

# Concept Note

## AGROECOLOGY for South East Asia

### Evolution of DP CANSEA from "Conservation Agriculture Network for South-East Asia" towards creating a research platform on Agroecology

#### 1. INTRODUCTION

This document describes the initiative to build a research platform in partnership in Southeast Asia aimed at accompanying ecological intensification and disseminating agroecology. It is a measure to expand the integration of scientific issues between CIRAD and partners on common challenges, common principles, common practices and common Research & Development (R&D) activities based on Agroecology.

##### 1.1. Background

DP CANSEA originated in the desire to build a sustainable regional partnership to promote the development and dissemination of Conservation Agriculture (CA) in Southeast Asia.

Many projects, funded by AFD, have been implemented by Cirad in partnership with national research institution for many years in the region (Cambodia, Laos, Vietnam). They aimed at developing and promoting farming systems based on conservation agriculture (CA) for environmentally sustainable intensification and diversification of agricultural production.

This long partnership through bilateral projects has provided the following main results:

- Building and sharing of large experience and knowledge in CA development in different agroecosystems;
- Important capacity building in the different countries mainly in the field of agronomy (agronomists, technical staff, ...) and focused on national institutions;
- Vocational and academic training;
- Establishment of specific research centers and institutes (e.g. DALaM in Lao PDR, CASC in Cambodia, and NOMAFSI in Vietnam);
- Promulgation of the Lao national decree (2009) for CA registration as agricultural development practices;

CANSEA network has been established in 2009 between 9 institutions from 8 countries as a result of the positive and encouraging results of these projects, aimed at addressing the various R&D issues related to agricultural development in the region.

The objectives defined in the CANSEA strategic program corresponded to three regional challenges: i) intensification and diversification of mountain farming in Southeast Asia; ii) the restoration of the fertility of degraded soils (erosion, acidity); and iii) the development of human resources through the implementation of academic and technical training programs.

CANSEA is a regional organization structured as a network that may be viewed as a partnership platform for the dissemination of Conservation Agriculture (CA) in Southeast Asia, involving:

- i) the Ministry of Agriculture, Forestry and Fisheries (MAFF - Cambodia),
  - ii) the Yunnan Academy of Agricultural Sciences (YAAS - China),
  - iii) the Indonesian Agency for Agricultural Research and Development (IAARD - Indonesia),
  - iv) the Ministry of Agriculture and Forestry, the Department of Agricultural Land Management (DALaM – Lao PDR),
  - v) the University of Kasetsart (Thailand),
  - vi) the Northern Mountainous Agriculture and the Forestry Science Institute (NOMAFSI)
  - vii) the Soils and Fertilizers Research Institute (SFRI – Vietnam),
  - viii) the University of Queensland (Australia),
- and finally the Cirad.

## **1.2. The current initiative**

CANSEA appears to have functioned more as an institutional exchange network (awareness raising, lobbying) than a scientific platform sharing research and training actions. Its level of activity, production of knowledge, and involvement of members was essentially linked to the existence of projects focused mainly on CA.

In accordance with regional challenges and Cirad organization, CANSEA is entering a new phase and its future orientations aim at enlarging the scope of activities to include agroecology practices (conservation agriculture being one among them), to develop activities in partnership, and to move from being a network to a research and training platform on agroecology for Southeast Asia. The development of scientific activities through a research platform will involve both CANSEA members already working on conservation agriculture and new scientific members to work on complementary subjects for common objectives.

For CIRAD, it is important to:

- Develop a research platform on Agroecology focusing on the design and assessment of Agroecology-based cropping systems,
- Refocus CIRAD's contribution toward research approaches aimed at addressing common identified challenges,
- Initiate exchanges to present regional issues in terms of research and development to promote and develop sustainable agriculture in Southeast Asia,
- Bring together CIRAD's and partners' skills on scientific themes and approaches for designing and evaluating production systems in an agroecological transition.
- Encourage the support to « all » sustainable agriculture approaches towards agroecology principles, by implementing new research and development activities involving all main stakeholders.

## **1.3. Contexte**

After decades of intensification, the agro-business system is now showing its limits; this model is more and more dependent on inputs and fossil energy and presents major negative impacts on environment, economic and social aspects.

