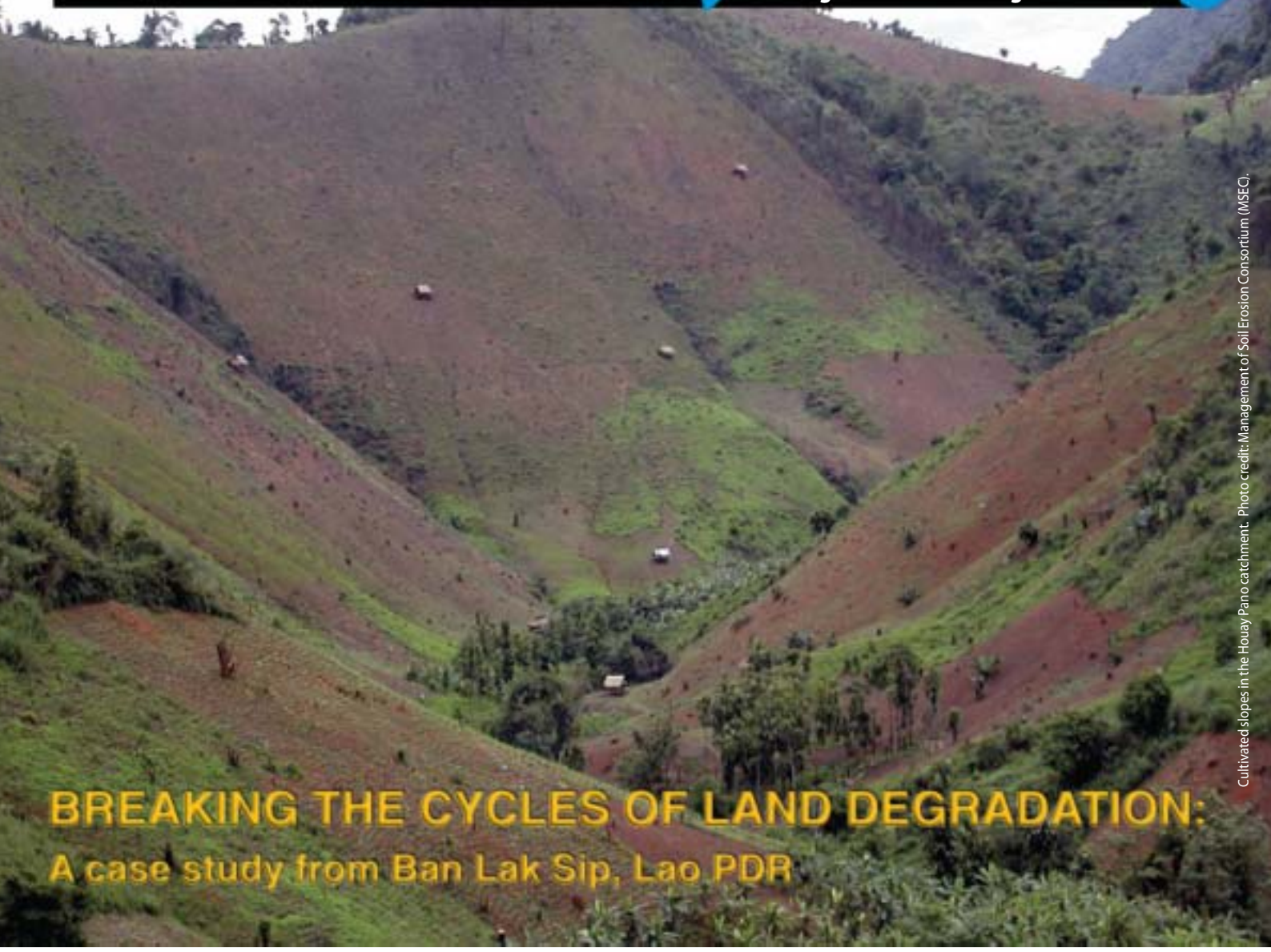
Water Policy Briefing

Issue 16

Putting research knowledge into action



Cultivated slopes in the Houay Pano catchment. Photo credit: Management of Soil Erosion Consortium (MSEC).

