
Towards new modes of governance of the research–development continuum to facilitate the dissemination of agricultural innovations in a mountainous province of northern Vietnam

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Abstract: The mountainous regions of northern Vietnam have, thus far, failed to share the impressive economic development that has blessed the rest of the country in the past decade. Despite the multiplicity of Research and Development (R&D) projects working there with the common objectives of agricultural development and poverty alleviation, lack of coordination among projects can limit the effectiveness of development actions beyond the original place they were carried out. Moving from experimental development projects to actual implementation of results on a large scale requires defining mechanisms for better coordination among R&D projects and testing them in a real development context. Since 2000, a collective of R&D projects has developed such an approach in Bac Kan Province. It involves both organisational and technical aspects such as the management of databases, the testing of innovation, the provision of decision support aid for the diffusion of innovation, and the formulation of development policies.

Keywords: mountain agriculture; governance; research-development continuum; agricultural innovation; Vietnam.

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1 Introduction

The standard approach to agricultural extension associated with technology transfer is based on the hypothesis that the intrinsic value of a technological innovation is enough in itself to guarantee its diffusion. However, even if a technical proposal can respond to a specific problem, experience has shown that, in many cases, it is simply not sufficient to ensure that the proposal is adopted by farmers [1]. Technology-oriented extension, which was efficient under the centrally managed cooperative system in Vietnam, is no longer reliable in the present family-based farming systems. The outstanding progress made in agriculture over the past few years is more due to the emergence of markets than to the diffusion of technical information [2]. It is, thus, important to anticipate future changes and adapt agricultural extension to suit future cooperative models that will be based on community resource management [3]. In order to facilitate the diffusion of innovation in

the complex biophysical and socioeconomic contexts of mountainous regions [4], advantage has to be taken of the considerable potential that exists in the large number of R&D institutions and projects implanted there. Between the years 2000 and 2002, we were able to develop new methodological and institutional approaches to diffuse innovative alternatives to slash and burn systems and we tested these alternatives onsite in Bac Kan Province. First, this paper discusses the limits of the present agricultural extension system in Bac Kan Province that incited us to propose that R&D projects enter a new partnership mode. We then present the collective approach we used for three years to face the challenge of the diffusion of innovation in heterogeneous mountain environments. The third part of this paper describes the main lessons we learnt from this experiment and suggests how to further strengthen this collaborative approach as well as how to transfer it to other contexts.

2 Toward new governance modes of R&D projects

2.1 Problems involved in the diffusion of agricultural innovation in mountainous regions

The extreme diversity of the physical and human environments has been identified as one of the main obstacles to the diffusion of innovative cropping systems proposed by different projects in Bac Kan Province [5]. Technical information has to be adapted to local circumstances, and this implies a weighty agrarian diagnostic apparatus [4]. Once the constraints have been identified, there comes the equally problematic implementation stage, since provincial extension systems or R&D projects often do not have the human and financial resources necessary to cover the agro-ecological diversity found in such large areas. This is why projects tend to concentrate their efforts on a limited number of pilot sites and are then faced with the enormous difficulty of validating their results beyond these test sites. For this reason, the impact of innovations outside a project's zone of influence is often limited.

The second constraint that affects the innovation process is that only a small amount of knowledge is capitalised from experience gained from different national and international R&D projects. By ignoring the past successes and failures of different projects, development stakeholders are forever reinventing 'new' solutions, many of which have already been tested with varying degrees of success. Despite the good intentions of all these projects, their mode of operation and the lack of coordination between projects have become an obstacle in achieving a visible and measurable large-scale impact.