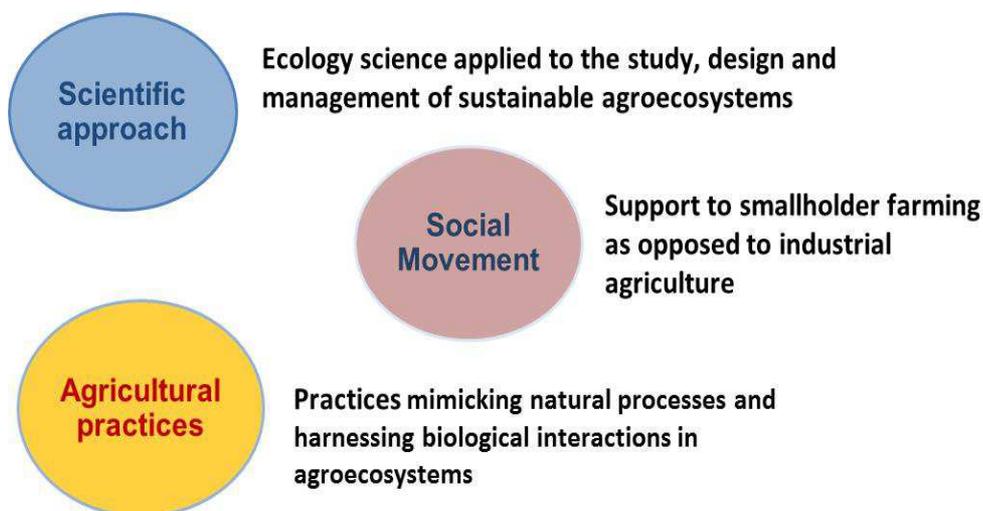
Due to fast growing population, increased pressure on its natural resources, climate change impacts and the necessity to produce more and more food in a sustainable way, South East Asia is at a crossroads regarding agricultural development.

Agriculture (and especially family farming) is now undergoing economic and social crisis combined with an ecological dimension (especially in ecosystem fertility):

- Yield and productivity gain (controlled environment and good agro climatic conditions / soil fertility) reached its limits, especially in terms of cost-benefits with poor performance in fragile environments and where the climate is unstable;
- Deterioration of soil fertility, loss of farmland, decrease in biodiversity, exhaustion of non-renewable resources, deterioration of landscapes, contribution to climate change;
- Family farmer dependency on firms upstream and downstream, indebtedness, pressure from large-scale farms (land and resource grabbing).
- Disappearance of former systems of fertility management (slash-and-burn followed by a long fallow period) and over uses of mineral fertilizers and pesticides;
- Migrations of impoverished farming populations in fragile ecosystems, with finally lack of labor force in countryside;
- High sensibility to extreme climatic hazards (drought and flood) which are more and more frequent including intra and inter annual rainfalls variability and pest and disease outbreaks;
- Constraints on production factors put heavy pressure on farmers' ability to adopt agroecology-based systems, on natural resources, and on the environment.

The Agricultural production faces particular soil and climatic constraints (soils, slopes, altitude areas) and very economically constrained farmers. Moreover the production systems are integrated in commercial agriculture inducing rapid agrarian transition. By the way, village communities are regularly confronted with productivity-related challenges, with rapid transitions from agrarian subsistence farming to commercial farming leading to irrelevant agricultural practices.

Agroecology (AE) approaches are seen as convincing and evidence-based alternatives towards sustainable agriculture. They cover technical, economic, societal and policy dimensions of agricultural production respectful of environment, able to face the different challenges identified. They also contribute to poverty alleviation, food security, climate change mitigation and adaptation with involving all stakeholders of the value chain and decision makers. Agroecology is considered both as a scientific approach, a social movement and a set of agricultural practices:



The set of agricultural practices includes Agroforestry, Conservation agriculture, Agroecological crops protection, Systems of Rice Intensification, Integrated agriculture and gardening (VAC), Organic agriculture. These practices are implemented in a systemic and holistic approach involving high diversity of knowledge in order to design farming systems in accordance with local, socio-economical and agropedological contexts.