BREAKING THE CYCLES OF LAND DEGRADATION:

A case study from Ban Lak Sip, Lao PDR

Unsustainable farming practices in many regions are causing land resources to degrade—threatening future food security as well as the livelihoods of poor rural people. But, as new research has shown, tackling local problems requires an understanding of the policies and wider economic and social factors that influence farmers in their decision making processes to adopt inappropriate land use practices.

A broad, multi-scale analysis of land degradation in one village in Laos has provided valuable lessons that could guide environmental policymaking elsewhere, helping to ensure that new policies do not have unintended consequences.

IWMI
International
Water Management
Institute

Breaking the Cycles of Land Degradation:
A case study from Ban Lak Sip, Laos

Around the world, intensive farming in fragile environments is taking its toll on natural resources. This has led to greater awareness of the need to use agricultural land sustainably—to maximize yields without compromising the health and productivity of the soil. Laos' current rural-development and land-use policies were influenced in part by exactly such an environmental agenda. However, a recent study has shown that land degradation has actually increased in the village of Ban Lak Sip since these policies were put in place.

The study used an innovative multi-scale approach to analyze local land degradation in relation to Laos' broader socioeconomic and political environment. This showed that new policies had created an artificial shortage of land—forcing farmers to crop more intensively, and inadvertently causing more degradation.

Conventional forms of scientific analysis would have identified the change in farming patterns as the cause of degradation. But, importantly, they would not have pinpointed why the change occurred—information which is vital if ways of resolving the problem are to be found. So, because of the analytical approach used, the case of Ban Lak Sip provides a cautionary lesson in the formulation of environmental policy.

Policymakers need to carefully consider the impacts that conservation efforts will have on people's livelihood strategies, if they are to avoid forcing communities to take up practices that increase environmental degradation. To this end, any environmental policy that imposes restrictions, especially on people's livelihood activities, will need to offer new opportunities too.

Policies for development and environmental protection

Since 1975, Laos' rural development policies have had two major aims. One was to improve the services—including medical treatment and education—available to people living in remote areas. The other was to halt shifting cultivation, thereby stabilizing communities, improving socioeconomic conditions, enhancing resource productivity and minimizing land degradation.

However, ensuring access to services often involved moving remote highland communities to more accessible areas close to roads and rivers. This was true in the case of Ban Lak Sip, which was identified as a suitable resettlement area because it was located on a major road. Resettlement began in 1975 and continued until 1997.

By the late 1980s, in need of financial support, the Lao government started to involve international donors and foreign NGOs in the making of its rural development policy. Since then, foreign consultants—employed by institutions as diverse as World Bank, Asian Development Bank, United Nations agencies, Swedish International Development Agency and the International Union for the Conservation of Nature—have been working at promoting and writing up numerous decrees and laws relating to property rights and natural resources management. As a result, the new rural development policy placed new political stress on promoting the change from a subsistence to a market economy, and emphasizing the need to abandon slash-and-burn practices in favor of stable, market-oriented agriculture. To help achieve this, decision makers introduced the Land Use Planning and Land Allocation program in 1989 which allocated each household in Ban Lak Sip three plots of farming land, and banned agriculture on the rest of the land around the village. This non-agricultural land was then reclassified as 'production forest' (use of which was limited to hunting, collection of forest products, and some timber extraction) and, when located on the tops and upper slopes of hills and along streams, as 'protection forest'. These forests were intended to reduce soil erosion problems and minimize the amount of soil washed into watercourses.

