

Scaling up local diagnostic studies to understand development issues in a heterogeneous mountain environment: An introduction to the SAM Program

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Abstract

The mountain rural communities in northern *Viet Nam* are among the poorest in the nation, and have benefited the least from the recent economic growth. The Mountain Agrarian Systems Program (SAM) has been working in *Bac Kan* Province since 1998, studying the complexity of the mountains in an interdisciplinary fashion to understand the needs and possibilities of farmers in the area. A research methodology was developed to deal with the extreme diversity, rapid institutional changes, and substantial external influences at play in the studied region, and consisted of multiple monographic studies and a regional geographic approach. A scaling-up process allowed us to generalize our site-specific results to broader areas. The studies indicate that the pessimistic outlooks of certain authors are exaggerated, although much work remains in order to raise the living standards of the mountainous regions to those of the rest of the country. Future development activities in the mountainous areas should focus on making efficient use of scarce resources, building on social capital toward community-based resource management, and diversifying farmer income sources. The SAM Program results also offer indicators to identify those individuals in greatest need of development assistance.

Keywords: mountain agriculture, socioeconomic transition, systems approach, scaling up, *Bac Kan* Province, Viet Nam

1. Introduction

In the last decades of the twentieth century, *Viet Nam* progressed from a nation of chronic food shortages to one of the world's leading exporters of agricultural products that include rice, coffee, rubber, and tea (Box 1). This economic growth,

marked by a doubling of gross domestic product between 1991 and 2000, was largely made possible by the *doi moi* reforms of the 1980s. *Doi moi* consisted of two successive reforms: the allocation of the means of production (especially land) to individual households, followed by economic liberalization and the opening to external markets.

The remarkable economic growth that resulted from the reforms was based largely on the rural household, which had become the new elementary unit of agricultural production. The technical, economic, and social changes that accompanied the transition transformed agricultural production, resource management, land use, and the institutions that defined resource access and distribution. However, the impact of the changes varied widely across different regions. In particular, agricultural growth in the past decade has benefited the delta regions far more than the more-remote mountainous areas (Kerkvliet and Porter, 1995; Poverty Task Force, 1999; Minot and Baulch, 2002).

Mountainous areas represent 75% of *Viet Nam* and contain 21% of the nation's population. Within northern *Viet Nam*, the disparity in economic growth benefits between the delta zones and the mountainous regions will likely grow during the next decade. For example, the poverty rate in the Red River Delta region is expected to fall from 15.0% in 1998 to only 3.8% by 2010 (National Center for Social Science and Humanities, 2001). In contrast, in the northern mountainous regions it is expected over the same period to rise from 28.1% to 34.4% (World Bank, 2001).

Some authors have attributed the predicted rise in poverty in the mountains to the vicious circle of increasing population, environmental degradation, increasing poverty, and marginalization of ethnic minority groups (Kerkvliet and Porter, 1995; Rambo et al., 1995; Le Trong Cuc and Rambo, 2001; Alther et al., 2002). Donovan et al. (1997) identified seven major difficulties faced by residents in the mountainous regions: (i) biophysical constraints (steep slopes and uneven terrain, access difficulties, acidic low-quality soils, harsh climate); (ii) environmental degradation (deforestation, erosion, floods); (iii) infrastructure constraints (underdeveloped communication and transportation networks); (iv) economic constraints (subsistence agriculture, lack of capital and limited market access); (v) high population pressure (high growth rates, land fragmentation, immigration, high unemployment); (vi) cultural constraints (low education levels, multiplicity of ethnic languages, conflicts among ethnic groups); and (vii) intellectual constraints (insufficient scientific knowledge about the mountains, attachment to the idea of a single development plan for all of the mountainous areas).

This last constraint is a major obstacle to development plans for the mountainous areas. Experience has shown that successful development plans for the delta regions often fail to achieve satisfactory results when transferred to the diverse human and natural environment of the mountains (Jamieson et al., 1998). The

Box 1: A short history of Viet Nam

The historical origin of *Viet Nam* dates to 258 B.C. when *Co Loa* was the capital of the *Au Lac* Kingdom. In 111 B.C. China conquered the northern part of present-day *Viet Nam* and instituted a 1000-year rule, marked by tenacious Vietnamese resistance and repeated rebellions. This ended in 938 A.D. when the Vietnamese won their freedom and built up an independent state. The country developed under the rule of 14 successive Vietnamese dynasties. External control was imposed once again at the end of the 19th century, however, when *Viet Nam* was occupied by the French. This new period of occupation ended on September 2nd 1945 with Ho Chi Minh's declaration of independence and the establishment of the Democratic Republic of Vietnam. The first Indochina War ensued, culminating in the French military defeat at *Dien Bien Phu* in 1954. The Geneva Accords of 1954 temporarily divided *Viet Nam* into two zones (the Communist north and the anti-Communist, US-supported south). Tension between north and south mounted over the next few years, until in 1964 full-scale war erupted. The second Indochina War lasted for the next eight years and ended in 1975 with the defeat of the pro-American regime. In July 1976 the country was reunified and renamed the Socialist Republic of Vietnam.