They clearly aim at strengthening innovation capacity of family farms, as well as the recognition of their contribution to food sovereignty in the region.

## 1.4. Challenges

The main questions are: How can inefficient, poorly managed smallholder systems be transformed into productive agroecological and sustainable farming systems? And how can environmentally destructive, energy and chemical-intensive industrial agri-systems could be converted into productive agroecological systems?

The overall objective is to develop sustainable rainfed agricultural production with family farming mostly in upland countryside and the challenges are:

- To accompany village communities regularly confronted with productivity-related challenges and rapid market changes,
- To accompany farmers in the current rapid transition from agrarian subsistence farming to commercial farming; Upland farming systems are engaged in a rapid process of agricultural intensification with major environmental impacts (soil erosion, loss of biodiversity), especially regarding overuse of pesticides,
- To accompany rainfed areas engaged in longstanding commercial monoculture and facing problems of land degradation and decreased profitability, pest control, limited access to water, etc.
- To support local communities in designing new strategies to enhance agricultural and new resilient cropping systems based on agroecology,
- To disseminate results and adapted methodologies to extension programs and policy makers to support the implementation of agroecology based alternative approaches for agricultural development,
- To develop innovative methods and cropping systems to support farming systems (and farmers' livelihood) resilience to climate change,
- To develop a global and systemic approach, including agricultural production factors analysis as potential bottlenecks for dissemination, to support alternative agricultural practices in a context of transition,
- To articulate the joint design of cropping systems and multi-criteria assessment of their effects on production performance and ecosystem services on different scales: plot, farm, village community, territory to address the policy makers relevant information.

## 2. Proposals for CANSEA evolution to a research platform:

We propose that the former CANSEA network in a research platform to bring together researchers on common topics related to agroecological approaches. Cirad and its partners should agree to work on common objectives, common principles, common challenges and common strategies.

**The objectives of the research platform** is to aggregate research teams in partnership on Co-design and co-evaluation of sustainable management methods for smallholders' agricultural systems based on the principles of agroecology.

## 2.1. Scientific basis for the research platform.

### The basic scientific questions:

- How to design farming and cropping systems for the sustainable management of natural resources based on the principles of agroecology?
- How to support the scaling up and out of ecological intensification based on agroecological principles in the context of rapid change in agriculture in Southeast Asia?

### Scientific role of the research platform:

To support a dynamic and progressive aggregation of skills around common issues such as:

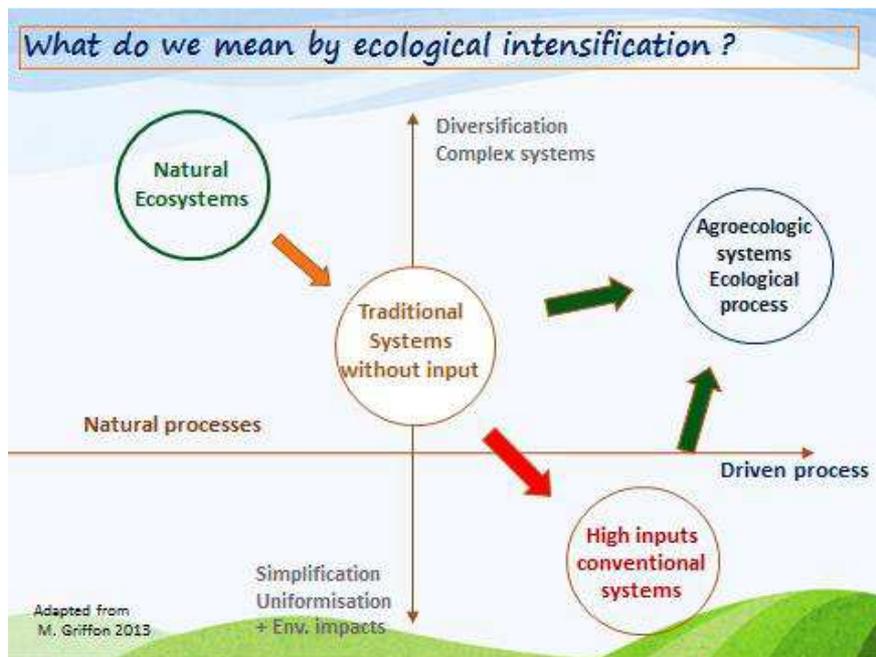
- The sustainability of smallholders' farms facing agro-economic constraints and market fluctuations
- Ecological intensification based on systemic agroecological approaches and practices (agroforestry, conservation agriculture, permaculture, Agroecological Crop Protection, etc.)
- Design and evaluation of integrated production systems supportive of climate change adaptation;
- An integrative approach at different levels to support agroecological transition process including innovation transfer methodology involving all stakeholders;
- Ecological intensification of upland agriculture, including integrated management of the bottoms of valleys, watersheds, and hillsides at the landscape level;
- Improving the performance of agricultural (and rice) fields under high pressure on production factors as water management, land availability and tenure, labor and mechanization, etc.
- Involvement of different stakeholders (farmers, research institutions, development projects, extension services, operators/NGOs, farmers' organizations, etc.) in order to identify common constraints, analyze the bottlenecks identified, and propose relevant partnerships and adapted methodologies.