This issue of Water Policy Briefing is based on research presented in *When 'Conservation' Leads to Land Degradation: Lessons from Ban Lak Sip, Laos* (IWMI Research Report 91) by Guillaume Lestrelin, Mark Giordano and Bounmy Keohavong. The full text of the report is available at *www.iwmi.cgiar.org/pubs/rrindex.htm*. The research was carried out by the Managing Soil Erosion Consortium (MSEC)—a multi-country collaborative effort to better understand land degradation, and potential solutions, in upland areas of Southeast Asia. MSEC is coordinated by IWMI with substantial contributions from France's Institute of Research for Development (IRD). MSEC's primary partner in Laos is the Soil Survey and Land Classification Center. For additional information, see *www.iwmi.cgiar.org/msec*.

Impacts of policies: intended and unintended

On one level, the resettlement and land reclassification policies applied in Ban Lak Sip worked. Forest cover was preserved not only in 65% of the land area of the village but also outside the village in the areas depopulated by the resettlements. Access to health services and education was improved and, simultaneously, farmers were encouraged to embrace more sedentary and market-oriented production methods. So, for example, both livestock production and the area of teak and banana plantations increased, as did vegetable cropping.

However, by limiting the amount of agricultural land available and moving more people into the village, these policies also caused an artificial land shortage (Fig. 1). This forced farmers to double the cropping period and shorten their fallow periods by almost two-thirds.

Already vulnerable to rill erosion and the degradation caused by tillage, these fragile highland soils rapidly began to deteriorate under the revised farming regimes. And, faced with falling yields, farmers have been forced to work harder and harder on the land available. Although relatively localized, this cycle of decline in land quality and working conditions has contributed to producing opposite effects to what was intended when the new policies were introduced (Fig. 2).

Implications for policymaking and research

The key lesson provided by the Ban Lak Sip study is that drivers far removed from a village or system can cause land degradation when they result in unsustainable change. In Ban Lak Sip's case, the changes observed were primarily imposed from the outside by policy inspired by the new economic and political situation of the country and by environmental concerns of Laos' new international partners. What this means is that, although land degradation in the village is being directly caused by the current farming systems, resolving the problem—and avoiding it elsewhere—requires an understanding of what changed to make long-established, tried-and-tested systems unsustainable.

The integrated multi-scale approach IWMI's researchers used to identify the root causes of Ban Lak Sip's land degradation problems covers various physical, social, economic and political dimensions. It can, therefore, be used to gain a better understanding of how policy changes in one sphere (environmental protection, for example) can affect other areas (such as agricultural land degradation). Thus, it provides a tool that can be used to guide future research and produce informed environmental policy (Box 1).

Figure 2. The policy, population and degradation cycle now occurring in Ban Lak Sip. With a limited amount of agricultural land available, and the yields from that land falling, farmers use their only other available resource—labor—to try to grow enough food for their households.

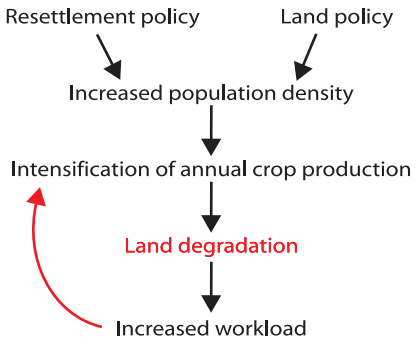
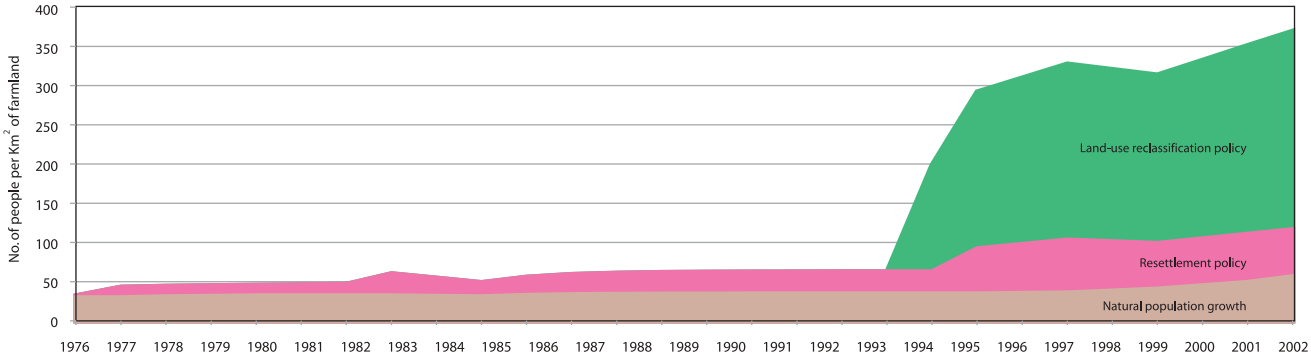