In the decade that followed, the socialist economy was extended to the whole country. In particular, agricultural production was controlled by cooperatives, ownership of all land was collectivized, and production was distributed to workers according to a labor-point system. However, *Viet Nam* was not growing enough rice under collectivized agriculture to feed itself. In 1978, the country entered into two new wars against Cambodia in the south and China in the north. The economy continued to deteriorate under the combined strain of these war efforts, the embargo imposed by western countries, and deteriorating trade relations with the Soviet Union. Early in the 1980s, *Viet Nam* witnessed the most serious ever socio-economic crisis. By 1986, the economy had almost collapsed; the annual inflation rate rose to a record 774.7%, and a poor rice harvest threatened famine.

At the December 1986 Sixth National Congress, the Vietnamese Communist Party announced the adoption of a program of market socialism called *Doi moi* ("Renovation"). This bold announcement is usually considered the beginning of reform. However, even before 1986 the State had begun instituting policies to improve the cooperative system. Some key policies that have shaped agricultural production include:

Resolution #6 (1979, Sixth Party Plenum). Facilitated the allocation of agricultural outputs, and initiated the agricultural reform process.

Decree #100 (1981). Allocated land-use rights for paddy fields based on number of people in a household (whether productive or non-productive). Each household was required to contribute a quota of rice to the cooperative, but could keep any surplus.

Resolution #10 (1988, Party Politburo). The virtual decollectivization of agriculture. Allocated long-term land-use rights for paddylands according to the number of productive workers in a household. Households were free to keep all production. Households, rather than cooperatives, became the elementary unit of production

Forest Protection and Development Code (1991). Began the process of allocating land-use rights for hillside lands and forestlands.

Land Law (1993) and Decree 02-CP (1994). Supplied additional details for allocation of upland land-use rights.

These ongoing reforms have transformed the face of *Viet Nam's* economy and society. *Viet Nam's* annual GDP growth rate averaged 7.2% during the 1990s. Although *Viet Nam* remains one of the poorest countries in the world, it has received international recognition for achieving the highest poverty-reduction rate in SE Asia. Poverty has been reduced considerably, from 58% in 1993 to 37% in 1998. Agricultural production has undergone a similar transformation, and since 1997 *Viet Nam* has been the world's second or third largest exporter of rice.

The country has entered a new phase of international integration by joining ASEAN in 1995, and APEC in 1998. It is now preparing for WTO accession.

difficulty of working within the extreme diversity of the mountainous regions is exacerbated by the lack of empirical data on these areas. Further, the data that are available often are fragmented and strung together from geographically-limited case studies. In the institutional and natural environment of the northern mountains in *Viet Nam*, new diagnostic methods need to be developed that can analyze data across multiple scales.

Like single-scale analyses, single-sector analyses (focusing, for example, only on forests, livestock, poverty, or inequity) do not adequately capture the complexity of the mountainous regions. Development plans need to be holistic, identifying the interactions among multiple sectors and working with all of those sectors that transform household livelihoods (Le Trong Cuc and Rambo, 2001).

To address the need for multi-scale and multi-sector analysis, in 1998 the *Mountain Agrarian Systems Program* (or SAM, the French acronym) was developed as a partnership among the Vietnam Agricultural Science Institute (VASI), the Institut de Recherche pour le Développement (IRD), the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), and the International Rice Research Institute (IRRI). The goal of the SAM Program was to study the complex interactions among local stakeholders, agricultural production, land use, and environmental changes, so as to propose concrete innovations for improving (i) agricultural productivity, (ii) natural resources management, and (iii) living standards of highland ethnic minority groups in *Bac Kan* Province. Holistic analyses of the transformations in the rural mountainous areas have enabled us to (i) identify the driving forces behind the *doi moi* reforms and (ii) evaluate the impact of those reforms on land use and farmers' strategies. This book presents our analyses and recommendations.

It is our hope that this work can put into context the pessimism that has developed toward the mountainous regions in recent years, while helping researchers to identify subjects that can develop the agricultural potential of the area. Our analysis of agricultural transformations in the mountains have already generated original diagnostic methods adapted to the particular biophysical and socioeconomic conditions of the mountainous areas (Castella et al., 1999; Castella et al., 2001), and technical and organizational innovations for sustainable agricultural development (Husson et al., 2000; Bal et al., 2000).