### Scientific issues for the research platform (next DP Agroecology for SE Asia):

- ✓ To support agrarian transitions with ecological intensification as shown in the illustration below (Griffon 2013), in order to make unbalanced systems evolve into more diversified and better-managed farming systems;
- ✓ Ensure ecological intensification of farming systems that are usually under pressure by integrating animal production, agroecological pest management, constraints analysis, and relations with the market;
- ✓ Combine co-design and co-evaluation methods for cropping systems aiming at ecological intensification;
- ✓ Ensure that strategies and scientific themes are addressing the challenges of sustainable agricultural development and relevant for designing and assessing farming systems;
- ✓ Check and document the capabilities of innovative agricultural systems based on agroecology to cope with the effect of negative externalities and to offer environmental services;
- ✓ Design methods of intervention and support agroecological transition by including all stakeholders, decision makers, and donors in the process of jointly identifying the needs;
- ✓ Promote a territorial approach and landscape ecology likely to enhance innovation towards agroecological alternatives and to give meaning to the proposed development actions;

- ✓ Ensure basic natural resources are valued: water, soil, and plant genetic resources that need to be taken into account at both social and economic levels;
- ✓ Highlight the importance of the context of intervention (the dynamics of change) and of the full range of methods and scales;
- ✓ Fully support the agroecological transition at all levels and in all spheres.

The conceptual framework of intervention is as follows:



We can put emphasis on these following keywords:

Agroecology, Ecological intensification, smallholders' farming, dynamic agrarian environment, climate change, resilience, agroecological transition, territorial and landscape approach, natural resources management.

## 2.2. Strategies and work frame

**Planned strategies:**

- To promote territorial approach and management of natural resources (water, soil) and plant genetic resources (backup, dissemination and exploitation);
- To assess economic, social, and institutional experimentations based on serious simulation games to support the dissemination process of innovative practices based on agroecological principles and to design engineering processes supportive of scaling up and out;
- Promote the ecological intensification of family farming based on all components of agroecology (conservation agriculture, agroforestry, organic farming, etc.) and all components of agro-forestry-pastoral systems (crops, livestock, forest) through participatory and territorial approaches;
- To develop methods and tools for the actors in agroecological transition with particular emphasis on crop diversification and integrated crop–livestock farming systems including all agroecological practices;

- To identify relevant partnerships to study the limiting factors for the dissemination of agroecology-based farming practices;
- To develop agroecological and spatiotemporal management of plant and animal communities and soil health in order to move from a chemical-based approach to balanced and sustainable pest prevention and management.

