# Recherches-système en agriculture et développement rural

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# *Systems-Oriented Research in Agriculture and Rural Development*

***International Symposium***

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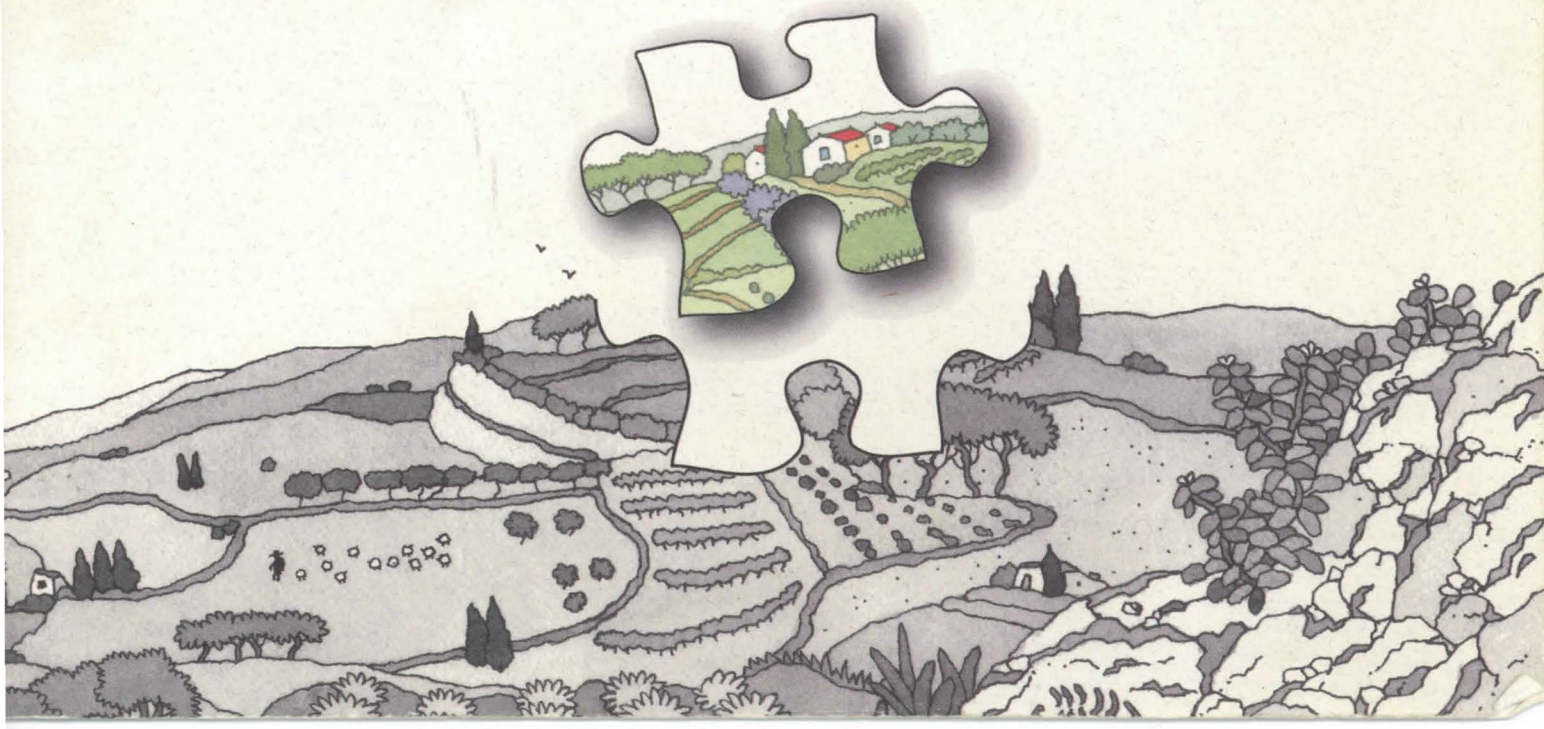
**Communications / *Papers***



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# Recherche-développement et réhabilitation de périmètres irrigués sur les Hautes Terres malgaches

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***Résumé***
*La réhabilitation de réseaux hydro-agricoles sur les petits périmètres irrigués des Hautes Terres malgaches a suscité une interrogation sur les moyens nécessaires à la valorisation et à l'entretien des périmètres réhabilités. Un programme de recherche-développement a été mis en place pour répondre à ces questions. Paradoxalement, après une étude des systèmes agraires dans leur ensemble, il apparaît que ce n'est pas du riz, pourtant omniprésent dans le paysage comme dans la culture, que pourra venir la valorisation des périmètres, mais plutôt des cultures de contre-saison, de l'élevage ou de l'arboriculture.*