We will not repeat all that here. Instead, in this introductory chapter, we will first present the systems-oriented diagnostic methods implemented in *Bac Kan* between 1998 and 2001. We will then introduce *Bac Kan* Province in terms of its geography, followed by a summary of each monographic and thematic study. We will conclude with a short section on what we have learned about research and development in our time in *Bac Kan* Province.

2. Methodology

2.1. Methodological constraints in the mountains

Development research programs in the mountains face three major obstacles that make traditional methods of diagnosis inappropriate.

First, the *extreme diversity* of the region, both social and ecological, makes it very difficult to generalize local results to larger areas. It is not easy to identify a district, commune, or village that is sufficiently representative of the complex mosaic that exists at a higher scale. This greatly complicates the procedures for choosing sample sites, data collection, and extrapolation of local results.

Secondly, the region has undergone *rapid institutional changes* in recent years, particularly since decollectivization began some twenty years ago. The political reforms accompanying *Doi moi* frequently restructure the relationships between farmers and the environment, as well as farmers' relationships with each other. Constantly adapting to new circumstances (industrialization, market integration, population migrations, etc.), farmers often seize upon innovations that offer short-term opportunities in the current institutional setting, even though the innovations sometimes have negative social and ecological effects over the longer term. This highlights the need for research results to be made available quickly. However, the results of research have often become obsolete by the time the research is complete.

Finally, there are many *external influences* with major impacts on the mountains. Policy changes and State interventions, the influences of the Chinese or Western markets, and large State-driven migrations are only a few of the external factors that have affected agricultural systems in the studied area. Such factors will remain important in the coming decades. Research undertaken in a small geographic area needs to adopt a broader perspective that includes consideration of these factors. Unfortunately, even research that professes an understanding of agrarian dynamics at the multi-province scale is rarely applicable beyond the scale at which the research was conducted.

2.2. Methodological approach of the SAM Program

Treat diversity as a research asset, not a constraint. The extreme biophysical, technological, and social heterogeneity encountered in the northern mountains makes it a challenge to generalize research results from a single studied area to anywhere outside of that studied area. However, we treated within-region diversity as a source of information, hypothesizing that it reflected production systems in various stages along multiple trajectories. The wide variety of situations observed thereby became an asset to us, allowing the study of a range of transitional stages in the evolution patterns of farming systems.

Scaling up from the individual field to the region. The sustainability of agricultural production depends on the compatibility between natural resource management at various scales. The majority of observed failures in natural resource management were results of conflicts between scales (Rabbinge and van Ittersum, 1994). Analyzing the viability of village agro-ecosystems necessitates considering natural processes, social dynamics, and resource management at levels both larger than the village (e.g., the district, the State) and smaller (e.g., local farmers, government officials). It is also necessary to quantify relationships among these multiple scales of analysis (e.g., indicators, multiple-scale geographic information systems, etc.).

Systems approach and interdisciplinarity. The analysis of the relationships among changing biophysical and socioeconomic environments forces us to integrate many components of a complex system. Using a systems approach, we integrated information from diverse disciplines (ecology, biometrics, socioeconomics, geography, etc.), leading to a holistic understanding of the processes taking place.

A people-centered approach, focused on the interactions between local villagers and their environment, led researchers to spend large amounts of time in the field, living and sharing experiences with local peoples. In this way, we gained the confidence of locals, an important step in the development of honest dialogue between researchers and development stakeholders.

Involving development stakeholders, particularly farmers, in each stage of the research process ensures that the work undertaken will address the perceived needs of local people. “Expert” researchers cannot expect to impose solutions on populations; instead, researchers need to accompany local stakeholders in a collective learning process that leads to sustainable development.

2.3. Research approach

Our research framework was influenced both by the methodological considerations presented above and the institutional mechanisms of the SAM partnership.

An original approach to scaling up

Our research consisted of three components as described in Figure 1.

A. Monographic studies. These studies were conducted in each of the six rural districts of *Bac Kan* Province, and typically consisted of four consecutive steps undertaken over a period longer than one year:

- First, an agro-ecological zoning of the district characterized the diversity of natural and human-influenced environments, leading to the selection of the commune that best represented the main characteristics of the district in which it was embedded.