#### **Potential actions:**

- To involve biological and biophysical indicators such as functional and genetic diversity of soil microbial communities to assess soil health/soil quality and ecosystem services assessment.
- Promote Agroecological crop protection based on biodiversity and relationships (including trophobiosis) between the different agro-ecosystem components.
- To integrate participatory varietal improvement, including disease resistance, as an integral part of crop improvement systems. Genetic improvement of crops should be carried out both in the existing farming conditions and in developing new crop systems
- To establish participatory modeling approaches with local communities to identify ways to improve the management of natural resources within given hydrological territories.
- To analyze the constraints on innovation within territories (villages, watersheds) and define policy tools (institutional change, incentives focused on communities or on different stakeholders) that can boost innovation.
- To establish approaches and methods to propose and support change and innovation with stakeholders at different levels.
- To analyze the consequences and impacts (social, economic, environmental) of these innovations at different levels (from farm to watershed).
- To study natural resources management, especially water, from the plot level to the watershed, including the effects of changes in practices on the resource (quantity, quality, spatial and temporal distribution, etc.).
- To initiate integrated management of the water resources (quantity, quality, spatial and temporal distribution, water flows, etc.) at different territorial or watershed levels, linked to the hydro-agricultural practices identified.
- To analyze the capacity of farmers to manage their relations with the agricultural sector, water management, and public action in irrigated areas.

#### **Methodologies proposed:**

- ✓ Adopt a participatory and territorial approach that places the agroecological transition at the center of multi-stakeholder negotiations on the management of land and natural resources.
- ✓ Utilize a Co-Design engineering methodology incorporating multifunctional plant biomasses that use ecological processes and interactions between genotype and environment.
- ✓ Take into consideration all the factors in the innovation process – technical, economic, social, legal, political, etc. – and the conditions for adoption and diffusion at different levels (institutional, technical, financial, social).
- ✓ Take into account external (especially global) factors for change and long-term analysis focusing on local territories, and build local adaptation to global change scenarios.
- ✓ Capitalize knowledge and manage the knowledge network to inform agricultural policies so as to support the rapid change of highly reactive family farming systems to market dynamics.

- ✓ Initiate integrated management of biomass and forage resources of a given territory aimed at resource optimization.
- ✓ Initiate integrated management of genetic resources (quantity, quality, spatial and temporal distribution, etc.) related to cropping systems and water availability at different territorial levels.
- ✓ Define a set of specifications for developing a concept and a process of evaluation in terms of estimating the value of soil and water resources for consideration in terms of "natural resources" capital.
- ✓ Analyze new forms of organization of agricultural production and the impact of these different forms of organization in relation to the change process and ongoing innovation, their dynamics, their factors and their consequences, and whether technological or institutional.
- ✓ Adopt an integrated approach linking diagnostic studies, innovation processes, adaptive research, monitoring and evaluation, and dissemination.
- ✓ Select/screen crops varieties that will enable cropping systems compatible with the management of natural resources and the various components of the farming system is part of the support needed by the farmers.
- ✓ To link and combine agroecology and conservation agriculture skills on issues related to climate change and rapid agrarian transitions, and share research topics at regional and national levels.

### 3. SWOT Analysis of the project

This analysis is focused on our project of an agroecology research platform, based on CANSEA evolution, aiming at reinforcement of CA and agroecology in Southeast Asia.

#### 3.1. Strengths

Agroecology, as a scientific discipline, a social movement, and a set of agricultural practices, is promoted around the world, in Asia and particularly in Southeast Asia. In this geographic zone, the Food and Agriculture Organization (FAO) organized a Regional Meeting on Agroecology for Asia and the Pacific in November 2015 in Bangkok, confirming the interest and the need for new approaches to feed a growing world population. We need practices that provide sufficient food that are neither risky for human nor detrimental to the environment and that assure economic viability for farmers.

We know that agroecological cropping practices can and should play a central role and our proposal is supported by the following facts:

- Starting from an existing network on such a practice (CA) and establishing a research platform on agroecology-based cropping systems design are relevant objectives to answer current challenges; The current CANSEA network can provide a strategic platform to foster Cirad and partners (national and regional) networking as well as research capacities;
- A lot of know-how has been generated on the production side, and many methods for alternative, sustainable forms of agricultural production have been documented. This rich body of expertise continues to grow. The flourishing organic sector, the growing interest in agroforestry, alternative pest management approaches, permaculture and conservation agriculture, are just a few examples.
- Enlarging the scope of current CANSEA network to all the agroecological practices allows different research teams from Cirad and partners to work together;