2.2 From the vicious cycle of good intentions to the benefits of coordinated R&D projects

In Bac Kan Province, the extension system was structured around independently led projects in liaison with the Department of Agriculture and Rural Development (DARD) [6]. With the help of CIDSE, an international NGO, agricultural extension activities were initiated immediately after the end of the collectivisation period, even before the 13-CP decree concerning agricultural extension was signed by the Vietnamese government in 1993. Extension services have good geographic coverage, but limited

funds for equipment and human resources force them to lower their profile and consequently limit their impact in the field. However, Bac Kan Province does benefit from aid from a large number of national and international projects (research institutions, bilateral or multilateral projects, NGOs, etc.) that contribute equipment and training programs. These projects also play an important role in giving direction to the way in which activities are conducted and contribute to defining development priorities. The mere presence of so many projects is advantageous since they multiply the number of activities and the geographic regions affected. It must be said, however, that despite their common objectives (sustainable agricultural development, the elimination of poverty, the management of natural resources, etc.) and the partners they may have in common (agricultural and extension services), these projects often function independently. The phenomenon of isolation has its roots in the design of the projects, and continues later in the implementation stages:

- Reading project documents, it is clear that for reasons of institutional profile and international recognition, project organisers prefer to avoid the geographical areas where projects have been undertaken, and to avoid duplicating the topics of other projects in the province. Local and national authorities in Vietnam encourage this because they want foreign aid to be as widespread as possible. This makes the cost of coordinating different projects very high.
- Different projects lay claim to their own original development approaches that are often thought to be incompatible with the approaches used by other projects. Intervention calendars, internal logic and the criteria used for the evaluation of the results of different projects are also obstacles to coordinating R&D actions.

The procedure of project definition may result in a wide diversity of approaches and a wide geographic cover. However, due to individual project management constraints, in Bac Kan the lack of coordination at the provincial scale leads to the paradox of:

- a duplication of activities or a gap between activities
- a very low level of capitalisation on results outside the immediate zone and time-frame of the project
- a situation in which projects compete for qualified agricultural extension agents.

Development stakeholders acknowledge that better coordination would increase the impact for everyone, and yet the absence of such coordination often leads to paradoxes that are overlooked by the development community. The activities that coordination imposes – the governance methods it supposes – take last place on every project's specification sheet. This continues to be true despite the fact that coordination has always been considered favourably by project evaluation teams, even if they systematically underestimate the time needed to put such coordination into practice.

Several coordination initiatives have been introduced in Vietnam to facilitate the circulation and exchange of information. The first of its type was launched in 1993 by a consortium of NGOs. The NGO Resource Center (www.ngocentre.netnam.vn) has been publishing a yearly directory of international NGOs since 1998. It also manages a reference library and holds forums to bring NGOs and State organs together. Even more recently, in 2001, the 'Vietnam Development Information Center' (www.vdic.org.vn)

was created through aid provided by donors, especially by the World Bank, the UNDP and several foreign governments. This centre aims to open Vietnam up to the rest of the world through more efficient use of information technology (e.g. video-conferencing, electronic libraries, the internet). It provides a portal through which the development aid community can get to know Vietnam better. These initiatives prove that development stakeholders are in favour of coordination. However, although this type of activity is common at the national level, it has yet to filter down to provincial and local levels.

Our experience in Bac Kan Province showed that the coordination of R&D requires both political readiness and a collective commitment. It also requires the use of specific tools and methods as well as precise know-how in networking and partnership management. These aspects of coordination, which have not yet been recognised by the scientific community, form a new research topic [7].

3 The coordination experiment conducted in Bac Kan Province in 2000–2002

3.1 The creation of the ‘Bac Kan coordination group’

At the end of 1999, representatives of different projects in Bac Kan expressed their desire for coordination to the provincial authorities mentioning the problems listed above. The representatives hoped that the provincial People’s Committee, which was represented in the steering committees of each project, would take responsibility for the coordination effort. But the provincial administration did not have the necessary know-how to implement the coordination requested by R&D stakeholders. In 2000, the ‘Bac Kan coordination group’ was gradually created through a collective learning approach (Box 1). The group is made up of representatives of national and foreign projects working in Bac Kan Province together with their local partners (at district, commune, village and household levels) and has the common objective of rural development in the broadest sense of the term, i.e. the eradication of poverty, development of human and institutional resources, improvement of the health system, etc. The collectively defined coordination objectives are as follows:

- to share information on the successes and failures of other projects so as to learn as much as possible about other people’s experiences
- to boost efficiency by avoiding duplication
- to capitalise on the acquired know-how of group members and make this knowledge available to the entire R&D community.

In order to achieve these objectives, specific tools and methods were designed and tested in collaboration with group members.