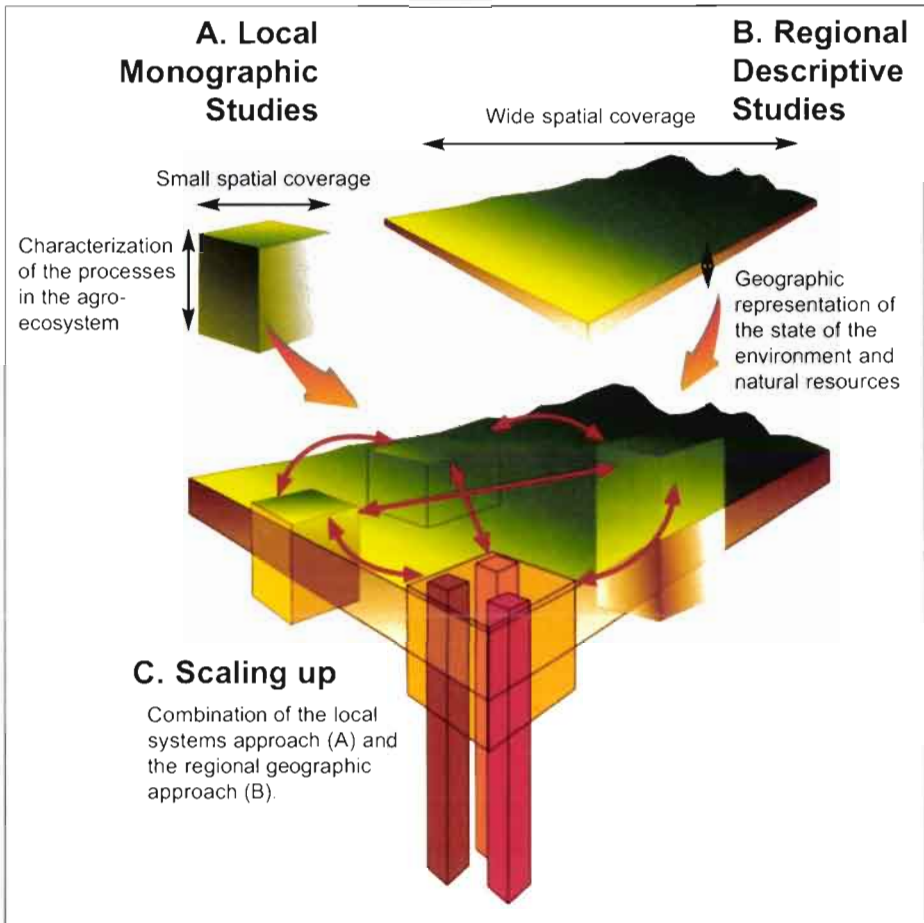


Figure 1: *The scaling up process: a combination of local systems analysis and regional geographic representation*

- Then, the agricultural histories of the studied area were traced through interviews with selected residents in the commune. From this information, we determined the driving forces of local changes as well as the factors responsible for household differentiation.
- Next, a representative sample of farming households (about fifty per commune) were selected for in-depth interviews addressing production strategies and their evolution over time, the performance of crop and livestock systems, non-agricultural sources of income, and farmers' integration in the village social network, among other topics.
- Finally, we integrated the above information into an analysis of trajectories of agricultural systems and household differentiation. We then related this

information obtained through surveys to geographic data generated from historical land-use maps, satellite images and aerial photographs, validating the processes described in the interviews and determining their ecological impact, particularly in terms of changes in forested area.

B. Regional geographic component. The SAM Program was able to benefit from results obtained by an earlier project in *Bac Kan* Province, specifically a geographic information system (GIS) with twenty layers of essentially biophysical information including geology, hydrology, soils, relief, and climate (Brabant et al., 1999). We complemented this GIS with our own socioeconomic data (population, ethnicity, poverty rates, accessibility, etc.) obtained from surveys, provincial statistics, and landuse maps.

C. Scaling up was accomplished by combining the local systems component (A) and the regional geographic component (B).

The comparative analysis of the various research sites made it possible to apply the lessons learned in the villages to wider geographic areas (districts, provinces), while still taking into account the internal heterogeneity of those wider areas. We then used methods based on GIS, multi-agent modeling tools, and role-plays (Castella et al., 2001; Castella et al., 2002a) to validate the indicators developed in the previous stages. After validation, these indicators will allow us to generalize our data to the provincial scale with remote sensing and GIS tools. The validation stage of the research is not presented in this book as the work is still in progress, but it is worth mentioning as the culmination of the methods presented above. This final step will confirm whether the chosen indicators (i) have meaning for both the local and regional stakeholders of rural development, and (ii) are useful in progressing from research to action.

