Family Agricultural Enterprise in Cambodia), aims to assist the farmers of the Otdomsoriya cooperative in the production of a high-quality natural fertilizer, "Bokashi", and to market it to other producers. Located in Takeo province, Otdomsoriya is an agricultural cooperative created in 2013 by a group of farmers who are collectively engaged in commercial activities such as the production of fertilizers, rice seed and rice. The cooperative now has more than 80 members, 34 of whom are women.

For ADG and FAEC, the main objective is to improve the fertility of the soil by supporting Otdomsoriya in the production of this fertilizer, from the collection of natural inputs available in several cooperatives. The goal is to get a fertilizer with high quality to allow to increase agricultural production and household income. Obviously, the challenge is also to create a Bokashi with affordable price to local people. To carry out this project, ADG and FAEC are working on three main axes:

1) Develop an efficient natural fertilizer formula adapted to the needs of small producers.

2) Set up the production system/facilities of this fertilizer.

3) Develop sales distribution channel and marketing strategy.

Aide au Développement Grembloux

Established since 1987, ADG is now a Belgian NGO active for the promotion of agroecology and improvement of food sovereignty, supporting family farmers' activities, and engaged for responsible consumption and healthy feeding practices in Belgium, Cambodia, Laos, Senegal, Benin, Peru and Bolivia. Since 2010, ADG emphasized on food sovereignty because it is a complementary right part of other fundamental rights.

Together with our partners, we build capacities of family farmers and other target groups to exercise their rights and defend them through:

- information and awareness;
- Technical, methodological, equipment, material, and financial supports to local dynamics;
- Training of these families and other local development actors;
- Promoting dialogue between farmers' organizations, local stakeholders and authorities in the interest of family farming; and
- Advocacy actions (directly or carried out by our partners).

More information on:
https://bit.ly/2CWSYYK

Figure 109: Location of Takeo Province

These actions are aimed primarily at the members of the cooperative. However, it will also attract other producers who want to use natural fertilizers but have neither the time nor the inputs to produce them. Bokashi is a mixture of organic matter and microorganisms essential for the maintenance and improvement of soil structure, ventilation, water retention capacity and nutrient absorption capacity. The microorganisms used also improve soil resistance to various diseases and pathogens. More importantly, over the long term, the experience with Otdomsoriya will serve as a model for other agricultural cooperatives and farmer organizations of the ADG network and the FAEC.

Figure 110: Bokashi during production process

As a result of the effort of ADG, FAEC and Otdomsoryia, and with the participation of two students in agriculture, in April 5 and 6 with an atmosphere that was both serious and relaxed, farmers and students produced 1.8 tons of Bokashi to test the production. The new production method they found allowed the fertilizer to improve by 20% of nitrogen while maintaining the same cost as the previous formula. Finally, the Bokashi is ready to be produced and supplied to the market.

Figure 111: Bokashi production in Otdomsoriya Cooperative

The mobilization of agroecology farmers and promotion of the Otdomsoryia cooperative

During the month of April, the ADG team in Cambodia also organized an awareness campaign in the form of a cheerful and loud procession in Takeo province. The goal was to inform and sensitize its inhabitants on the harmful impact of the use of chemical fertilizers and pesticides. It was also the perfect opportunity to promote Bokashi, a 100% natural fertilizer produced by Otdomsoriya, an agricultural cooperative supported by UPSCALE and ALISEA program. Headgear of all kinds, long sleeves and long pants to ward off the burning rays of the sun ... That's how, smiles on the lips and signs in hand, more than 60 participants got on their scooters to travel across villages in Takeo province. All are producers of organic vegetables, fruit and rice. They are members of different agricultural cooperatives in the area, supported by UPSCALE program. On the occasion of this campaign, they accepted to be the new faces of a better future in agriculture. These farmers, already sensitized and informed by the ADG team on various agroecological techniques, are now using no more fertilizers and chemical pesticides. Proud of their commitment, they wanted to share this new ecological approach with the rest of their community. Producers, traders and homes must also be informed, and nothing is more effective than when the message is transmitted by peers.

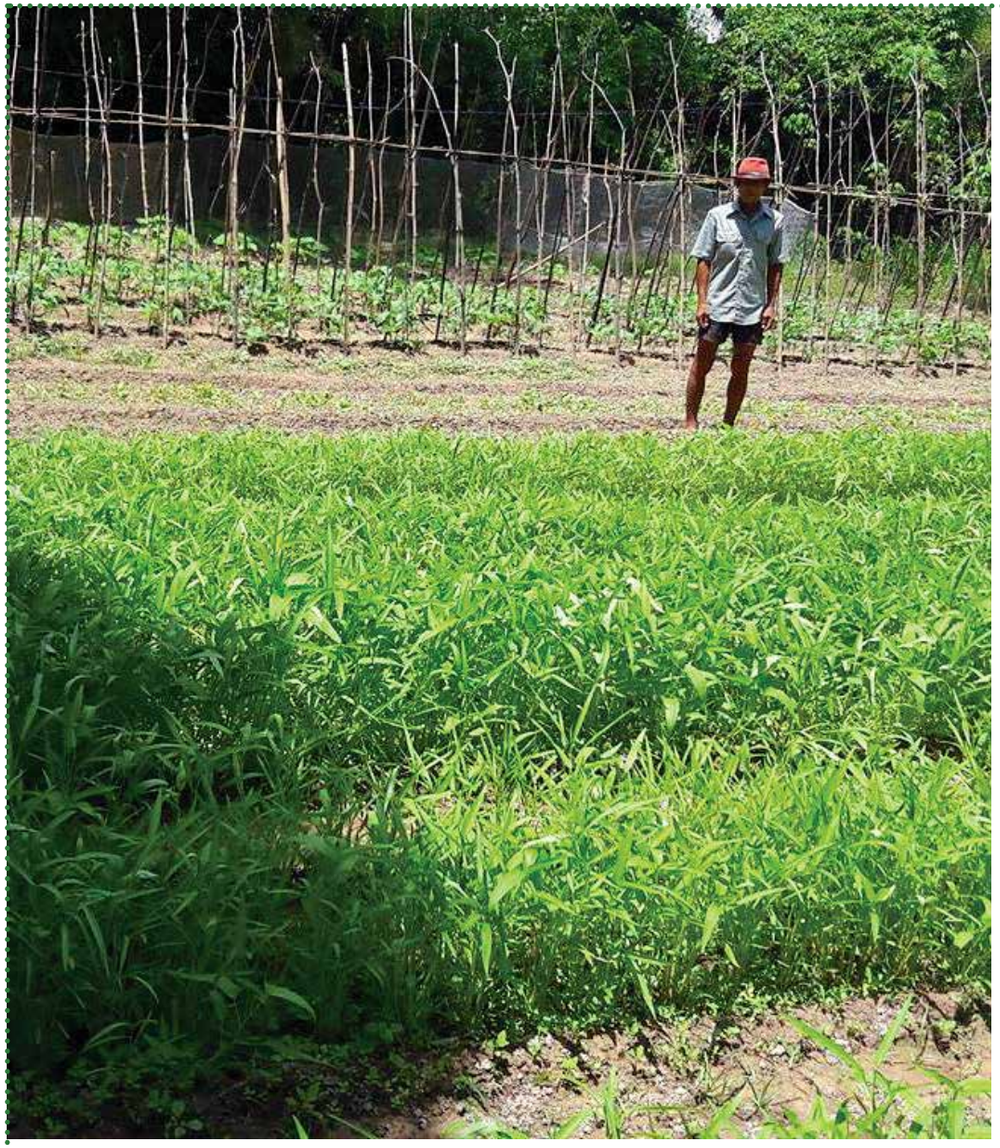


Figure 112: Production plot for Bokashi testing

Conclusion

Through its intervention to support the emergence of the Otdomsoriya cooperative, ADG supported small-scale farmers in Cambodia to improve their livelihoods while participating to greening the agriculture sector by producing organic fertilizer. The cooperative is far more than a simple enterprise: it is a way for farmers to gain market power, to get more visibility, to share knowledge and experiences and to speak with a common voice. The participation of the cooperative's members to the awareness campaign on the dangers of pesticides shows how much agriculture cooperatives can play a key role in bringing social changes. The transition toward agroecology requires small-scale farmers to be heard, and the development of agriculture cooperatives can help them reaching the attention of policy makers, private sector and consumers.