Figure 1. More people, less farmland. Effects of natural population growth, a resettlement policy (since 1975), and a land-use reclassification policy (1995) on the number of people per square kilometer of farmland in the village of Ban Lak Sip. The reclassification policy reduced the village's agricultural land to 31% of the total, so the number of people relying on each hectare of farmland rose dramatically.



Box 1. Designing environmental policies: avoiding unwanted side-effects

Consult communities—the wider impact of any proposed policies should be discussed with the communities that would be affected. Ban Lak Sip's residents, for example, knew that the new land reforms would force them to farm in an unsustainable way. Their input could have helped to produce a policy which avoided the current problems of land degradation.

Set up pilot policy trials—new policies should be tested in small areas before they are implemented on a large scale. Medium- to long-term participatory monitoring of the biophysical and socio-economic changes in the pilot areas would highlight potential problems and allow socially acceptable solutions to be identified.

Offset constraints with opportunities—access to new resources or livelihood opportunities should be provided if a new policy reduces available resources, such as land in the case of Ban Lak Sip.

Consider cultural values—in many areas of Southeast Asia, a policy threatening household self-sufficiency in rice may clash with traditional values and result in conflict which leads to environmental degradation. In Lao, for example, 'eating' literally translates as 'eating rice', and rice is often used in traditional ceremonies.

A multi-scale approach - what is involved?

The multi-scale approach used in Laos can easily be applied in other regions (Fig. 3). It considers household production strategies in light of (1) the 'biophysical dimension'—what farming systems are physically viable given the productivity of the land and the amount of land available; (2) the 'social dimension'—which practices are socially acceptable in terms of people's goals, beliefs and institutions; and (3) the socioeconomic and political dimension—what types of farming are feasible within the broader environment of the country.

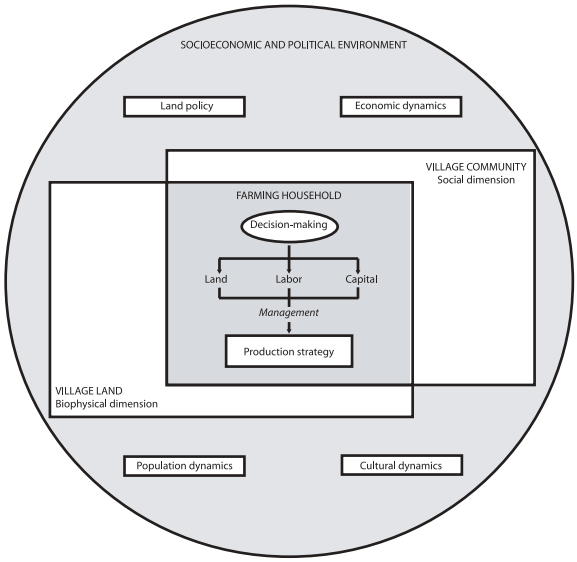
The real strength of the approach lies in its ability to take account of external pressures, as a whole range of 'outside' influences actually dictate what type of farming system can be applied in a particular area. Examples of such pressures include:

- *land policy*—which dictates how land and other natural resources are used;
- *population dynamics*—as increases or decreases in the number of people in an area influence the farming options available;
- *economic dynamics*—as changes in policies, market access and incentives all influence how people farm; and
- *cultural dynamics*—such as 'modernization' efforts or a resurgence of traditional values.