Box 1 The successive stages of the creation of the Bac Kan coordination group

In 2000, the vice-president of the People's Committee (PC) expressed her willingness to improve coordination between research–development projects in Bac Kan Province. But when the participants asked the PC to be in charge of coordination, the vice-president answered that those responsible for foreign projects should start by improving coordination amongst themselves, after which the province would see what it could do to take it from there. We decided to meet this challenge.

Since none of the group members had any previous experience in this area, we dedicated our first meeting – held in Hanoi in March, 2000 – to a discussion between representatives of the NGOs that had been involved in similar approaches in other provinces. A representative from OXFAM UK presented the lessons learnt from an experiment conducted in three provinces – Tra Vinh, Lao Cai and Ha Tinh. These lessons can be summarised as follows:

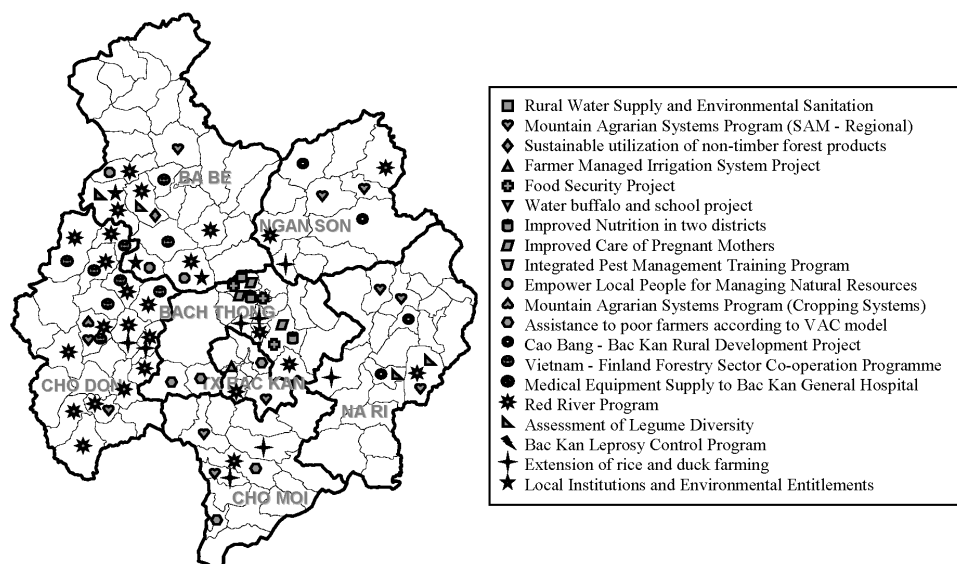
- Provincial authorities must be active participants in coordination.
- One or two organisations must take charge of the activities. These should be NGOs since they have better contacts with local authorities. The quality of human contact is the key to success, and confidence building takes time.
- If the organisations think in terms of projects there is a risk that they will put the value of coordination and networking into question and, by doing so, will minimise the objective, which is to reproduce results on a large scale.
- Organisations must have clear individual strategies before getting involved in partnerships, and they must be convinced that they can gain from coordination. Problems that could get in the way must be solved before the group is formed and negotiations begin, especially negotiations with provincial authorities.

The examination of these different points led the group to cooperate and share information informally before making a further commitment to inter-project coordination. Gradually, the group became more structured and certain projects took on different responsibilities: a project information database system was created, a project directory was released in 2001 and 2002, cross field visits were organised, thematic sub-groups were formed, one concerned with agriculture and one with health. In 2001, the 'Bac Kan coordination group' was officially set up under the auspices of the provincial People's Committee.

3.2 Coordination instruments

3.2.1 Integrating and capitalising on knowledge

One of the first steps in the creation of the coordination group was the creation of a database on projects taking place in Bac Kan: the *Project Information Database System (PIDS)*. The objective was to share information about 'who is doing what and where' [8]. The bilingual – English and Vietnamese – database contains a wide range of information about the projects: activities, products, references, bibliographies, institutions, contact people, etc. and allows the user to visualise intervention zones, thanks to a geographic information system (GIS). We developed a data collection and saving protocol and then proceeded to print annual updates of a project directory. These directories came out in 2001 and 2002 [9]. Above and beyond the collective dynamic set in motion through the PIDS, the results we obtained confirmed our hypothesis concerning the topic area and geographic coverage of the different projects (Figure 1).

