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Trade-off and synergies of integrating intensive Livestock production with Agroecology in Mountainous regions

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Cattle fed by cut & carry of elephant grass in the Dien Bien district (© Han Anh Tuan)

Key results and lessons learned from the Action

The analysis of the diversity of mixed crop-livestock systems in the mountainous area of North-West Vietnam made it possible to identify a typology of farms according to a gradient of crop-livestock integration and intensification of livestock systems (Blanchard *et al.*, 2018). Each type has its specific constraints and production objectives.

Intensive farming systems (type A) depend on the outside resources to feed their animals in stalling with rice straws, cultivated forage and concentrates (rice bran, corn, etc.) and with access to free grazing on paddies rice in lowland after each harvest.

Semi-intensive farms with a strong crop-livestock integration (type B1) feed their animals with stored rice straws, cultivated forage and concentrates (rice bran, corn). In the rainy season, animals move to the slope lands after harvest, or to pastures in the forest and have access to free grazing on paddies rice in lowland after each harvest.

In the **mixed farms with poor crop-livestock integration** (type B2), animals are not in stalling, except at night and are fed with stored rice straws and natural grasses cut and carried. They are led to pasture all year around. They rarely use supplements and do not grow forage.

In the **extensive mixed farms** (type C), the cattle and buffalo graze in high-altitude pastures and slope lands with control by a shepherd. Animals can come down again to access to free grazing on paddies rice in lowland after the winter harvest.

Scenarios for improving the feeding of cattle and buffalo that follow principles of agroecology have been defined with farmers, the extension services and the local authorities (Van Moere, 2018): (S1) establishment of a forage crop of *Pennisetum purpureum*; (S2) intensification of the crop of *Pennisetum purpureum* (irrigation, fertilisation); (S3) implantation or substitution of Pennisetum purpureum by *Panicum* maximum; (S4) establishment of an intermediate crop of *Stylosanthes guianensis* in paddies rice. The options need to be adapted to the types of farms to meet their specific objectives and take into account their own constraints. Intensification of *Pennisetum purpureum* is the best option for intensive farm. If the necessary investments are not possible, the change for *Panicum maximum* is an interesting way. Alternative options need to be devised to improve feeding of extensive farms by improving the management of collective pastoral resources.

The **modelling tool Xác định mô hình** (Find out the model), specially designed and adapted to the farms of the zone makes it possible to assess, in the context of the diversity of farms an economic balance, the fertilization, the feeding of the animals and the available productions to sale (Van Moere, 2018). This tool is a support for discussion of change for farmers, the extension services and the researchers based on indicators and graphics that make sense for them. It allowed for a participatory assessment of the implementation of scenarios in each type of farm and discussed the feasibility of their implementation.

Context of the Action

The mountainous regions are dominated by smallholder farms integrating crop-livestock system and very diversified. Those regions have known a significant population growth, a land redistribution and livestock privatization accompanied by deforestation and extension of monoculture on the hill slopes generating soil erosion and nutrient losses. Some agroecological options were tested with many technical options to enhance soil health and sustain long term crop productivity with no tillage practice, the maintenance of soil cover, and a diversification of the crop system. Grasses and legumes have been identified as cover crops and potential source of forage (Husson et al., 2001). Livestock farming remains pastoral with use of forage resources on upland pastures, under natural forests, but also on fields after harvest (rice, maize), along roadsides or with forage production. Intensive livestock production is in full expansion (growing market, income generation, valorisation of resource and space, support from local authorities) but the winter season is rigorous and dry. It leads to a forage deficit for livestock hindering the current development of beef cattle production.

Conservation agriculture and livestock production systems are considered in competition for the use of biomasses. There is a strong need on creating synergy between these two activities and create the condition to integrate an intensive livestock production and an agroecological development in the landscapes (production, income and sustainability).

➞ *How to bring farmers and village communities to adopt agroecological options while combining beef cattle intensification?*

Free grazing on paddies rice while slopes land are under production (© Blanchard)

Objectives of the Action

The action aims to analyse with the diversity of actors (farmers, extension services, private sector, and local authorities) the reasoned integration conditions of the agro ecological options and intensive beef cattle production in the diversity of crop-livestock mixed farms and in the territories.

We propose to generate knowledge on innovations that support the integration of intensive livestock and agro ecology in small mixed farms to promote integrated systems. It will be a question of defining innovation tracks to be implemented to reinforce the synergies and to minimize the compromises between these two systems of production.