### **3.2. Weaknesses**

- Lack of human resources identified to work on the different challenges in ecological intensification of agricultural production;
- Lack of structures/institutes/teams identified currently available to face all bottlenecks and constraints identified for Agroecology dissemination;
- Lack of public policy supporting agroecology dissemination and adapted development of the agricultural production environment;
- Lack of systemic and integrated approaches in agricultural development by the different governmental bodies in charge of rural development and protection of environment;
- Lack of real and operational policy rules to protect rural communities and to protect the environment;
- Need to develop and improve the means of knowledge transfer that includes the participation of farmers to scale up the use of these agroecological production systems;
- Need for massive investments that involve science, research and technology combined with adequate policies and economic incentives to promote and disseminate alternative practices based on agroecology. This necessary transformation of agriculture requires a similar concerted effort for its success as it has been done to the post-war agriculture;
- Absence of broad-based political support, regulatory frameworks and appropriate economic incentives.

### **3.3. Opportunities**

Agricultural production practices remain the central and crucial point as they are the primary factor to produce safe food for future generations. Here, agroecological cropping practices can and should play a central role in order i) to highlight existing best practices in the region, as well as challenges and the strategies to overcome them, and ii) to create the conditions aiming at strengthening agroecology at the country level, while enhancing the opportunities for regional integration.

The CANSEA evolution project is an opportunity to synergize research activities from different teams around common scientific challenges.

Regarding partnerships, we should therefore:

- i) exploit complementarities between countries and institutions in the region (in the area of CA R&D);
- ii) develop synergies with development partners to support the large-scale dissemination of research results;
- iii) capitalize on research results;
- iv) develop regional expertise in CA and agroecology through training and teaching.

The CANSEA network is the framework of an important thematic, geographical, and historical partnership on conservation agriculture and could be a basis for a transition toward agroecology. Through their experience and skills, member institutions could constitute the partners for research activities, so this current CANSEA network can foster partnerships between research, development, and civil society for addressing some scientific issues linked to ecological intensification.

The evolution of CANSEA involves the agroecological transition that needs to be addressed on the basis of its three components: science, farming practices, and social movement. The innovations related to ecological intensification practices require guidance and a participatory approach.

### 3.4. Threats

- Even if, in Laos, DALaM is a key player in the area of land management, partners involved with Cirad in R&D projects based on AE and CA do not represent the mainstream of national agriculture research in their countries.
- The partnership has been established through cooperation on common projects mainly funded by AFD. These funding will not be maintained in the future. It will be necessary to raise funding adapted to the goals of Agroecology dissemination.
- The level of the institutional dimension of the mobilization of stakeholders is not guaranteed.
- CANSEA network is likely to expand both geographically and thematically, depending on funding opportunities and the commitments of different stakeholders involved.
- Institutional network visibility is an issue, both for its sustainability and its ability to mobilize resources and set up projects.
- Pressure for increasing food production is very strong and natural resources are not considered as valuable, meaning that agroecological practices are disregarded.

## 4. Conclusion

This current proposal to aggregate research institutions on agroecology seems to be able to answer the former questions:

- How can inefficient, poorly managed smallholder systems be transformed into productive agroecological systems?
- How can environmentally destructive, energy and chemical-intensive based industrial cropping systems could be converted into productive agroecological systems?
- Does agroecology approaches and practices able to face the main challenges identified?

There is a high interest to develop Agroecology based farming systems in a context driven by the extremely quick agriculture transition based on the "agribusiness second green revolution" led by high consumption of chemical inputs.

The Agroecological transition proposed is not only an environmental and climate change friendly approach but also a reasonable socio-economical choice.

The evolution toward a research platform by aggregating research teams from Cirad and its partners is based on the common willing to face the major challenges identified at promoting and developing a sustainable agriculture in GMS countries.

We clearly choose to promote ecological intensification and agroecology principles and practices due to their ability to face the different challenges

We should be able to establish relevant partnerships and cooperation inside and outside Cirad to support a multidisciplinary and integrative approach which is now needed to support the development of alternative approaches for sustainable agriculture.