Figure 1 Geographic coverage of different R&D projects in Bac Kan province in 2001

N.B.: Projects whose symbol do not appear on the map cover the whole province.

In Bac Kan Province, it is often difficult to access geographic data since the databases belong to different services and are often in incompatible formats. New projects almost always begin with a data search and information creation phase, but the information gathered is very often lost for future use soon after that particular project is over. It is vital for decision makers and provincial technical services to keep a file on past projects and capitalise on acquired knowledge in a way that is easily accessible by future users. One of the partners in the project coordination group compiled a geographic database on Bac Kan Province that is useful for project planning and management of natural resources [10]. A digital almanac was designed as a user-friendly GIS that can be used in different ways [11], for example for:

- experimental and demonstration plot management at the provincial scale
- standardisation and documentation (meta-data) of maps and existing data, integration of fragmentary data from different sources
- agro-ecological diagnoses and socio-economic monitoring at all scales from village to province.

The above tools need to evolve. Without the ability to adapt and be part of a collective dynamic, and be transformed by that dynamic, they will be of little use. They must never become a necessary step in a prescriptive process. Experience has shown that if tools like these provide solutions to real problems and facilitate coordination, then the different partners will clearly see their advantages. On the other hand, the work load needed to update the database may become an insurmountable obstacle and, thus, render the tools useless.

3.2.2 An experimental network to test and validate technical innovations

3.2.2.1 Documentation and inventory of innovation.

Bac Kan coordination partners have prepared specification sheets describing the innovations they tested onfarm. They documented methods, advantages and constraints and provided much needed information to extension agents and farmers to facilitate the adoption process of the innovation. Some of these files developed by the Mountain Agrarian Systems Program [12] (SAM Program is the French acronym) were distributed to different project partners who were able to apply the innovating techniques within their own experimental network [13]. The SAM Project team has designed a decision support aid allowing the farmer to choose the most appropriate technique as a function of the soil type, slope and production objectives specific to each plot [14]. In the same way, the Red River Program [15] also produced a series of specification sheets designed to feed a database that can be consulted on the internet at www.interdev-net.org. Here again, the process is dynamic; the files evolve as knowledge is refined with each growing season. Information sharing and update mechanisms still have not been standardised, but at the same time this is a sign of their flexibility in the face of changes within the coordination group.

3.2.2.2 Toward a provincial experimentation network in rural zones.

Each Bac Kan based agricultural project has set up its own experimental network in partnership with the agricultural services at different administrative levels. These networks vary considerably in the innovations they have tested (introduction of new varieties, cropping systems, etc.) and their management techniques. Information concerning experimental and demonstration plots set up by these different projects was compiled in 2001 under the auspices of the Bac Kan DARD [16]. All the partners agreed that the province possessed an excellent extension tool which was, unfortunately, not being used. For example, the very good spatial and thematic cover of more than 1900 experimental plots set up by different projects in 2001 should have led to results being transferred on a provincial scale, while taking the diversity of agricultural zones into account. Lack of standardisation, however, and the inability to pool experimental results have proved to be obstacles to scale transfer. As a consequence, each project only benefits from the fruits of its own labour. Due to this problem, and despite the privileged relations each project enjoys with different agricultural services, experimental activities rarely have any impact outside their own region. Once again, it is clear that although coordinating their efforts would be to everyone's advantage, the methods and the institutional mechanisms needed to upscale the experimental network to the province do not, yet, exist. We have been trying to raise the awareness of our partners in the Bac Kan coordination group about these problems and to ease the collective learning process in which we have been involved since 2001, along with the DARD.

3.2.3 Participatory approaches to the diffusion of innovation

The third field of activity we explored in order to facilitate the diffusion of innovation is the use of participatory approaches. These studies, which were carried out in the framework of the SAM project, begin with the observation that participative approaches have become a necessary step for any R&D project. However, these approaches have

been applied in an extremely prescriptive way as if they were a series of disconnected tools – village cartography, landscape analysis, sowing calendars, household wealth ranking, problem trees for the identification of development constraints, etc. – that have to be used if the study is to be validated [17,18]. We developed a participatory diagnostic method that takes into account constraints that have been identified during monographic studies in Bac Kan Province [4].