This part was based on ADG articles: "Article Bokashi" and "Article Awareness campaign", available on:

https://bit.ly/2P9faVg

Figure 113: Safe vegetables certified through PGS and supported by Rikolto

3 Scaling up Participatory Guarantee Systems (PGS) in the Mekong Region

3.1 The PGS: a great alternative to third party certification to build trust between agroecology stakeholders

Participatory Guarantee Systems (PGS) emerged over 40 years ago, as "locally focused quality assurance systems […] based on the active participation of stakeholders and built on a foundation of trust, social networks and knowledge exchange." (IFOAM-Organics International, 2008). In several European countries (France, Italy, Spain, Portugal, Japan) organic farmers were initially inspected by committees that involved farmers as well as retailers, processors and/or consumers (Sylvander, 1997). Later on, PGS were revived in Brazil (where alternatives to certification have been sought since the 1990s), India and Mexico (Fonseca et al., 2004; Khosla, 2006; Nelson et al. 2016). Today, PGS are recognized as a suitable alternative to third-party certification for smallholders for several reasons: 1/ the cost of participation is much lower, and mostly takes the form of voluntary time involvement rather than financial expenses (May, 2016); 2/ by developing trust and mutual understanding between farmers and other stakeholders, PGS help develop multi-stakeholder dialogue and collective learning processes (PGS is often characterized as "knowledge intensive"); 3/ as a result, PGS are powerful instruments to stimulate local market development as they play a key role in developing consumer confidence in local produce.

IFOAM has been trying to define and structure the intrinsic changing notion of PGS around six key principles (May, 2016):

- A shared vision is the philosophy underpinning the PGS group that can go beyond organic standards towards social justice, fairness, autonomy, etc. PGS members are able to elaborate their own rules and procedures, based on national or international standards or not.
- Trust is the cornerstone of participatory certification schemes and refers to farmer-to-farmer relationships as well as farmer-to-consumer.
- Horizontality principle ensures a non-hierarchical management with a shared and rotating responsibility of the decision mechanism.
- Transparency is necessary to build trust, so all the management system should be documented and understood by all stakeholders as well as mechanisms to verify the compliance to the rules should be explicitly defined.
- Participation is the core mechanism of PGS embodied in the principle of collective responsibility that binds stakeholders together in the certification process.
- Finally, PGS emphasis on the learning process of certification rather than on control of compliance. A major added-value of PGS compared to third-party certification is the mechanisms to support farmers in their journey towards a more sustainable agriculture in addition to the award of a label or seal.

PGS are therefore particularly relevant for organic and agroecological products in the Great Mekong Sub region (GMS), where a large majority of producers are smallholders who could benefit from a low-cost and adaptive certification system to access niche markets with premium prices and thereby foster organic and agroecological farming in the sub region. PGS emergence in the Mekong Region builds on the will to improve access to domestic (and more especially local) markets for the farmers' products and increase their income as well as contributing to expanding areas of organic production through small-scale agriculture. ALiSEA supported several initiatives in Myanmar, Cambodia and Vietnam to promote and develop Participatory Guarantee Systems.

This part was based on the article "Enabling bottom-up approaches in top-down environment: Case study on Participatory Guarantee System (PGS) facilitation in Huaphanh Province, Lao PDR" by Pierre Ferrand and Claire Georges, available here: *https://bit.ly/2Aigflg* and the concept note for a regional experience sharing workshop about PGS organized by ALiSEA in Vientiane, Laos on 1-3 October 2018.

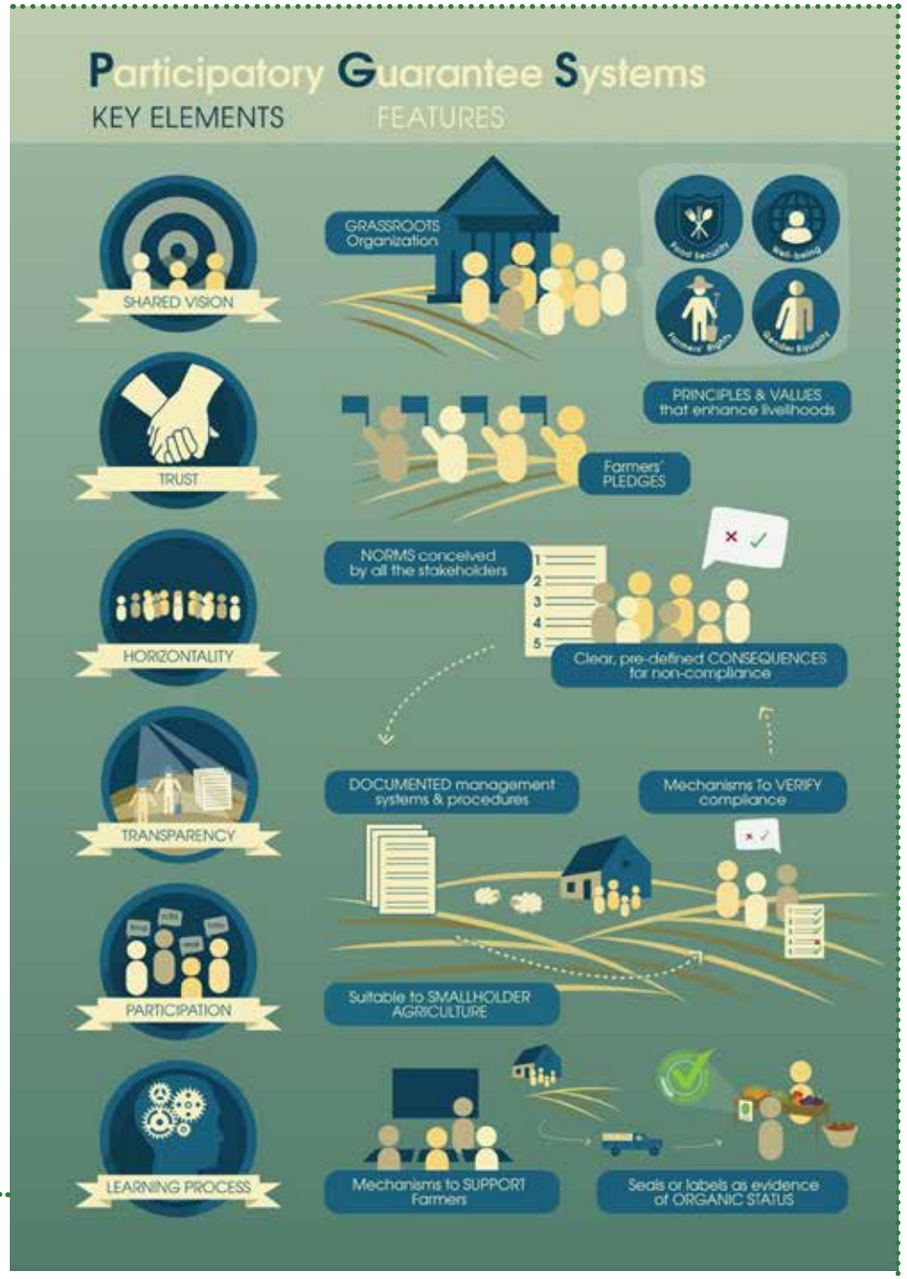


Figure 114: Schemes on PGS princples, IFOAM, 2008

3.2 Promoting Organic Vegetables through Customer Engagement in Participatory Guarantee Systems in Cambodia

Nature Agriculture Village

Natural Agriculture Village (NAV) started in 2014, as a wholesaler of veggies grown by Cambodian farmers free of chemical fertilizers and poison. NAV is now supporting several groups for PGS implementation since 2016 in Kandal province. NAV main office is Pnohm Penh.