***Mots clés***
*Irrigation, réhabilitation, système agraire, système de production.*

## Le projet de réhabilitation

La dégradation rapide des infrastructures hydro-agricoles, normalement entretenues par l'administration, a nécessité la mise en place d'un projet de réhabilitation des petits périmètres irrigués (100 à plus de 2 000 hectares de surface irriguée). Dans le cadre du désengagement de l'Etat, il a été décidé que cette réhabilitation se ferait en transférant la gestion et l'entretien régulier des réseaux hydrauliques et des ouvrages aux usagers. Le projet national affiche une ambition importante puisqu'il vise ainsi la consolidation de l'outil de production de 142 000 hectares (116 périmètres) sur les 700 000 hectares de surface irriguée à Madagascar (figure 1).

## La recherche-développement

Le programme de recherche-développement doit contribuer :
– à l'adaptation et la consolidation des exploitations agricoles ;
– au renforcement de leurs revenus à travers l'accroissement des productions agricoles ;
– à la prise en charge par les producteurs et leur organisation des infrastructures réhabilitées.
Des axes de travail sont identifiés pour prendre en compte tous ces aspects (figure 2).

## Méthode de travail

L'équipe pluridisciplinaire est composée d'un agronome généraliste, un agro-économiste, un agronome système de culture, un agronome protection de bassin versant, une zootechnicienne et une sociologue, neuf assistants de recherche et dix observateurs affectés sur le terrain
Un réseau de hameaux-test (10) et d'exploitations de référence (50) représentatifs de l'ensemble des hameaux et de l'ensemble des exploitations de la région étudiée permet de réaliser :
– des enquêtes ponctuelles sur des sujets divers : bois, alimentation du bétail, système de culture... ;
– des suivis : trésorerie, marchés, troupeaux ;
– des expérimentations d'innovations : nouvelles variétés, techniques culturales, associations, rotations, mais aussi crédit et organisation.

## Résultats

• Une meilleure connaissance du milieu et du fonctionnement des exploitations (figure 3) : on retiendra entre autres la classification en quatre grands types de fonctionnement selon la structure de l'exploitation et le calendrier de trésorerie dépendant des objectifs et des stratégies des exploitants.
• Des possibilités de développement :
– à court terme : intérêt du crédit garanti par les productions stockées localement, des cultures de contre-saison sur rizière pour assurer un revenu complémentaire et la fumure du riz, principale culture autoconsommée, de la rizipisciculture ;

– à moyen terme : amélioration de l'élevage par une meilleure prise en compte des problèmes d'organisation de la prophylaxie, d'alimentation et de génétique ;
– à long terme : développement de l'arboriculture fruitière et forestière.

## Conclusion

Il est possible de formuler des recommandations à partir des enquêtes, suivis et expérimentations réalisés. Les propositions pour le développement de la région, la valorisation et l'entretien des infrastructures réhabilitées ne concernent pas directement des modifications de la culture du riz mais :
– à court terme, le crédit lié à un stockage villageois, les cultures de contre-saison sur rizière et la rizipisciculture ;
– à moyen terme, l'amélioration des systèmes d'élevage en commençant par l'organisation de la prophylaxie et l'alimentation avant d'aborder les problèmes génétiques ;
– à long terme, l'amélioration de l'arboriculture forestière et fruitière pour la production de fruits, de bois et la protection des bassins versants.

## Pour en savoir plus

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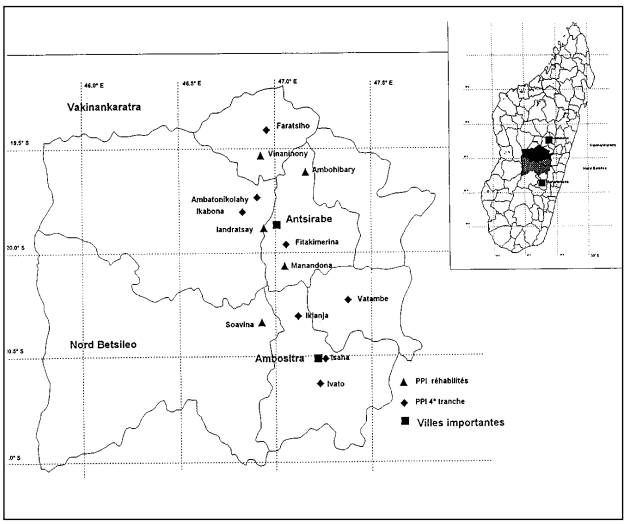