3.2.3.1 SAMBA role play: a rapid diagnostic tool for collective action.

The SAMBA role play focuses on the farmer's decision making process. It highlights the relations between the agricultural use of slope lands and self-sufficiency in rice provided for each family by individual paddies [17,19]. We designed and refined this method in successive role play sessions carried out in different districts of Bac Kan Province with groups of farmers. The farmers showed great interest in this method of collective learning about local resource management. In an informal atmosphere, the group was able to examine different scenarios and analyse their impact on household economy and the agricultural landscape as a whole. Through interviews we were able to determine that the farmers were using their own reference points and local rules for making decisions during the role play. This participatory approach goes beyond official statements and lets the internal power structure of the community come to the fore, allowing many farmers to express their opinion for the first time. Initial results were very encouraging in terms of rapid diagnosis, though problems persist when it comes to applying these results to a plan of action. The advantage is that the level of abstraction of the role play, in which a virtual village is constructed with cubes (each cube representing 1,000 m² of land), virtual families, etc., lets the participants get straight to the decision making process and concentrate on local institutions without becoming emotionally involved. The downside is that once a consensus has been reached, the environment is too abstract to go onto the next step, i.e. defining the action to be taken at the scale of individual plots of land. The second constraint is the use of the SAMBA role play as an extension tool. It should be noted that the number of participants is limited to about ten for each session and the game would consequently have to be played several times before the entire community is reached. Simplifying the game so that extension agents could use it more freely would run the risk of denaturing the process as has too often been the case with other participatory approaches. This is why we prefer to use it simply as a participatory diagnostic tool. Other partners in the 'Bac Kan coordination group' are, of course, free to use it as a means of consultation between local stakeholders about resource management problems. For our part, we have developed a complementary approach to transform the collective learning process into concrete action.

3.2.3.2 Participatory simulation to accompany farmers in their innovation process.

The first step in this approach was to develop a common language between researchers–developers and farmers in order to facilitate the integration of local know-how and scientific knowledge [20]. These studies brought together several participatory tools, such as a 3D landscape model and a GIS-based model of the village, which provided a common basis for discussions between farmers and researchers. The results of the first step of spatial modelling were transferred to a graphic model where

different zones of the village territory were identified as a function of the resource management practices associated with them. The third step was then to use this model as a support for discussion with local stakeholders about the spatial management of the natural resources over time [21]. Once the main constraints at the village scale had been identified, especially concerning fodder resources for buffaloes and cattle, farmers were able to simulate on paper the adoption of different innovations. They then received project support in order to reproduce, in their own plots, the results of their simulation [22]. In the long run, it would be possible to transform these simulations of technical interventions into SAMBA-type role plays. This would mean going from an individual model of adoption of innovation to the collective management of resources at the scale of the village community.

We do not consider the above approaches to be replacements for other participatory approaches developed in Bac Kan by other R&D projects, but rather, to be complementary tools. In the long run, these additional participatory approaches should help bring different partners together in the framework of the Bac Kan coordination group.

4 Achievements and future outlook

4.1 Lessons learnt from the coordination experiment conducted in Bac Kan: toward a better integration of the research–development continuum

4.1.1 Integration of knowledge

Since 2000, we have been contributing to an experiment aimed at coordinating research–development projects in Bac Kan Province. This experiment has revealed that the main problems of sharing fragmentary information from different sources (i.e. projects) are organisational rather than technical. It is often difficult to go beyond institutional and disciplinary differences in order to facilitate knowledge sharing. One way of achieving this aim is to define common objectives and/or fields of interest. Two examples illustrate this approach:

- *The diagnostic study of the tensions between environmental conservation and rural development policies in the Ba Be National Park [23].* None of the five projects involved in this venture had enough data or disciplinary knowledge to implement the study. However, each project did have fragmentary data which, once combined, constituted a knowledge base as a preliminary step toward integration. Sociologists, geographers and agronomists all had their own reading of the new set of data and were able to integrate their knowledge into a systematic presentation of their results. We then presented the local stakeholders (farmers' panels, village chiefs, Park administrators, etc.) with our understanding of their problems on the basis of our common knowledge. This interaction allowed us to validate or refute some of our preliminary hypotheses. The result of this work was published and distributed in Bac Kan. It is now a working base on which to define new actions.