More information on NAV on their facebook page: *https://www.facebook.com/pg/NaturalAgricultureVillageShop/about/?ref=page_internal*

Supporting the emergence of PGS certifications in Cambodia

In Cambodia, almost all meats, fruits and vegetables available in the wet market are uncertified, which limits people's capacity to get information on the health and environmental risks related to what they consume. At the same time, food safety issues are threatening the health of people and ecology. The most critical one is the continuous food poisoning outbreaks being found across Cambodia due to poor quality fruits and vegetables and unsafe overuse of chemicals to produce both local and imported products.

To ensure that the products are safe, safety procedures need to cover various steps of the production process. Furthermore, certification processes should involve different stakeholders of the food system, including producers, consumers, sellers and certifying bodies, in order to build trust and to ensure a high control on the production process. Such certification can ensure the quality of produces where safety, along with health and ecological benefits, is the core to Natural Agriculture Village's business values. However, certification of organic vegetables by third party is costly and hardly reachable to smallholder producers. Therefore, the Natural Agriculture Village's initiative funded by ALiSEA aimed at promoting a low-cost

Figure 115: NAV's production gardens

and locally-based quality assurance system through "Participatory Guarantee System (PGS)".

In 2016, PGS was introduced in Cambodia by FAO and ADB, in close collaboration with the General Directorate of Agriculture, to provide Training of Trainers (ToT) and to pilot it with farmers of 10 PGS groups. The Natural Agriculture Village (NAV) started in 2014, as a wholesaler of veggies grown by Cambodian farmers free of chemical fertilizers and poison and is the first company that started selling the PGS organic vegetables in Cambodia. NAV was also the first company selected for participating to ToT on PGS certification process at national level. PGS veggie production in Cambodia started with three groups of farmers in 2016, and then increased by three more groups in 2017. In early 2018, four more groups of farmers were developed and supported to grow PGS organic vegetables. Currently, many other organizations and projects are being implemented to promote PGS organic vegetables production in Cambodia.

In this context of growing interest for PGS products in Cambodia, ALiSEA provided a small grant to the NAV Company in 2017 to support farmers to develop and implement PGS certification process. Two PGS farmer groups were selected and trained on PGS. The two groups were located in Krang Yov and Koh Khsach Tonel communes, in Sa Ang district of Kendal province. In total, 26 farmers were trained to PGS certification. At the end of the initiative, about eighty percent of them applied PGS and are now selling vegetables to NAV based on contract farming, while the other twenty percent has not yet started due to labour shortage and lack of inputs to produce compost. In addition, farmers were also trained to adopt organic farming practices as net houses and organic fertilizers. Through its project, NAV also engaged in promoting these PGS organic veggies for consumers in the target areas of the company and to sensitize on organic standards and organic shops good performance.

Bringing PGS to the supermarkets

In parallel to the training activities, NAV has put much effort in bringing PGS products to the market. Many buyers, consumers and farmers from different regions, retailers and supermarket representatives have been invited to visit the farmers' PGS organic fields, and at least 30 visits from all kind of stakeholders took place in a year. As a result, the company has received tremendous support from both consumers and retailers, including supermarkets. NAV supported village has been successful in selling PGS organic vegetables, with purchase orders made by numerous supermarkets and some organic vegetable shops. PGS vegetables are now on sale at AEON super market, Lucky super market, Super Store, and other super market in Cambodia, and some organic shops as well as wet market (Toul Tombong and Depo markets). On average, about 200 kilograms of PGS vegetables are sent to market every day.

The example of the AEON Mall, a standard Japanese supermarket, illustrates well this growing interest of supermarkets for PGS production. AEON Mall would previously not allow NAV company label to sell their PGS organic vegetables as the market only recognized international standards. After several site visits by the market representative to NAV's farmers, along with the company's further explanation, a trustful and loyal relationship was built between AEON Mall and NAV. The Mall has now recognized the quality of the PGS organic vegetables and has provided a separate stall to sell the PGS organic veggies in every branch of the mall. Additionally, other supermarkets including Lucky Market have also provided a separate place to NAV's farmer groups of the company's PGS organic vegetables. To go further: https://bit.ly/2pWmDZI

Figure 116: Visit of diverse stakeholders at NAV's PGS gardens

3.3 Capitalisation of Participatory Guarantee System experiences for upscaling & institutionalisation in Vietnam

Figure 117: Location of Thanh Xuan district, where one of the Rikolto's activity in PGS in taking place

RIKOLTO (VECO)

Rikolto is an international Non-Governmental Organisation (NGO) with more than 40 years of experience in partnering with farmers' organisations and food chain actors across Africa, Asia, Europe and Latin America. Rikolto envisions a world with food systems that allow poverty and hunger to be eradicated and that do not burden our planet more than it can bear. Active in Vietnam since 1994, Rikolto run programmes in 15 countries to foster more sustainable and inclusive food systems. Rikolto builds bridges of trust and trade, between the food industry, governments, research institutions, and farmer organisations around this one central question: 'What will we eat tomorrow?'

More information on:
https://vietnam.rikolto.org/

Rikolto's activities on PGS supported by the ALiSEA network

PGS was first implemented in Vietnam in Thanh Xuan commune, Soc Son district, in Hanoi. It was introduced by the Danish nongovernmental organization ADDA in 2008, following the model developed by IFOAM for organic agriculture. In 2010, Rikolto (then called VECO) started using the same PGS mechanism with a food safety standard.

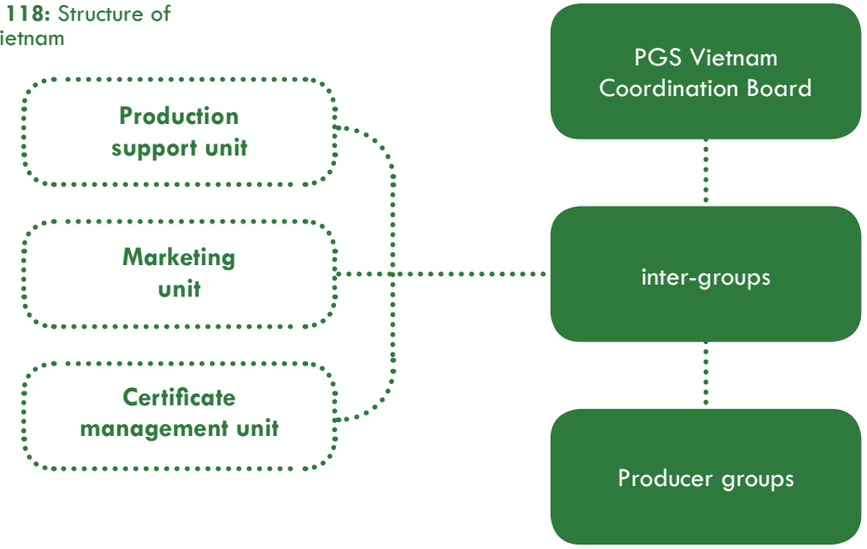
With the support from ALiSEA, Rikolto (VECO) has led a capitalization process in order to inform future advocacy activities and to facilitate PGS replication by other actors. This capitalization work focused on assessing and analyzing the past successes and failures of Rikolto's activities on PGS in Vietnam. Through the initiative covered by the small grant, the project produced three deliverables to document and share Rikolto's experience:

- 2 case studies were produced to assess and share Rikolto's experiences and successes with PGS experiences in Vietnam, including lessons learned & best practice:
  - One case study on "PGS organic in Thanh Xuan, Hanoi – An example of sustainability"
  - A second case study on "When PGS falters: key lessons for the improvement of PGS in Vietnam"
- A Policy Brief was also produced in order to give policy recommendation on scaling up PGS in the Mekong region: "Building trust in safe and organic vegetable chains through Participatory Guarantee Systems (PGS)".