Procedure for selecting research sites

A prerequisite in the research-action approach is that local stakeholders have to agree upon a common problem. Their acknowledgement of a problem makes it more likely that they will take ownership of project activities. The role of researchers is to elucidate the aspects of the problem at a range of scales and from a variety of viewpoints. For this reason, we chose our research sites from a perspective oriented toward specific problems. The institutional partners of SAM Program selected *Bac Kan* Province from among several mountainous provinces of northern *Viet Nam*, based on the following criteria:

- *Socioeconomic:* *Bac Kan* is classified as the poorest province in *Viet Nam*. It lies between *Thai Nguyen* Province (to the South), which benefits from proximity to the delta zones, and *Cao Bang* Province (to the North), which draws economic benefits from a shared border with China (commercial exchanges). In the absence of industrial and commercial activities, the farmers of *Bac Kan* are largely dependent on subsistence agriculture.

- *Ecological*: *Bac Kan* is one of the major focal points of the Ministry of Agriculture and Rural Development because of the large number of farmers still practicing slash-and-burn cultivation on the hillsides, the growing population pressure, and the already-substantial deterioration of natural resources.
- *Political*: The province was created only in 1997, and provincial authorities have shown a great interest in studies that can describe the state of provincial affairs. Such descriptions could serve as a basis for adapting national agricultural and environmental policies to the provincial context.
- *Institutional*: *Bac Kan* Province was an ideal site for our project because of the other projects that already were working there, with which we could create synergies and partnerships. The existence of the geographic database described earlier (Brabant et al., 1999) facilitated the selection of research sites within the province. As the poorest province in the northern region, it is also targeted by a variety of national and international programs focused on rural development and poverty reduction.

The synchronic and diachronic aspects of the study both played a role in selecting study sites within *Bac Kan* Province. The diachronic analysis required sites for which sufficient historical data were available, while the synchronic analysis necessitated that the study sites be selected in terms of their current phase in the evolution process (market integration, infrastructure, rural exodus, etc.). To satisfy both of these requirements, we selected research sites that covered the regional diversity along each of these axes: agro-ecological diversity and the full gradient of market integration (Castella et al., 1999).

Finally, we related our findings to those of other partner project sites in *Bac Kan* Province, both to compare sectoral approaches and to validate the representativeness of our selected sites (Figure 2).

3. *Bac Kan* Province

Bac Kan is a mountainous province in northern *Viet Nam*, extending from 21°48' to 22°44' N latitude and from 105°26' to 106°15' E longitude. Several rivers have their sources in this province, and play major ecological roles in downstream provinces. The regional climate is subtropical mountainous, with mean annual precipitation of 1500 mm. The monsoon weather cycle is characterized by two distinct seasons (Figure 3):

The hot, rainy season, from April to September. Maximum rainfall occurs in July, with an average of 263 mm. Rainfall in this season represents 82% of annual precipitation. Temperatures vary between 22.9°C and 27.3°C.

The cold, dry season, from October to March. Average monthly precipitation in this season varies between 13.0 and 70.5 mm, and the average temperature is 18°C. Winter temperatures can drop dramatically, to as low as 2.2°C.