- *The documentation of innovative cropping systems.* Some agricultural extension programmes found themselves confronted with a lack of technical options to propose to farmers in the hillsides, especially when it came to offering alternatives to slash and burn systems. The participatory process based on the principle of responding to local needs expressed by farmers often led to solutions that had already been tested and shown to have serious limitations in local conditions. Some solutions, such as cinnamon trees or anti-erosion hedges of Tephrosia, were fashionable but did little to solve the real problems [24]. To put it bluntly, sometimes for want of a better solution, farmers would often ask for the same technical options as their neighbours had obtained. This mimicking strategy allowed the rapid diffusion of the proposed innovations during the life span of the project and throughout the intervention area. However, the innovations did not survive the project because they did not tackle the roots of the problems [14,17]. The first tests of ‘direct sowing on plant cover’ (SVC) conducted in Cho Don in 2000 were very promising, not only for the farmers who were involved in the field testing but also for development project workers who were eager to extend their results. The common interests of Vietnamese-Finland Forestry Support Program (VFFP) and the Helvetas (Swiss NGO) participatory technology-development project led them to join forces for
 - common activities such as the translation of specification sheets, onsite visits, etc.
 - exchanges such as the implementation of a SVC trial by the SAM team on VFFP sites in exchange for the planting of anti-erosion hedges on the SAM experimental site by VFFP.

The main lesson to be learnt from these experiments is that the integration of fragmentary knowledge requires specific know-how and methods and that these cannot be improvised. For information gathering tools, we can cite GIS, relational databases, modelling and comparative systems approaches [5]. As for know-how, it is not limited to technical aspects alone, but also concerns group leadership, human qualities, attitudes to partnership, and the management of inter-institutional communication networks.

4.1.2 An adaptive process anchored in local conditions

Experience has shown that coordination requires the ability to adapt to a changing institutional environment: teams change, managers change, and it is often difficult to maintain continuity in joint actions. Once objectives have been fixed, trajectories are often unpredictable because they depend on human factors, and a single change can influence an entire project. Coordination therefore requires flexibility, and results are often unpredictable. But this process is also important in that it helps those involved understand the collective dynamic itself. The tools used are only a pretext to trigger social transformations that then call for the modification of those tools or the gathering of other data or the use of other methods. Facilitators of such coordination processes should be looked on as partners like any other members of the coordination group, and not just as outside observers. Whether they are researchers or developers, their role is not to deliver a prescriptive message, but to facilitate the collective learning process [5].

User participation in R&D projects is not just an excuse to adhere to some fashionable ideology, or make a donor happy; it is the real key to success [25].

Without the active participation of all the development partners (villagers, administrative bodies, decision makers, researchers, development agents) coordination would lose its legitimacy in the eyes of other group members. However, if participation in the group is imposed from above, it can rapidly become counter-productive, so it needs to be carefully managed and evaluated. Group consensus must be a product of the method of governance, and may thus vary from group to group. However, the systematic search for consensus can become an obstacle to action once the rules for the way the group is to function have been settled.

4.2 The challenges of scale transfer

4.2.1 Institutionalising the coordination approach

The above activities can be achieved in the long term only if their management is taken over by provincial authorities. This devolution process has already started in Bac Kan Province and yet, as in the case of any social process, it will take time to convince people at all the hierarchical levels of the benefits of this approach. It will also require reforming certain institutional mechanisms at the provincial level that presently stand in the way of the coordination of R&D projects. We have already taken the first step in awareness building by using the 'coordination prototype' described above. However, many governance problems persist and we are currently attempting to deal with them through specific studies.

4.2.1.1 Means of communication and rules for sharing information.

Certain technical obstacles need to be overcome to enable the exchange of information and data. For the project information database system (PIDS), for example, we had to

- define protocols to feed the database and to deliver results
- standardise procedures
- define update periods and mechanisms.