***Figure 1.*** *Situation du projet.*

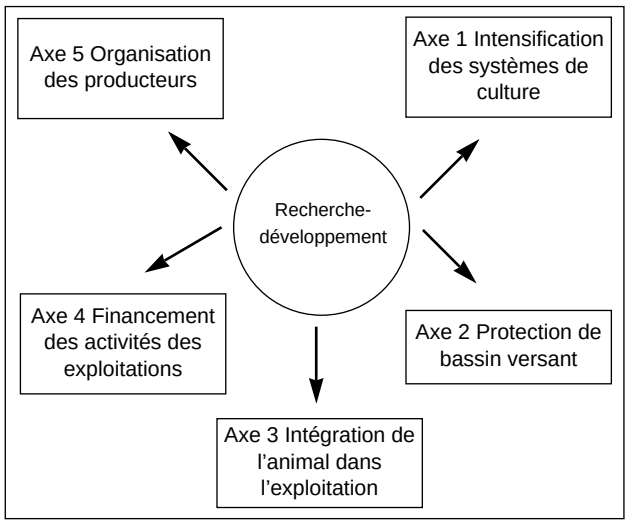


***Figure 2.*** *Les axes de recherche.*

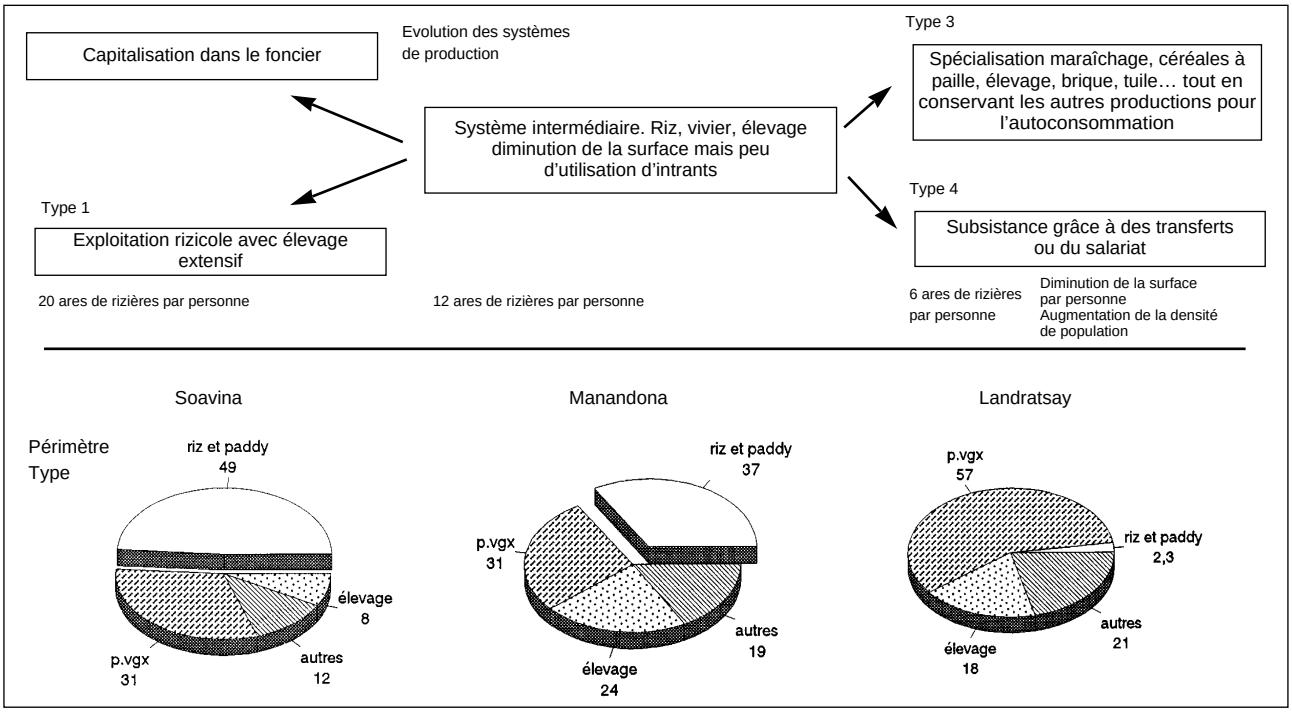


***Figure 3.*** *Typologies des systèmes de production.*

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# Diversity of Highland Farming Systems in Northern Thailand