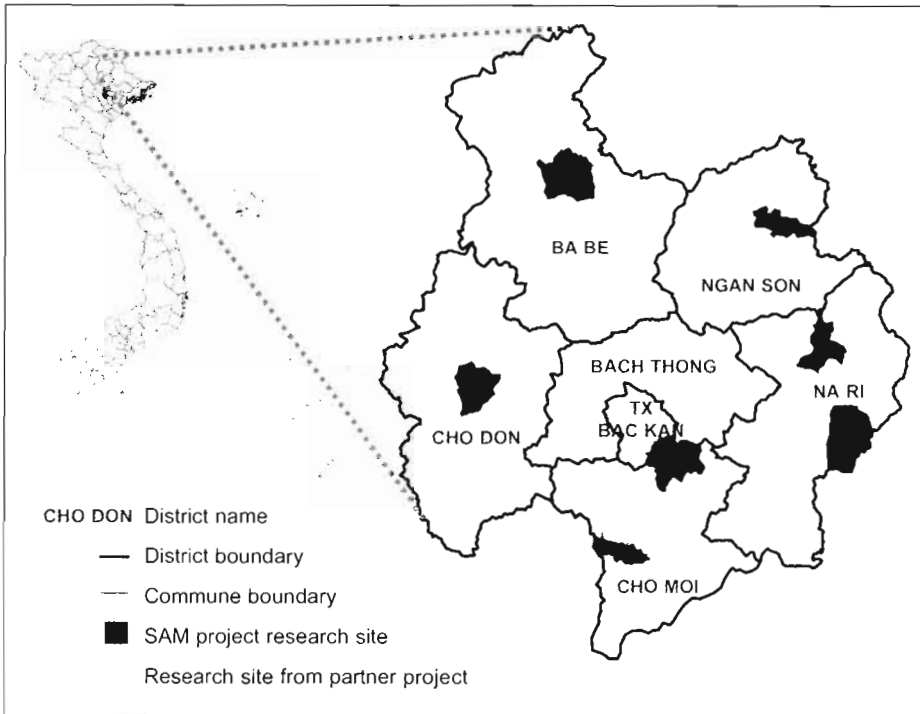


Figure 2: Bac Kan Province and study sites

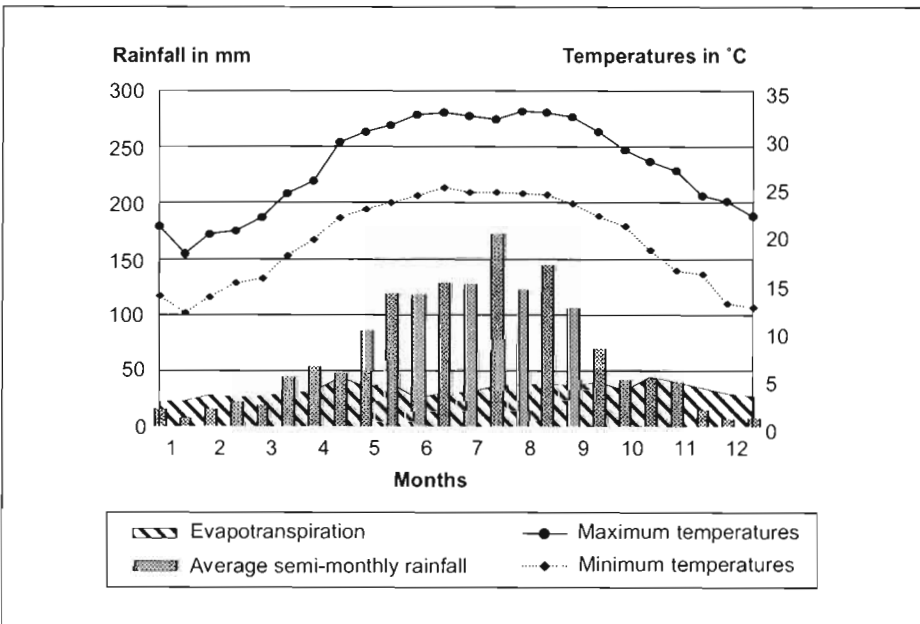


Figure 3: Average meteorological data for Bac Kan Province (1985-1995)

These two seasons determine the schedule of agriculture activities for *Bac Kan* farmers (Bal et al., 1997).

The 122 communes of *Bac Kan* Province are grouped into six rural districts (*Bach Thong, Cho Moi, Na Ri, Ngan Son, Ba Be, Cho Don*) plus one that contains the town of *Bac Kan* (Figure 2). The total provincial land area is 4,857 km², and the population in 2000 was 281,872 giving a population density of 58 inhabitants per km². Between 1991 and 2000, the population grew by 2.2% per year. According to a 1999 census, five major ethnic groups live in *Bac Kan* Province: the *Tày* (55%), the *Dao* (17%), the *Kinh* or *Viet* (13%), the *Nung* (9%), and the *H'mong* (5%) (*Bac Kan* General Department of Statistics, 2001). The other ethnic groups (*San Chay, Hoa*, etc.) constitute less than 1% of the provincial population.

The population is partitioned into two major groups:

The *Tày, Nung, and Kinh* compose the majority group in the province. They live along the major channels of communication and transportation, close to population centers such as *Bac Kan* town and the district administrative centers. They control most of the political and administrative institutions in the province. Their settlements are close to rivers and streams, and they predominantly engage in paddy rice cultivation. Helped by good accessibility and market integration, they sell much of their agricultural production.

The rest of the population of *Bac Kan* Province (*Dao, H'mong, San Chay*, etc.) lives in remote areas that are difficult to access. They have limited areas of irrigable flatland suitable for paddy rice. Instead, these people often rely on extensive hillside slash-and-burn cultivation systems, the yields of which are very vulnerable to climatic variability. Agricultural production is mostly for household consumption. Although many of these ethnic groups were nomadic peoples in the past, most have switched to sedentary production systems since the cooperative period.

Most of the subsistence agriculture in *Bac Kan* Province is founded on paddy rice cultivation in the limited valley-bottoms that cover only 2.6% of the province's land. Other important subsistence crops include maize (21,000 ha in 2000) and cassava (26,700 ha), which are used mainly for feeding pigs and are not traded commercially. Cash crops include soybean (1080 ha), sugarcane (460 ha), peanuts (400 ha), and tobacco (175 ha). Although cash crops do not cover a large proportion of the provincial area, they nevertheless can provide an important proportion of farmers' incomes. In addition, the raising of large ruminants (cows and buffaloes) is stable or has decreased during the past few years because livestock represents both a pressure on the natural resources and a major source of conflicts associated with crop damage and resource use (Castella et al., 2002). Finally, perennial plantations (fruit and timber) have developed rapidly in recent years, helped along by projects' training and subsidies for tree growers.