But if technical obstacles are relatively easy to overcome, the organisational problems that go along with them are often much more difficult to solve. The decision to put information on an internet site, for example, led to serious discussion. We had to decide who would host the site, which information would be available to the public and which would be restricted, who would be responsible for the updates, etc. Group members were careful not to step on other partners' toes. Problems of the intellectual property of individual and group projects still remain to be solved. However, the new institution which the coordination group has created will have to justify its existence by the products and by the benefits it provides to its members. If the members do not recognise the group's role in the facilitation of interaction, then the group's dynamics will no longer be upheld and the institution will, in the long run, have no reason to exist. This is why we proposed making the coordination group into an official body, placing it in the hierarchy above the project level. This institutional project, which we named 'The Bac Kan Province Resource Center', would provide a site and physical support for capitalisation on knowledge and would also help make this knowledge available to the public.

Setting up such a centre implies important management decisions. Everyone agrees that only the provincial government has the legal power needed to host and run the centre. But which technical department or service of the province would be able to take over the centre without interrupting its coordination dynamics? After a lengthy discussion, we decided to associate the centre with an existing institution, the provincial 'Agro-forestry Extension Center', rather than create a new institution. In the years to come, the centre will be called upon to play a key role in the passage from individual to community-based management of innovation. In Bac Kan, as in most northern mountain provinces in Vietnam, much is expected of the agricultural extension system. Auto-subsistence agriculture cannot finance its own development. The extension center will, therefore, provide an interface for technical departments and at the same time for farmers [6]. The resource centre will also provide a methodological framework to support the diffusion of innovation and community-based management of natural resources.

4.2.1.2 Assessment of human resources and training needs.

The above changes in the structure and mode of operation of the extension centre also call for major changes in extension agents' behaviour. This implies a move from the top-down technology transfer process, which up till now has meant delivering a prescriptive message that is not adapted to the audience (ethnic groups, genders, etc.), to a bottom-up process of collective learning that identifies local problems and provides support for development stakeholders. A recent study to evaluate the training needs of agricultural extension agents in Bac Kan [26] showed that extension agents do not have any preliminary specific training in extension methods. During the course of their careers, they may participate in different projects that include sporadic training programmes, and, generally, this is the only way they can stay up-to-date.

The resource centre should thus promote individual training programmes adapted to the capacity and objectives of each agent. At the present time, R&D projects offer disconnected training programmes. Agricultural service agents often pass through a series of training sessions even if the sessions are not related to their particular needs or abilities. Through better consultation, projects could include individual training modules that would enable an agent to progress from the beginning to the end of a fruitful learning process, by tapping the strong points of each project involved in the centre. This integrated training approach would solve the present problems posed by competition between projects for sparse and poorly trained local and provincial staff. People often change projects or leave the region once they have been trained, as they are drawn by promises of better employment elsewhere. To find a remedy for this brain drain, those responsible for coordination could try to identify future 'leaders', whose loyalty could be encouraged through specific training programs, and who could be employed by the resource centre between projects. In this way, these agents would no longer feel the need to jump from one project to the next; but would benefit from the continuity provided by the project coordination to build a real career. These new institutional mechanisms would also enable real progress to be made in the content of the training courses by creating a coherent overview of the benefits of each project. Trainees' attention could be drawn to different approaches, their critical acumen would be encouraged and they would have the freedom to draw on all the knowledge they have acquired and all the methods they encountered during training to design their own responses to the specific problems they meet.

4.2.2 Mobilising information to support rural development

The integration of knowledge by the resource centre will give it the status of an observatory of rural transformation. But there is no question of limiting it to the role of passive repository of information, which might result in its losing some of its social usefulness. The information must be easy to access if action is to be taken. Two types of information that are useful for innovation can be distinguished: that which facilitates extension activities and that which is useful for the formulation of agricultural policies, and which thus contributes to strengthening the former.