Case study "PGS organic in Thanh Xuan, Hanoi – An example of sustainability"

The case study "PGS organic in Thanh Xuan, Hanoi – An example of sustainability" released by Rikolto investigates the factors that made PGS Thanh Xuan the most successful PGS model in Vietnam and identifies some of the features that should be replicated by other PGS to improve their sustainability. Here will be given the key points of the study.
After PGS was first implemented in Vietnam in Thanh Xuan commune, Soc Son district, in Hanoi by ADDA in 2008, the Thanh Xuan intergroup is today comprised of 21 producer groups for a total of 121 members. Thanh Xuan intergroup is one of the 5 intergroups managed by PGS Vietnam's General Coordination Board in northern Vietnam. PGS production is based on the Vietnam PGS Organic Standards in line with the Ministry of Agriculture and Rural Development's Standards for Organic Production and Processing. In 2013, the Vietnam PGS Organic Standards were officially admitted into the IFOAM Family of Standards. Over the 10 years of operations in Thanh Xuan, the production area for PGS organic vegetables increased from 7.7 ha to over 20 ha in 2018.

Figure 118: Structure of PGS Vietnam



So far, Thanh Xuan is the most sustainable PGS model in Vietnam, building on a solid market, government support, strong reputation and sustained commitment by its member farmers.

Some insight on **PGS' performance** in Thanh Xuan

Food safety

Before they can apply for PGS certification, farmers must be trained for 3 months on the organic PGS standards and practices. Their water and soil are tested during the certification process to ensure their safety. The 3-level certification process – internal control within each farmer group, cross-checking across farmer groups and random inspections by the Coordination Board – coupled with the quick chemical test performed on the vegetables, controls and assures farmers' compliance with the PGS Organic standard

Income generation

Farmers' income from the sales of PGS vegetables varies from 2.5 to 10 million VND (USD 110 –430) per month depending on the size of the production area and season. This is approximately 12 times more than the income yielded from rice production. Most vegetables sell for 15,000 VND/ kg (USD 0.65), except for herbs which cost 25,000 VND/kg (USD 1.1). This is higher than the price of non-PGS vegetables. This has resulted in higher and more stable income for farmers.

Visibility and consumer engagement

Thanh Xuan is well known by safe and organic food retailers in Hanoi, and by local customers. Between 2008 and 2015, over 500 groups have visited the site to learn about PGS and organic agriculture.

Market access

The Thanh Xuan intergroup sells 30 - 40 tons of organic vegetables per month to buyers in Hanoi and up to 70 tons in winter. In 2018, it has approximately 30 regular buyers from the retail sector such as Bac Tom, Tam Dat, Soi Bien and Ecomart. The intergroup also set up two businesses to support the marketing of its products: Thanh Xuan Agricultural Service and Investment Co., Ltd and Thanh Xuan Organic Vegetable Cooperative.

Sustainability

While the intergroup still receives external support from development actors, it has its own financial resources to pay for intergroup activities. These resources come from farmers' contribution to the intergroup. Farmers also use part of their profit to invest in infrastructure such as irrigation systems and net-houses.

Environmental protection

PGS has contributed to reducing the environmental pollution linked to the use of agrochemicals in Thanh Xuan. Thanks to the use of organic fertilizer and compost, soil fertility has increased. The use of natural pest management methods such as natural insect repellent flowers contributes to local biodiversity.

Key **success factors** for PGS sustainability:

- Thanh Xuan farmers are able to plan their production well and to provide buyers with the vegetables they require, both seasonal and off-season.
- The intergroup's strong connection to markets has enabled farmers to earn a stable income which has maintained their commitment over the years.
- The proximity of Hanoi, where consumers' demand for organic products is high, makes transportation easier and reduces logistical struggles.
- Farmers have a good command of organic production techniques for vegetables and they demonstrate a hardworking attitude.

  After 10 years of existence, the intergroup has been able to demonstrate the benefits of PGS to farmers which has encouraged new farmers to join the intergroup. It also managed to build a strong reputation with end-consumers and retailers in Hanoi, thus inspiring trust.
- Intergroup leaders have demonstrated strong leadership, knowledge and enthusiasm and have been able to communicate them to farmers.
- Local authorities at the communal and district level have supported the intergroup through land consolidation policies, training delivery, and infrastructure investment.

However, **a series of some elements should still be improved** to increase the sustainability and performance of PGS in Thanh Xuan. The involvement of consumers should be strengthened in cross-checking inspections and as members of the intergroup to further strengthen the trust relationship. Second, local authorities could increase their involvement by promoting PGS in their local community in order to attract more farmers to participate in the system and to encourage more consumers to buy PGS products. Third, the intergroup needs to maintain farmers' knowledge up to date to ensure that all members follow the organic standard, the PGS pledge and PGS regulations correctly. Finally, as young people migrate to industrial zones, mobilising young people to join PGS will be one of the challenges in the coming years.

This part was based on the Rikolto case study 'PGS organic in Thanh Xuan, Hanoi To go further: https://bit.ly/2CTD9SS & https://bit.ly/2J6qsEu

Figure 119: Thanh Xuan farm, Hanoï

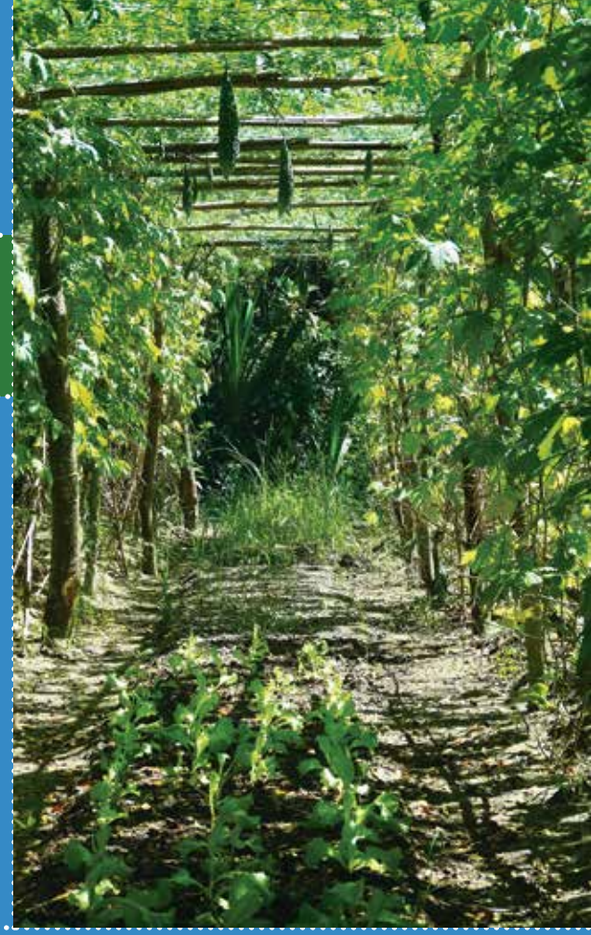
Conclusion

The PGS are a useful tool to build trust to respond to the growing demand for safe and environmentally friendly products and to scale up agroecology. PGS allow to decrease the cost of participation compared to third party certification as it mostly takes the form of voluntary time involvement rather than financial expenses (May, 2016). In addition, PGS facilitates trustful relation and mutual understanding between farmers and other stakeholders, and also support collective learning processes. Finally, PGS are powerful instruments to stimulate local market development as they play a key role in developing consumer confidence in local products. However, PGS being very knowledge intensive, there is a great need for knowledge sharing and capacity building. Scaling up PGS requires a strong cooperation between farmers and support from the government and development agencies to facilitate the PGS procedure. Therefore, ALiSEA organized a Regional Sharing Workshop on PGS in October 2018 to support the needed experience sharing and collaborative effort to scale up PGS. To go further: *https://bit.ly/2CTD9SS*

Figure 120: PGS Organic vegetable production, North Vietnam

Figure 121: Bi-weekly Organic Market in Vientiane, Laos

Conclusion
Bibliography



Conclusion

Shedding light on grass-root level actions for a transition toward agroecology

With a fast-growing population, increased pressure on its natural resources and climate change impacts everyday more present, the Mekong Region is at a crossroads regarding its agriculture development, calling for an important shift towards an agroecological transition.

Across the region, there is a strong shared interest for bridging and synergizing existing agroecology initiatives from farmers' organizations to policy makers' level, in order to share and enrich experiences, to increase the visibility of the practices and scale up their adoption.