## A Case Study on the Rice Production Systems of Karen Farmers

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Karen people are of Tibeto—Burman ethnic origin and have lived in the mountains of the border areas of northern Thailand and Myanmar for the past 600 to 700 years. There are about 300 000 Karen living in Thailand, where they comprise approximately 52% of all hill-tribe people. Their major principle—to live in harmony with nature—is supported by their traditional beliefs and cultural heritage.

Karen farmers are known as specialists in developing paddy rice fields and small-scale irrigation systems along narrow river valleys, where alluvial soil deposits exist. However, potential paddy land is very limited in the mountainous settlement areas of their villages. The Karens' social structure and settlement patterns are well adapted to taking advantage of all types of available land resource, which has led to the development of small scattered villages, many in inaccessible, marginal, mountain forest areas. Key factors are the ability of the Karen to redistribute population through exogamous marriage, and their willingness to move and settle far away from their relatives. As land for paddy rice production was limited and the population was increasing, Karen farmers developed a sustainable upland rice farming system. They elaborated swidden systems, which are ecologically sound because annual crops are planted for only one year following a long forest fallow period of 8 to 10 years. More than 100 different species, with several varieties of cultivated and useful uncultivated crops (herbs, medical plants), have been found in swidden and fallow land. This system based on short cropping and long fallow periods can effectively maintain soil fertility, prevent soil erosion, and control grass weed infestation, as it enforces forest recovery within four years of planting. This highly diversified upland rice cropping pattern helps to reduce production risks and assures the production of a wide variety of food and other supplies to fulfil basic needs (ie, for houses, cloth, and traditional medicine).

This poster presents the results of a participatory rural analysis (PRA) of the diversified production system of the Karen farmers in Tambon Huai Poo Ling, Mae Hong Son district and province, Thailand, which is a project area of the Thai-German Highland Development Programme (TG—HDP).

The majority of farmers in Huai Pool Ling still practice a well-organized traditional swidden farming system, due to remoteness and very limited road access. Even though the Karen have been there for over 100 years, 86% of the total area is under forest or forest fallow. They produce a wide range of crops for subsistence and can harvest more than sufficient rice for basic consumption needs in an average year. However, their traditional farming system is changing, due to population growth, infrastructure development, increasing integration into the cash economy, and the provision of government services.

In a series of village meetings, participatory appraisal, visualization, and analytical tools have been applied to identify interventions for the development of farming systems with farmer participation. These interventions are aimed at intensifying the traditional swidden and paddy cropping systems gradually taking account of farmers' indigenous knowledge and their need to maintain their role as the main actors at all stages of the development process. This should ensure that intensification of the system will be sustainable and will lead to reduction in pressure on remaining forest resources, while also improving quality of life for villagers.

During the PRA process, it was found that the Karen farmers in Tambon Huai Pool Ling were using seven cultivars of paddy rice and 21 cultivars of upland rice. More rice cultivars were used in upland fields than in paddy fields, which corresponds with the larger diversity of upland niches. A farmer usually grows two paddy rice cultivars and between five and eight upland rice cultivars, most of which are 'non-waxy rice' (typically used and preferred by the Karen people), as stated by farmers. The several cultivars of 'waxy rice' or glutinous rice planted are used only in special ceremonies. Farmers store the seeds of each cultivar separately, and plant them in different portions on land. They can distinguish various cultivars from the shape of the seed and the habitus of the plants, and collect seeds from those that are healthy and high yielding.

The diversity of rice cultivars has helped to stabilize rice production over the years and reduces risks from pests and diseases. The farmers developed cultivars for short and long vegetation periods to reduce the risk of unfavorable weather conditions during the flowering and harvesting periods and to overcome labor constraints: they can gradually plant and harvest each cultivar individually.

Karen farmers are familiar with the concept of 'experiment'. They are continually trying 'new' rice varieties that are known to perform well. They obtain this information and seeds from neighbors growing the 'new seeds', relatives, or farmers from other tribes in villages sometimes far from their own. Government and nongovernment development agencies also introduce new rice varieties.