Partnership

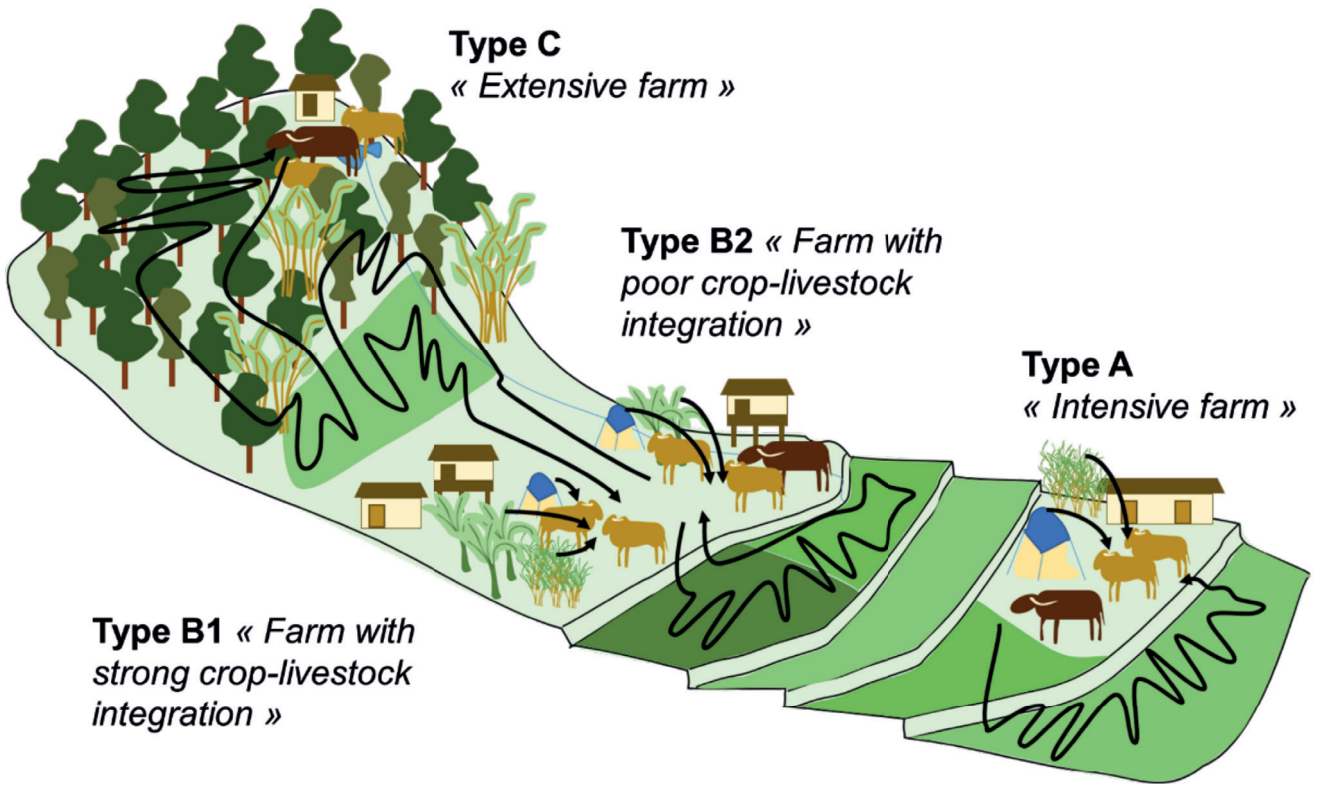
The proposed partnership is based on 4 research institutions involved in projects on the development of intensive livestock production and agro ecology projects in mountain areas of Vietnam and Laos: French Agricultural Research Centre for International Development (CIRAD with UMR Selmet and UR Aida), the National Institute of Animal Science (NIAS) and the University of Tasmania and University of Queensland.

Location and description of the Action

The action took place in two zones of North Vietnam concentrating the problems of soil fertility management and erosion control, and strong development of beef cattle production. **Điện Biên Province** in the far north-west of Vietnam is a strongly pastoral zone, with livestock more or less integrated with agricultural production mainly rice. **Sơn La Province**, on the border of Laos in North-West Vietnam is a more diversified province with cattle, buffalo and beef cattle production in the hills, production of maize, cassava, fruit and coffee on the slopes land and pig production and rice in the low lands.

The action has five main activities:

- A synthesis on production and use of forage, conservation agriculture and agro ecology in Northern Vietnam and Laos.
- A diagnosis of the production and use of biomasses (forage, crop residue, manure) in a diversity of farms in two villages, one in Điện Biên Province and one in Sơn La Province, to produce a typology of farm diversity of the mountainous areas.
- An adaptation of a farm-modelling tool to the regional context and the typology of farms
- The co-design, with a diversity of actors, of improvement scenarios of feeding animals respecting the principles of agro ecology.
- A participatory assessment of the impact of these scenarios (economics, sustainability, production, feed and pasture management) using the modelling tool as a support for discussion with farmers.



Typology of mixed crop-livestock farms (Blanchard et al., 2018)

Expected impacts and prospects

The action made it possible to recognize the diversity of crop-livestock farms in the mountainous areas and to adjust the intervention proposals to the constraints and specific objectives of each type of farm.

The participatory approach created knowledges (resources management, livestock holder's c onstraints, etc.) among all actors that are now actionable when the setting of a concrete actions comes.

The action has produced a simulation tool for mixed crop-livestock farms which can still be more detailed (integration of the natural resources feeding values, extension of the time step, etc.) and thus enables a better comprehension of the producer strategies and adjust the action of local institutions. The enrichment with a wide range of possible options (forage production, conservation agriculture practices, etc.) could incorporate a process of advice and support for farms in the region favourable to the development of agroecology.

Useful links and contacts

Blanchard M., Do Van, D., Hàn Anh T., Thanh H., 2018. Agro-pastoral diagnosis of the mountain areas of North-West Vietnam. Chiềng chung commune (Mai Sơn District, Sơn La Province) and Thanh Yên commune (Điện Biên District, Điện Biên Province). Report in: TAG ACTAE Project. 40p.

Van Moere C., 2018. Evaluation des synergies entre intensification de l'élevage et options agroécologiques : modélisation de scénarios dans le Nord Vietnam, Mémoire de Master, ISTOM, 2018.

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