This book compiled knowledge products from different organizations that developed initiatives contributing to a transition toward agroecology.

The different narratives compiled here offer a rare insight into concrete actions, accumulated experiences and knowledge to move toward agroecology. Several policy guidelines have already been or are being elaborated to support a transition. However, outstanding demonstration sites and initiatives (at different scales, from farmer plots to community level and beyond) as those supported or documented over the past years are more than ever necessary to embody such policy recommendations and inspire more people to take on agroecology dissemination further.

Lastly, the diversity of the agroecology initiatives and stakeholders presented in this book highlight the necessity to have a holistic approach and promote agroecology across all levels and dimensions for ensuring the transition. This means combining different actions from co-creating and testing new practices, bringing together farmers, development practitioners, research centers and private sector, to integrating agroecology in the university curricula and fostering market access innovations.

Agroecology Futures...

Between 2015 and 2018, with the support from the French Agency for Development (AFD), GRET has facilitated the emergence of a regional network gathering a large coalition of stakeholders involved in the promotion of agroecology, the Agroecology Learning alliance in South East Asia (ALiSEA). The first phase of the project supporting this emergence is coming to an end by June 2019. Over the past three years, while the network was emerging, its regional secretariat helps producing, documenting and aggregating knowledge and experience about agroecology. This was done through organizing multi stakeholders and thematic workshops, implementing studies and co-research process, developing knowledge management and communication tools and supporting agroecology initiatives through a Small Grant Facility. It contributed to increasing the visibility and credibility of agroecology promoters and grass root level initiatives.

ALiSEA has now started to work on shaping its future ahead of a second phase of the project, likely to start in 2019. A consultation process with all the members has been initiated in order to analyze the strengths and weaknesses of the network, to understand the members' expectations for the future and to assess the different ways to increase their ownership. The consultation process already revealed a strong willingness of ALISEA members to get more involved in the activities and to have greater participation in its governance and decision-making process. A strengthened regional network will contribute to enabling access and pooling resources from Mekong Region countries to target the agroecology-related research, agricultural engineering, training/education, value-chains improvement/certification constraints and challenges faced by smallholder farmers, development operators and policy makers in the region.

Several critical issues have been already identified for conducting further collective actions in the future. One can mention the following as priority issues:

- Education & Training on Agroecology
- Agroecology Performance Assessment
- Agroecology Crop management
- Market access and certification for agroecological products
- Agroecology & Climate change

Among all priorities, ALiSEA believes that the issue of **Youth in Agriculture** is the most critical and instrumental one for accompanying a transformative transition towards agroecology.

Compared to their parents, rural youth are better informed, increasingly mobile and have access to a wider range of products. But, they are also less likely to stay in the village due to both pressure from their parents to find a "better" job than farming and the negative narrative in general about farming activities (seen as backwards and tedious). This important outmigration of the young generation poses a direct threat to the future of family farming.

Thus, several actions at **different levels** and **targeting different stakeholders** should be implemented in order to support the change in the narrative towards agriculture and facilitate the emergence of what we could call **Agroecological Food Systems.**
This would require combining

- **Educative actions** at both **primary school** and **consumers level** to (re)valorize local food systems (to create added value) and pave the way for a **new generation of mindful consumers**
- Mobilization of **Higher Education & Technical Vocational Education and Training** to further develop **Agroecology as a Science**, produce of **evidence-based reports** and build the capacities of **future development workers & farmers**
- **Testing Agroecological innovations** through collaboration between Civil Society Organizations (including farmers' organizations), Development partners (including government agencies) and Academia

- **Promoting Agroecology** through the development of **quality inputs** (Open Pollinated Quality Seeds, Organic inputs, Botanical solutions…) **quality signs, certification & innovative market outlets** (Geographic Indications, Organic Agriculture, Participatory Guaranty Systems, Community Supported Agriculture…), and fostering **social business** initiatives & engagement with **private sector**
- **Advocacy at policy makers' level** (from local districts to national and regional level)