Agriculture represents 58% of provincial GDP, whereas services make up 31%, and industry and construction the remaining 11% (*Bac Kan* General Department of Statistics, 2001). Provincial GDP increased by nearly 60% between 1996 and 2000, driven both by agricultural development and the doubling of public investments in construction during this period (*Bac Kan* General Department of Statistics, 2001). The main beneficiaries of growth in construction and services are urban households, representing only 14% of households in the province, while most of the poorest families remain in rural areas. Development in the agricultural sector has caused the poverty rate to drop from 29% in 1998 to 17% in 2000. The mechanisms behind these macroeconomic changes are revealed in our studies at the commune and village scales.

4. The monographic studies

The first part of the book consists of five monographic studies covering five different districts of *Bac Kan* Province. These studies demonstrate that the trajectories observed at the village level result from an interaction between historical factors and internal household characteristics (i.e., area of paddyfield and household composition).

In Chapter 1, we present a short history of recent changes in land use and agriculture and their governing institutions, up to the *doi moi* reforms of 1980, using examples from *Xuat Hoa* Commune located in the district of *Bac Kan* town. This chapter provides the background to the remaining monographic studies, which for the most part begin their analyses at the time of *Doi moi*. The historical events presented in Chapter 1 took place in similar form and with similar effects throughout the mountains of northern *Viet Nam*. Likewise, the present-day situations described in Chapter 1 (e.g., high population pressure, changing rules of resource access, and a process of integration with the broader market) also exist throughout the northern mountains. Chapter 1 presents the hypothesis that is central to this book, namely that household differentiation is based upon two major factors: (i) abundance of labor force relative to the number of mouths to feed in a given household, and (ii) access to land, particularly to paddyland. This hypothesis is further developed in the subsequent chapters.

In *Cho Don* District, through the case of *Ngoc Phai* Commune (Chapter 2), we examine the role that ethnicity plays in determining farmers' production systems and circumstances. Historically, ethnicity was the key factor determining farmers' livelihood systems, with some ethnic groups making their living through shifting cultivation on the forested hillsides while others lived in fixed settlements around lowland irrigated paddyfields. However, circumstances have since changed. Chapter 2 shows that up to the 1980s, ethnicity helped to define production

systems as they are now observed, but has since faded in importance for the analysis of production strategies.

In Chapter 3, we look at *Cho Moi* District. In *Thanh Mai* Commune, the production systems have changed dramatically in response to policy reforms. Farmers have responded to population pressure by diversifying their production systems. Facing paddyland scarcity, some of them have moved to secondary houses in secluded forested areas to tap resources distant from their village centres and develop new agroforestry systems. This chapter clearly demonstrates the diversity of the mountainous regions, and the fact that a single national policy can have a wide range of effects in different areas, even within one commune.

In Chapter 4, we look at two villages within *Duc Van* Commune in *Ngan Son* District that have reacted in very different ways to the *doi moi* reforms and that have very different outlooks on the future. We examine these differences in light of the relationships between local farmers and the State.

Chapter 5 combines two villages from *Ba Be* District and one from *Ngan Son* District with one village from neighbouring *Cao Bang* Province for a comparative analysis of the effects of accessibility (or road access) in defining livelihood strategies. An analysis of accessibility provides a link between biophysical factors and farmers' socioeconomic constraints. Accessibility also helps predict the degree to which regional policies will achieve the desired results in a given area.

5. The thematic studies

In the second part of the book (Chapters 6-10), we address five development issues that were prioritized through the monographs:

1. Geographic distribution and dynamics of natural resources in the mountain landscapes,
2. Farmers' access to paddyland,
3. Farmers' access to forestland,
4. Crop-livestock interactions, and
5. Conflicting environmental and development policies.

These five sectoral studies aim at understanding the complex relationships among individual farmers' decision making, the institutions that regulate access to resources, and the biophysical and socio-economic environment in the recent period of transition.

Chapter 6 integrates geographic data with our monographic study of *Cho Don* District. We show that the latest round of forestland allocation has indeed halted forest deterioration, though such a macroscopic view ignores the different effects of the policy on individual farmers. Indeed, this chapter shows that forest cover quality has ameliorated primarily in the wealthier *Tây* villages that have extensive

paddyfields. In contrast, forest cover quality continues to deteriorate in the poorer *Dao* and *H'mong* villages that are still reliant on forest resources for survival.