4.2.2.1 Information for agricultural extension.

In the years 2001 and 2002, we studied the agricultural extension system of Bac Kan Province [6]. This study was an institutional analysis of the extension system and the mechanisms of transfer of technical information. A survey of 135 farmers in Cho Moi district investigated their relations to agricultural extension and their adoption of rice-related innovations (rice transplanting techniques, the use of hybrid rice varieties and the forming of farmers' groups for the production of rice seed). This was completed by a study on village communication networks and their role in the diffusion of technical information [27]. These studies confirmed the coexistence of two channels for the dissemination of technical information. The first, which can be qualified as linear, vertical, top-down or official, and applies to the technology transfer system, is the basic structure of the official extension system. The second communication channel, which can be qualified as horizontal, bottom-up or informal type of networking, is generally used by R&D projects. Despite their diametrically opposed modes of operation, these two technical methods of information transfer are linked. Between the R&D projects and the extension services, the nature and frequency of interactions is governed by contractual relations. The same extension agent can often contribute to both communication channels. At the local level, the village chief is at the interface of the two channels since he is at the centre of the village communication network and he is also the last echelon of the technology transfer channel [27]. Like the extension agents, the village chiefs are, therefore, called upon to play a key role at the interface between the official and informal networks, thus guaranteeing the farmers' access to technical information and the means to apply it (training, subsidies, etc.). The focused training of extension agents should enable them to combine networking activities with the traditional linear diffusion of technical information. Although the latter may be very efficient, on its own, it is no longer sufficient to meet future challenges to extension in the framework of a new cooperative system.

4.2.2.2 Information for formulating agricultural policies.

Agricultural policies are instrumental in supporting the innovation process. These policies often play a decisive role in the adoption or rejection of a technical proposal and thereby in the success of its diffusion. The definition of agricultural policies requires a large knowledge base, especially when the policies are to be applied in a very heterogeneous mountain environment. In this case, two approaches also coexist: a top-down, central planning approach and a bottom-up, participatory approach, based on consensus building between successive levels of the hierarchy. Currently both groups, i.e. the official planning authorities and R&D projects, appear to be defending one or other of

these diametrically opposed approaches. In the former, no simple and easily applicable message can possibly come from below due to the diversity of the natural and human environments in Bac Kan Province. In the latter, this diversity makes all attempts to apply a uniform agricultural policy in the province impossible. Our experience in Bac Kan since 2000 has shown us that these two approaches are not incompatible but are, in fact, complementary. Beyond providing a knowledge base, the resource centre should offer a platform to facilitate communication between the two approaches. We initiated such a platform in Bac Kan by testing complementary land use analysis and planning tools. These methods, known as LUPAS (Land Use Planning and Analysis System [28]), CLUE (Conversion of Land Use and its Effects [29]), and SAMBA-GIS [30], are complementary in terms of the results they have generated and the questions they answer about land use dynamics [31]. They all rely on the existence of large datasets and, for this reason, it is important that they be brought together in the Bac Kan Resource Center. In return, they can provide policy makers with easy-to-understand results and food for thought in drawing up agricultural policies. They have shown promising results from a scientific point of view, but we are as yet unable to judge their utility in feeding debates on agricultural policy. Needless to say, the above approaches do not exclude the use of other methods that may provide a totally different reading of the existing knowledge base.

5 Conclusions

The future of coordination depends on the institutionalisation of the process begun in the year 2000. Several ongoing management problems remain to be overcome. To succeed, the Bac Kan Resource Center needs to perform the following functions:

- Facilitate coexistence between the two technical information exchange systems, i.e. the ‘linear, top-down’ and the ‘networking, bottom-up’, by recognising the advantages and limits of each.
- Promote flexibility in the management of equipment and human resources. Networking activities should allow the resource centre to diversify its sources of funding while maintaining relative stability in terms of management despite the inevitable turnover in project managers and staff.
- Be of real use to development by providing tools and methods that are adapted to real conditions in Bac Kan. They should be able, for example, to feed current debates on cooperative models and farmers’ organisations with the concrete results of development experiments.
- Reinforce the knowledge capitalisation process through an increasing contribution to the formulation of agricultural policies.
- Finally, the underlying concepts of the resource centre need to be transferred to other provinces. Bac Kan could provide an example for other coordination groups, which would also reinforce the strength and legitimacy of the original group.

Training is essential to change research–development partners’ attitudes toward more inter-institutional coordination and networking and, as a consequence, to ensure that efficient coordination continues after the life span of individual projects.

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