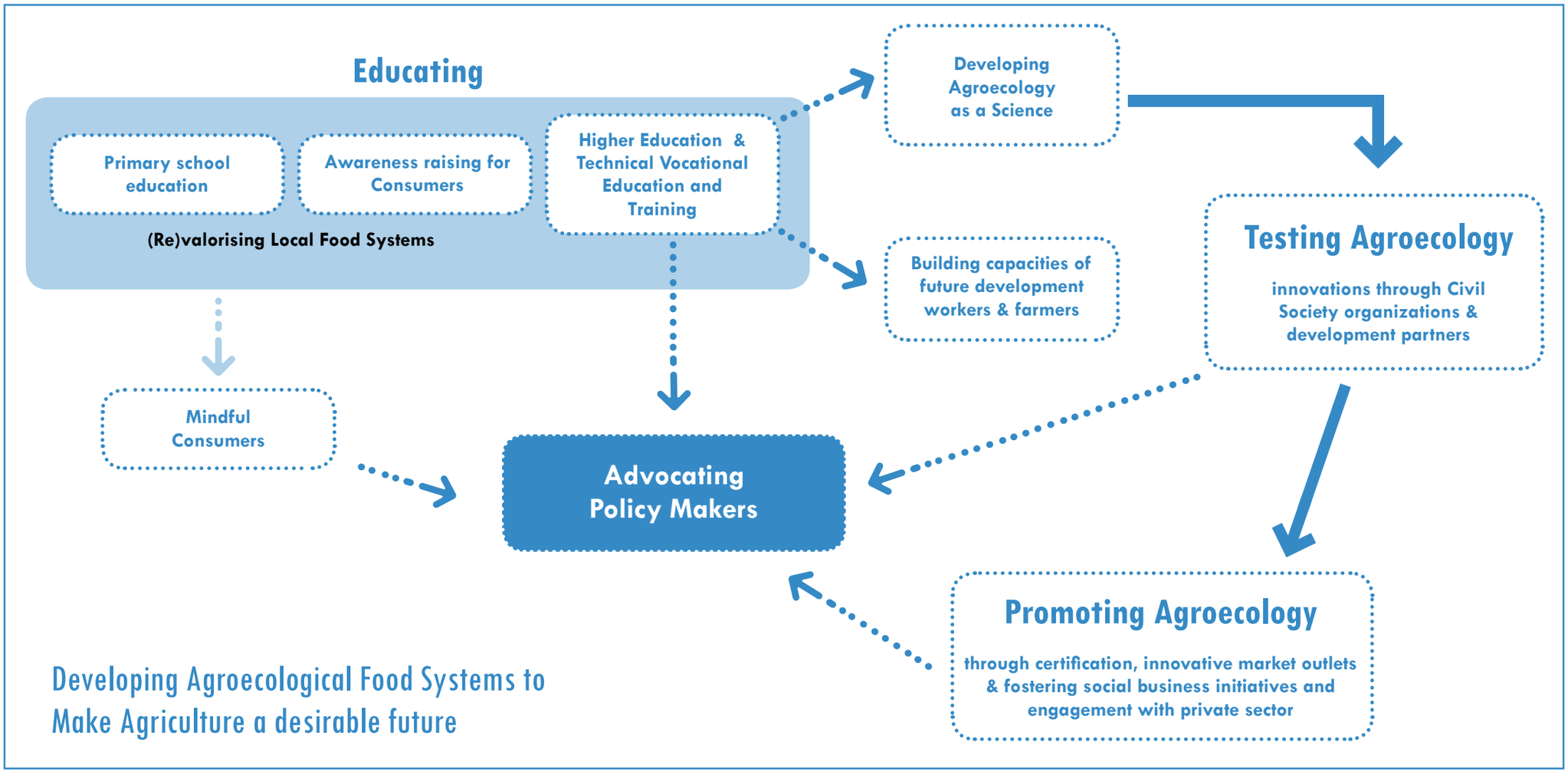


Figure 122: Regional Experience Sharing Workshop about PGS, Laos, 2018

Figure 123: ALiSEA General Meeting in Laos, 2017

Figure 124: Regional Academic Conference in Yezin University, 2017

Figure 125: Visit of Kokkoya Organic Farm in Yangon, 2018

Figure 126: Field visit during the ALiSEA General Meeting in Vietnam, 2017

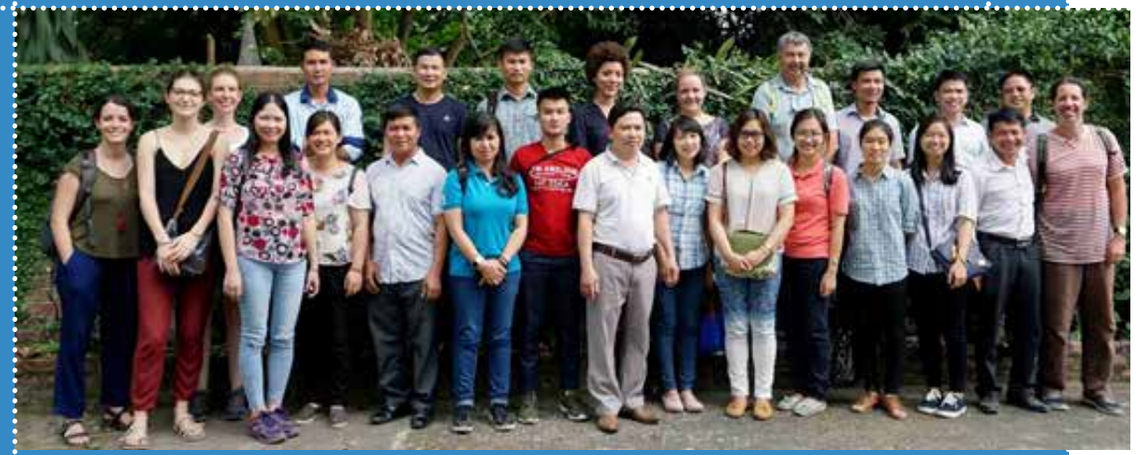


Figure 127: Field visit during Agroecology General Meeting in Laos

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Photos p84, p89 (PhoMaLok farm), p91, p93, p94, p98, p103, p110, p122, p 126, p127, p145: ALiSEA

Photos p102: a courtesy from CISDOMA

Photos p112, 113: a courtesy from ADG Cambodia

Photos p117: a courtesy from NAV

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Annex 1

ALiSEA Charter

Version of 21st March 2017

A framework document for a shared vision, a common objectives and a member driven governance of ALiSEA

Background

South East Asia at a crossroads: from agricultural intensification to ecological matters

It is estimated that about 87 per cent of the world's 500 million small farms (less than 2 ha) are in Asia and the Pacific region (IFPRI, 2007). In this region, the ecosystem provides jobs for 60% of the working population and generates a quarter of the region's gross national product (ESCAP, 2008).

In the Mekong region more especially, farmers have historically practiced subsistence-based integrated farming combining crops, livestock and trees in complex landscape mosaics. Paddy rice is main staple food all over South East Asia. Agricultural practices relied on strong ecological knowledge built over many generations by subsistence farmers, all based on agroecology principles.

Over the last decades, population pressure combined with government policies for the conversion of temporary land use to permanent land use led to decrease of shifting cultivation. All countries in the South East Asia have engaged in a process of so-called 'modernization' of agriculture by applying the agricultural practices of the Green Revolution to export-led monocropping.

Depending on their respective history, demographic changes, economic development patterns and agroecological potential of their landscapes, agriculture intensification has evolved at different pace and had variable ecological impacts throughout the region (land degradation and biodiversity depletion associated with the generalization of input-intensive cropping practices).

Agroecology: a modern solution for smallholders

Agroecological practices can respond to different types of problems: wind or rain erosion; loss of organic fertility and/or soil minerals; poor water management; reduction of biodiversity; parasite attacks; frequent unforeseen weather occurrences and climate change; lack of farm autonomy (related to chemical inputs, animal feed, energy, etc.); mediocre food quality; contaminations of the environment, products and people; and price fluctuation, etc.

By relying on production diversification, reducing use of external inputs, increasing recycling of locally available natural resources, and mobilizing labour and knowledge intensive practices, agroecology offers broad range of solutions to family farmers that:

- improve nutritional and food quality,
- increases incomes and creates employment
- helps reduce risks for the environment and the health of populations

At territorial level, there are also indirect impacts on incomes and employment (industries created, local trade boosted, etc.).

Agroecology methods are favourable to biodiversity and ensure soil fertility. This makes it possible to recover land that has become unproductive, improve resistance to climate incidents (diversity of activities, soil protection practices) and participate in the fight against climate change.

Agroecology approaches are thus convincing and evidence-based alternatives to the current agrifood system. They aim at strengthening innovation capacity of family farms, as well as the recognition of their contribution to food sovereignty in the region.

Across South East Asia, there is a strong shared interest for bridging and synergizing existing agroecology initiatives, in order to share and enrich experiences, to increase the visibility of the practices and scale up their adoption by farmers. Meanwhile, there is a need also to include such practices in public policies, and to increase main agroecology stakeholders' capacity for fund raising in order to strengthen existing networks.

Name

The proposed name for the regional alliance is "ALiSEA" – the Agroecology Learning alliance in South East Asia.

Vision

An increased credibility and visibility of agroecology practices at family farmers, consumers and policy makers level spearheads the redesigning of the landscapes, the livelihoods and the mindscapes in the Mekong Region.

Such regional agroecology transition supports the emergence of healthy and resilient food systems and the creation of innovative and fulfilling jobs for the rural youth while sustainably preserving natural resources.

ALiSEA Mission

ALiSEA is a network of Agroecology practitioners and supporters (sharing and supporting common goals on AE) that actively engages its members into information/ knowledge sharing and vibrant collective actions promoting an agroecological transition, and providing meaningful benefit for all participants.

The network intends promoting a unifying agroecology concept for gaining higher visibility and influence, generating public support, and establishing a learning process to facilitate an agroecology transition in the region (Cambodia, Laos, Myanmar and Vietnam), i.e. supporting farmers in transitioning from their current practices to agroecological practices through gradual transformation of their farming systems.

ALiSEA functions as a platform to share and discuss real issues encountered at multiple levels (i.e. from grass-root level actors to policy makers) and influence on policy dialogue. It provides reflexion and feedback mechanisms for all stakeholder groups.

The stakeholders/members have complementary knowledge and capabilities which, when combined through the network, will:

(i) scale up the knowledge created in the innovation process
(ii) facilitate the dissemination of innovative practices through the enabling environment created,
(iii) engage in policy dialogue on agriculture and rural development issues (e.g involve in consultation process of policy reviews),
(iv) be inclusive for local communities involvement (experimentations and innovations, social movement and process for change), and
(v) provide supports for resource allocation and service delivery

ALiSEA objectives

- To analyse current regulatory, socio-economic and institutional constraints in order to improve the environmental conditions for agroecology transition and development
- To share learning from and capitalise on the knowledge and key experiences of different actors (research centres, academia, government agencies, CSO/NGOs, Farmers' Organizations or Federations, private sector) that are supporting farmers in their agroecological transition
- To generate, aggregate and disseminate broad Information, Education & Communication materials (video, reports, handbooks) targeting farmers, development practitioners and consumers about agroecology
- To map outstanding agroecology sites across the Mekong region and to facilitate Farmer to Farmer and multi stakeholder visits
- To assess local conditions, potentials, and build shared strategies for scaling up successful agroecology practices
- To encourage / promote agroecology local and healthy food (building consumers' confidence, private sector engagement and producers' certification…)
- To foster policy dialogue in order to include agroecology in national / regional strategies
- To support co-development of performance indicators to assess agroecology impacts and facilitate its field testing.

Principles of ALiSEA

ALiSEA will operate based on the following main principles:

- ALiSEA aims to support small farmers to gain sustainable improvements in their livelihood whilst preserving the environment
- Voluntary basis – members of ALiSEA will participate in the network on a voluntary basis
- Not for profit – ALiSEA does not operate on a profit-making basis
- Non-discrimination – ALiSEA works to support all and does not discriminate on the basis of political affiliation, gender, race, religion or any other basis.