Chapter 7 examines in detail the hypothesis that production strategies are driven by two main factors: access to paddyfields, and the level of rice self-sufficiency attained by a household in those paddyfields. An extensive typology of 300 farm households in our monographic-study sites confirms that montane paddy rice is the cornerstone of production systems in this region. We classified farmers according to the area of paddyfield owned and the cropping intensity in their paddy fields. This classification remains a major component of our understanding of mountain agriculture.

In Chapter 8, we look at four communities whose production systems rely almost exclusively on the forested hillsides and the impact of *Doi moi* on farmers there. Like chapters 4 and 5, this chapter shows that a single policy (here, forestland allocation) can have markedly different effects on different groups of farmers even within a very small region.

Chapter 9 addresses the issue of crop-livestock interactions, a central point in our holistic understanding of food-feed production systems in the northern mountains. A typology of animal-husbandry systems demonstrates the diverse roles of cows and buffaloes in the production systems of different kinds of farmers.

Finally, Chapter 10 looks at *Ba Be* National Park, and the conflicting goals of rural development and biodiversity conservation in this region. Chapter 10 shows that development policies have a much better chance of producing the desired effects if they take into account the circumstances and interests of stakeholders within the targeted areas.

The positive impacts of the *doi moi* reforms on the northern mountains are undeniable. However, this second set of chapters demonstrates clearly that while the reforms removed many obstacles to economic development for most farmers, they caused new problems for other farmers, particularly those reliant upon slash-and-burn cultivation. The latest forestland allocation policies have left these farmers with production strategies that are no longer adapted to their institutional environment, and farmers must now adapt or face emigration to urban areas that will pose harsh new challenges.

6. Conclusions

The four years that we have spent working with farmers in *Bac Kan* Province have convinced us that the “doom and gloom” hypotheses of earlier authors (Jamieson et al., 1998; Le Trong Cuc and Rambo, 2001) do not represent the only possible future for farmers in the mountains of northern *Viet Nam*. Indeed, several successful SAM Program innovations have demonstrated that farmers have the capacity to find new production practices and modes that are sustainable in the

present institutional and environmental context (Husson et al., 2001). The following approaches have the potential to increase agricultural production and income sustainably for farmers in the northern mountains.

Making efficient use of scarce resources

Our work has already demonstrated that mountain resources can be more efficiently used through agro-ecological innovations (e.g., improved fallow management, direct seeding into cover crops, multiple-use forage crops, etc.) (Husson et al., 2000). These innovations enabled both farmers with no paddyfields to make more efficient use of the hillsides, and farmers with paddyfields to intensify their production sustainably.

Although these technical innovations offer substantial sustainable increases in agricultural productivity, experience has shown that their adoption is often constrained by the institutional and social environment (e.g., weak social control of crop damage by animals, tree planting in collective pastures, theft, etc.) (Castella et al., 2002). Technical innovations need to be accompanied by organizational changes, for example in livestock management and collective pasturing systems, that can create an environment in which all villagers can benefit.

Building on social capital to achieve community-based resource management

Up to now, the technical innovations we have observed have been initiatives by individuals. As resources become scarce, all stakeholders in a community need to work together to increase the carrying capacity of their ecosystem. If projects are to have long-lasting impacts, they need to utilize the adaptive and location-specific process of building on social capital by working in active partnership with farmers. Although slow, this process is the only way that farmers themselves will take ownership and sustain the changes being introduced. This participatory, multi-stakeholder process also generates increased social cohesion, which has the potential to help the poorest and most marginalized of community members to benefit from the economic growth in their areas.

Development in the future will be based upon coordination among multiple stakeholders, and must move beyond the family sphere to which it has been confined since the 1980s. VASI and its partners in the Red River Program (VASI-GRET, 2000) are already working with farmers' organizations that are showing promising results. Institutionalizing these participatory methods should lead to a growing political confidence among farmers, empowering them to make their voices heard in policy-making and project development.

Diversifying income sources

At present, agriculture is at the center of rural development in *Bac Kan* Province, in spite of the province being disadvantaged with respect to the delta in terms both of productivity and market accessibility. Agriculture alone will not be able to

support the growing population in the mountains. Instead, the future must see households moving to non-agricultural sources of income, particularly as infrastructure projects make the mountains more and more accessible. Both the development of rural industry and the strengthening of education need to be vital components of sustainable rural development in the mountains.

The need for research and development activities in these communities remains stronger than ever, and each chapter in this book closes with a short section on the implications of the research for future development activities. However, more than anything, the results presented in this book should make clear that development must be based on a solid understanding of different local contexts and variables in mountainous regions that drive farmers' livelihood strategies and determine the chances of successfully implementing innovations in the future. It is our hope that this book will help researchers and development workers to identify priority themes for development in the mountainous areas in the years to come.

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