The names of some varieties indicate the origin of the cultivar or the farmers from whom it was received. For example, '*bue khae*' upland rice has its origin in either Lisu or Hmong hill-tribe villages. '*Bue Naw Mue Rue*' upland rice was obtained from Mrs. Naw Mue Rue, who lives in another village. Study of the names of different rice cultivars can reveal the local information network.

If in the first year, the 'new' variety performs well, farmers will keep some seeds to try the following year. After about three years, farmers will have gained enough experience to be confident in planting a larger area. Even if it does not do well in the first year, some farmers still experiment in the second, reasoning that "it might not have got used to its environment yet." Karen farmers are extremely open to testing and adopting new varieties that have proved successful, but they are also very careful not to lose their own cultivars. During an 'experimental' process, cultivars that do not perform well are dropped.

The farmers' judgement of acceptable or unacceptable rice varieties corresponds to their main household objectives such as productivity, security, and continuity. Farmers evaluate each cultivar by investigating those aspects of the varieties related to fulfilling the objectives. Aspects include yield level and consistency, resistance to pests and diseases, and plant characteristics (ie, height, tendency to shed, early or late variety, tiller fall or not, hairy or bald husks, and the taste of the boiled rice). These selection criteria are prioritized differently from household to household according to household resources and social relationship. The farmers' descriptions of some rice cultivars illustrate the criteria used for selection as follows.

'*bue jao hom*'. This improved paddy rice cultivar provides a high yield of 80 tang per 1 tang of seed, whereas other varieties yield, on average, 45 tang per 1 tang of seed. It is an early variety, which is preferred by households. It did not produce sufficient rice in the previous year. This cultivar does not like cold water and, as it is not a photo-sensitive variety, is suitable for planting on plots where effective rains are late. Traditional, photo-sensitive varieties usually provide low yields when planted in such plots.

'*bue suu khi*'. This cultivar is considered to be an "upland rice cultivar for the poor." It provides a secure average yield of about 45 tang per 1 tang of seed. When cooked, it rises well in the pot—the main reason for poorer farmers' preference for this cultivar. The taste of *bue suu ki* is not greatly appreciated.

'*bue phlow pli*'. Only farmers who do not have paddy fields grow this upland rice cultivar because it is usually harvested with paddy rice, late in November. It tastes very good.

During the exercise of studying and analyzing the farmers' rice production system, it was found that farmers are open and willing to test new cultivars; however, they start carefully, with only small amounts. If varieties prove successful, the farmers multiply the seeds themselves and distribute them to relatives and neighbors in their own network in order to exchange information. However, it has become evident that farmers tend not to replace their traditional cultivars entirely with the successful, high-yielding varieties introduced by the project and government extension services. In addition, farmers have not been disappointed with unsuccessful varieties, as this is part of their own experience in discovering new technologies within their concept of experiment.

Since 1992, the TG—HDP has supported Karen farmers in testing new paddy and upland rice varieties. It is capitalizing on the farmers' concept of experiment by using on-farm research trials to test different options that may fit the traditional cropping system. These trials are evaluated by the farmers, with support from project and extension staff who use participatory appraisal methods during field visits and village meetings. The on-farm experiment plots are also used as sites for exchanging information and ideas with other farmers from surrounding villages during field days; the plots are also aids in training extension staff to identify with ease cropping system interventions suited to farmers' circumstances. This strategy is being used by the project to identify and provide more options for farmers to increase and intensify production without risk.

Using this approach, farmers are at present testing and screening 72 paddy rice varieties received from the International Rice Research Institute (IRRI, Philippines) for highland conditions. This should induce a selection process for finding higher yielding paddy cultivars, and for increasing farmers' access to paddy rice genetic resources. Following the first harvest, farmers selected 27 varieties with which to continue. A similar strategy has been used to introduce red kidney beans (*Phaseolus vulgaris*) as a cash and subsistence crop, rhizobium strains for soil improvement, and pigeon peas (*Cajanus cajan*) for buffer strips and hedgerows, and to test intensive fallowing.

In conclusion, the Karens' traditional, highly diversified rice production system can sustain farmers' livelihoods for hundreds of years. However, due to change—population growth and increased cash demand—these extensive systems must be intensified. Nevertheless, the approach to transforming the traditional system must be based on the farmers' indigenous knowledge, in order to utilize their concept of experiment and the local information network. The extension approach must help farmers intensify their systems with the support of extension workers, who provide information and small inputs of various new and different options for farmers to test. The farmers select and apply those options that fit their systems. The extension and farmers' networks then provide the channels for the dissemination of farmer-approved technologies.