Members of the ALiSEA

ALiSEA is an open coalition of stakeholders active on agroecology within the Greater Mekong Sub-region, including:

- Civil Society Organizations (Farmers' Organizations, Local and International NGO, Consumer associations…)
- Research centers, universities, colleges and institutes with a research focus on agriculture and rural development
- Private sector operators
- Government agencies responsible for Agriculture, Fishery, Livestock, Forestry and Rural Development

Members pledge to respect ALiSEA charter and to actively engage in promoting an agroecology transition in the Mekong region through participation to experience & knowledge sharing and collective actions.

Proposed governance for ALiSEA

At each country level

A National Secretariat

A National Secretariat of ALiSEA is hosted by an existing institution already involved in networks, with broad areas of intervention (agriculture related). Its main areas of work are to support:

- Agroecology Knowledge Gathering & Sharing (undertake agroecology related issue watch, collect case studies, success stories, stakeholders' testimonies…)
- Networking and event organizations (support identification & organization of thematic workshops, Enlarge ALiSEA member basis & strengthening agroecology alliance, Facilitate national & regional studies, research, collective actions…)
- Small Grant Facility

Such secretariat receives financial support and technical backstopping from GRET.

The national secretariat is renewed on a yearly basis in order to increase involvement of ALiSEA member in its governance.

A National Board of Experts

Pluri-disciplinary board of experts (4-5 people) has been established at national level and provides meaningful inputs to ALiSEA on

- Small Grant Facility (SGF): each national expert is part of the ALiSEA SGF selection committee and contributes to formulation of specific calls for proposals, selection and improvement of concept notes and project proposals, evaluation…
- ALiSEA formulation of ToR for thematic workshops and consultancies / research.

National experts are recognized and motivated scientists and development practitioners open to the wider "agroecological transition" approach promoted by ALiSEA. They help bridging scientific /academic communities with development practitioners. The national experts are graduated (at least a master degree) in the field of agroecology, agriculture, forestry, environment or community development.

An Annual General Assembly (AGM)

Such ALiSEA collective moment at national level has three folded objectives:

- Presenting main progresses done during the year for promoting the agroecological transition in the region (e.g.: outstanding studies, case studies and videos, multistakeholders round tables with scientists, farmer leaders, development practitioners, policy makers…)
- Addressing the governance of ALiSEA, including the composition and functioning of the board of experts, the selection/renewal of secretariat members, the achievement and review of the Small Grant Facility, the funding and financial management of the network, etc.
- Discussing and validating the strategic action plan (e.g. priorities) and the detailed annual action plan of ALiSEA. The elaboration of the plans can be done in advance by the secretariat members than presented to the GA.

At regional level

Regional Secretariat

The Regional Secretariat of ALiSEA is currently hosted and facilitated by GRET with one regional coordinator based in Laos and 2 national coordinators based in Cambodia & Myanmar.

Its main areas of work are to support:

- ALiSEA network functioning and governance support
- Agroecology Knowledge Gathering & Sharing (undertake agroecology related issue watch, collect case studies, success stories, stakeholders' testimonies…)
- Networking and event organizations (support identification & organization of thematic workshops, Enlarge ALiSEA member basis & strengthening AE alliance,
- Facilitate national & regional studies, research, collective actions…)
- Small Grant Facility

Regional General Meetings (once every 2 years)

Such ALiSEA collective moment at regional level has three folded objectives:

- Presenting main progresses in regards to the agroecological transition in the region (e.g.: outstanding studies, case studies and videos, multi-stakeholders round tables with scientists, farmer leaders, development practitioners, policy makers…)
- Sharing similar ongoing initiatives at regional level to foster synergies and experience exchanges, networking
- Addressing the governance of ALiSEA, including the composition and functioning of the board of experts, the selection/renewal of secretariat members, the achievement and review of the Small Grant Facility, the funding and financial management of the network, etc.
- Discussing and validating the strategic action plan (e.g. priorities). The elaboration of the plans can be done in advance by the secretariat members than presented to the RGM.

Annex 2

List of ALiSEA members

ActionAid Cambodia (AAC)
Cambodia

Agriculture and Forestry Research and Development Centre for Mountainous Region (ADC)
Vietnam

Agro-Forestry Development Consultant (AFC)
Laos

Association for Preservation Nature Resources and Community Development(APEDC)
Laos

Agriculture Development Bank Denmark (ADDA)
Cambodia - Vietnam

Agriculture Science Institute of Northern Central Vietnam (ASINCV)
Vietnam

Aide au Développement Gembloux (ADG)
Cambodia

Association for Rural Mobilisation and Improvement (ARMI)
Laos

AETS (Application Européenne de Technologies et de Services)
Thailand - *Regional*

AGRISUD INTERNATIONAL
Cambodia - Laos

Association de Soutien au Developpement des Societes Paysannes (ASDSP)
Thailand - *Regional*

AVSF (Agronomes et Vétérinaires sans Frontières)
Cambodia - Laos - Vietnam

AVSI Foundation Myanmar
Myanmar

Cambodian Organic Agriculture Association (COrAA)
Cambodia

Center of Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN)
Cambodia

College of Environment and Natural Resources Management, Can Tho University, Vietnam
Vietnam

Bac Tom Stores Chain
Vietnam

Center for Agrarian Systems Research and Development (CASRAD)
Vietnam

Centre d'Etude et de Développement Agricole Cambodgien (CEDAC)
Cambodia

Comité de Coopération avec le Laos (CCL)
Laos

BIOPHAP CO., LTD
Vietnam

CABI - SEA (Centre for Agriculture and BioSciences International - South East Asia)
Regional

Christian Social Service and Development Department of Pathein Myaungmya Sgaw Kayin Baptist Association (PMA-CSSDD)
Vietnam

Community Development Association (CoDA)
Laos

Cambodian Institute for Research and Rural Development
Cambodia

Center for Agricultural Research and Ecological Studies (CARES)
Vietnam

CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement)
Cambodia - Laos - Vietnam - Myanmar - regional

Community Entrepreneur Development Institute (CENDI)
Vietnam

Conservation Agriculture Service Centre (CASC), General Directorate of Agriculture (GDA)
Cambodia

Department of Agriculture, APSARA Authority
Cambodia

Earth Net Foundation
Thailand

Environment Conservation and Community Development Association (ECCDA)
Laos

Consultative Institute for Socio-Economic Development of Rural and Mountainous Areas (CISDOMA)
Vietnam

Department of Food Processing Technology (DFPT), Vietnam National University of Agriculture (VNUA)
Vietnam

ECHO Asia Impact Center
Thailand - *Regional*

Faculty of agriculture, National University of Laos
Laos

COOPERATIVE DES PRODUCTEURS DE CAFÉ DU PLATEAU DES BOLOVENS (CPC)
Laos

Development of Environment and Community Association (DECA)
Laos

ECOLAND
Cambodia

Fauna and Flora International (FFI)
Cambodia

DAN CHURCH AID (DCA)
Cambodia

Doh Taung Thu (Our Farmer)
Myanmar

Enrich Institute
Cambodia

Federation of Farmer Associations Promoting Family Agricultural Enterprise in Cambodia (FAEC)
Cambodia

Food Crops Research Institute (FCRI)
Vietnam

Green Community Development Association (GCDA)
Laos

HEKS/EPER (Swiss Church Aid)
Cambodia

iDE Cambodia
Cambodia

Food Security Working Group (FSWG)
Laos

Green Shoots Foundation
Cambodia

Huam Jai Asasamak Association (HJA)
Laos

Institute for Agricultural Environment (IAE)
Vietnam

German International Cooperation (GIZ) / ASEAN Sustainable Agrifood Systems (ASEAN SAS)
Regional

Green Way
Myanmar

CC (The International Cooperation Center) – Thai Nguyen University
Vietnam

Institute for research and application of development methods (Iram)
Cambodia

Golden Plain Livelihood Development Services Co-op Ltd.
Myanmar

GRET Professionals for Fair Development
Myanmar - Laos - Vietnam - Cambodia

ICCO Cooperation
Cambodia - Myanmar - Vietnam

Institute of Technology of Cambodia (ITC)
Cambodia

International Center for Tropical Agriculture (CIAT)
Regional

Louvain cooperation
Cambodia

Myanmar Institute for Integrated Development (MIID)
Thailand

Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI)
Vietnam

International Volunteers of Yamagata (IVY)
Cambodia

Meaying Huamjai Phattana (MHP) (Woman Mobilizing for development Association)
Laos

Myanmar Organic Grower and Producer Association (MOGPA)
Myanmar

OCKENDEN Cambodia
Cambodia

Karuna Mission Social Solidarity (KMSS)
Myanmar

Mondulkiri Indigenous People's Association for Development (MIPAD)
Cambodia

Natural Farm Kirirom Co. Ltd.
Cambodia

OXFAM
Cambodia - Laos

Khong District Community Development Association (KCDA)
Laos

Myanmar Fruit, Flower and Vegetable Producers and Exporters Association (MFVP)
Myanmar

Network for Environment and Economic Development (NEED)
Myanmar

Participatory Development Training Centre "PADETC"
Laos

Pesticide Action Network Asia and the Pacific (PAN-AP)
Regional

Rehabilitation and Development for Cambodians Organisation (RDCO)
Cambodia

Rural Development Agency (RDA)
Laos

Seed to Table
Vietnam

PGS Vietnam
Vietnam

Research Center for Rural Development (RCRD)- An Giang University
Vietnam

Rural Development and Sustainable Agriculture Promotion (RDSAP)
Laos

Social Policy Ecology Research Institute (SPERI)
Laos - Vietnam

Pha Tad Ke Botanical Garden
Laos

Research Centre for Gender, Family and Environment in Development (CGFED)
Vietnam

Samatoa lotus Textiles
Cambodia

Society for Community Development in Cambodia (SOFDEC)
Cambodia

Plant Protection Research Institute (PPRI), Vietnam Academy of Agricultural Sciences (VAAS)
Vietnam

Rikolto in Vietnam
Vietnam

Samdhana Institute
Laos

Soils and Fertilizers Research Institute (SFRI)
Vietnam

Southern Center for Agriculture and Rural Policy and Strategy (SCAP-IPSARD)
Vietnam

SWISSAID
Myanmar

VIETNAM FARMER'S COOPERATION FORUM
Vietnam

Vivre de sa Terre
Cambodia

SRD The Center for Sustainable Rural Development
Vietnam

Terre des Hommes Italia in Myanmar (TDH-It)
Myanmar

Vietnam Organic Agriculture Association (VOAA)
Vietnam

Wildlife Conservation Society (WCS)
Cambodia

Sustainable Agriculture and Environment Development Association (SAEDA)
Laos

Triangle Génération Humanitaire (TGH)
Myanmar

Vietnam Rural Development Science Association (PHANO)
Vietnam

World Agroforestry Centre (ICRAF)
Regional

Sustainable Development for Highland Communities Association (SuDHiCA)
Laos

University of Battambang (UBB)
Cambodia

Village Focus International (VFI)
Laos

Y-Farm
Vietnam - *Regional*

Annex 3

List of initiatives supported by the Small Grant Facility of ALiSEA

Name of organization	Name of Small Grant Initiative	Knowledge products
Mondulkiri Indigenous People's Association for Development (MIPAD)	Bridging agriculture to ecology conservation among indigenous people communities in Mondulkiri Province	**Case study:** Forestry smart agriculture and livelihoods **Case study:** The transition of forest based medicinal plants to garden based medicinal plant
Myanmar Institute for integrated development (MIID)	Upland Value Chains and Climate Change Adaptation in Taungyoe Ethnic Communities	**Case study:** Addressing the challenges of upland farming in southern Shan state for climate resilience **Case study:** Supporting sustainable livelihoods and reclaiming degraded land by enhancing agroforestry in southern SHAN state
Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI)	Workshop for sharing experience on recycling of rice plant residues for enriching lands with organic matters and in-time cultivation of next crop	**Success story:** "a story of a Dao Woman in Bac Kan Province
UNESCO	Developing of Teaching & Learning Materials	Agroecolgoy **Manual** Agroforestry **Manual** Integrated Agriculture **Manual** Organic agriculture **Manual**
Agriculture and Forestry Research & Development Center for Mountainous Region (ADC)	Promotion of indigenous knowledge based climate change resilient and organic farming practices in the northern mountainous region of Vietnam	**Book:** Promoting Indigenous Knowledge and Good Agricultural Practices in Climate Change Adaptation - English and Vietnamese versions **Sucess story 1:** A story from Mrs Phuong **Success story 2:** A story of Mr Hai
Aide au Développement Grembloux (ADG)	Developing innovative business model for Agricultural Cooperative to produce and collectively supply natural fertilizer to local producers	**Article** on Bokashi **Article** on Awarness campaign **Case study**
Ockenden Cambodia	Promoting Agroecological related Skills Among Local Community and Key Actors	**Three success stories**
Social Policy Ecology Research Institute (SPERI)	Promoting agroecology farming for self-reliant livelihood of local upland farmers through documenting the case of native eco-vegetables of the Hmong community of Long Lan village, Luang Prabang district, Luang Prabang province	**Case study:** Native ecovegetables of Hmong community in Long Lan village, Luang Prabang province, Laos **Case study:** Integration of the ecological vegetables and community cattle breeding in Long Lan village, Luang Prabang province, Laos
Chalmers University	Agro-ecology for resilient and sustainable livelihoods of natural disaster affected groups: Co-evaluation and research in development with smallholders of Tonzang, Tedim and Kale townships in north-western Myanmar	**Case study 1:** Agroecology for resilient and sustainable livelihoods of natural disaster affected communities in Myanmar: Lessons from the STRONG project approach to farmer field schools (FFS) in Chin State and Sagaing Region" **Case study 2:** Addressing climate vulnerability and farming system challenges with local agroecological knowledge: Insights from collaborative research with rural communties in Chin State and Sagaing Region, Myanmar
ECHO Asia	Saving seeds, securing biodiversity, and sustaining rural livelihoods in the Irrawaddy Delta	**Press article:** the value of seed: a growing network of community level seed banks in Asia

Name of organization	Name of Small Grant Initiative	Knowledge products
Terres des Hommes Italia (TdH)	Ecosystem approach for drought resistant home gardening in Central Dy Zone	On-Soil Home Garden **Manual:** Ecosystem approach for drought resistant home gardening in Central Dy Zone, english and myanmar versions
Research centre for Gender, Family and environment (CGFED)	Sharing experience and replication of closed loop agricultural model adapted to climate change for women and local key persons in Nghia Hung District, Nam Dinh Province	**Success story 1:** Ms. Do Thi Hai, Chairwomen of Women's Union, Nghia Minh Commune **Success story 2:** Ms. Mai Thi Dung, Hoang Nam Commune, Nghia Hung District
The Consutative Institute for Socio Economic Development of Rural and Mountainous Areas (CISDOMA)	Promoting agroecology transiton via enhanicng farmers' analytical and decision making capacity through application of simulation games	**Article:** enhancing farmers' analytical and decision making capacity through application of simulation games
RIKOLTO	Capitalisation of Participatory Guarantee System experiences in Vietnam for upscaling & institutionalisation	**Policy Brief:** Building trust in safe and organic vegetable chains through Participatory Guarantee Systems (PGS) **Case Study 1:** "PGS organic in Thanh Xuan, Hanoi – An example of sustainability" **Case Study 2:** "When PGS falters: key lessons for the improvement of PGS in Vietnam"
Toward Organic Asia (TOA)	Young Organic Farmers: the Journey of Hope	**Case Study:** Young Organic Farmers

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Inspiring and innovating stories from the Agroecology Learning Alliance in South East Asia
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The present document is based upon some case studies and research supported by ALiSEA and funded by the French Agency for Development (AFD). The ideas and the opinions presented in this document are the ones of its authors and do not represent necessarily those of the AFD.

2018

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