Obviously, however, identifying the complex interactions that actually lead people to apply unsustainable practices requires a multidisciplinary approach and the use of a wide range of data and data sources. The Ban Lak Sip study, for example, gathered research about the physical environment and the links between production practices and land degradation via fieldwork conducted by the Managing Soil Erosion Consortium (MSEC). It also used group discussions and interviews with key informants (e.g. village authorities and first settlers) to assess local perceptions and community characteristics, and questionnaires and structured interviews to gather information on rural livelihoods and the farming systems used. Finally, researchers assessed Laos' broader socioeconomic and policy environment by interviewing government authorities and development agents and consulting government publications, regional literature reviews and national statistics.

This thorough and wide-ranging approach allowed researchers to pinpoint both the 'direct' causes of degradation in the area and the 'hidden' drivers that were actually encouraging unsustainable practices.

Figure 3. A stylized view of the farming system in Ban Lak Sip – and its wider context. The case study examined the causes of land degradation at different scales, from the household to the national level.



A gully in a cropped field and the exposure of bare rocks in Ban Lak Sip.

Degradation - the evidence

The study found evidence for erosion around the village. Landslides and eroded gullies (Photo 1), for example, were damaging crops and making areas of land less productive. Gully erosion in particular was causing large-scale soil losses in cropped fields in the highlands (Box 2). Researchers calculated, for example, that, in 2001 and 2002, gullies in the cropped fields of one watershed were responsible for soil losses of 18 and 1.5 tons/hectare respectively, whereas rates for the entire watershed were measured at 2.4 and 1.1 tons/hectare during the same periods.

Further evidence that erosion was linked to annual crop production was provided by a study of the sediment in the area's streams in 2001 and 2002 (Table 1). This showed that, despite the fact that less rain fell in 2002 than in 2001, there was 65% more sediment in the water in 2002 and almost twice as many new gullies had appeared on the annual cropland. Researchers suspected that this was because the area planted with annual crops in 2002 had increased, while the area protected by fallow vegetation had decreased sharply (Table 1).

Interviews with farmers indicated that erosion was actually a long-term problem, as 87% of those surveyed said that there had been a large increase in soil erosion across the area over the past 15 years.

Box 2. Highland areas at risk in Ban Lak Sip

Ban Lak Sip's highland areas are those most at risk from erosion, because they have thinner soils than other areas. The problem of erosion in these areas becomes more pressing once it is realized how much they contribute to the villagers' livelihoods. Almost one-third of the livelihood activities of an average household are carried out in the highland areas. More importantly, such areas account for the majority of all annual crop production, the mainstay of Ban Lak Sip's still largely subsistence-based production system. In fact, annual cropping—in particular, upland rice production—is the single most important livelihood activity undertaken by village households.

Table 1. Erosion in Ban Lak Sip: the amount of sediment eroded from one 60-hectare sub-catchment (measured in a weir at the outflow of the sub-catchment) compared with the land uses in the entire Houay Pano catchment (67 hectares). An increase in erosion in 2002 was linked to a rise in the area of crops and a drop in the area of fallow.

		Eroded sediment in the sub-catchment (tonnes/hectare per year)			Land use in the whole catchment (% of the total land area)		
Year	Annual rainfall (mm)	Total	Bed load	Suspended load	Annual crops	Fallow	Forest
2001	2,222	4.09	1.46	2.63	8.6	60.2	14.2
2002	1,807	6.75	1.80	4.95	39.3	35.1	14.2

Direct causes of degradation: changes in farming systems

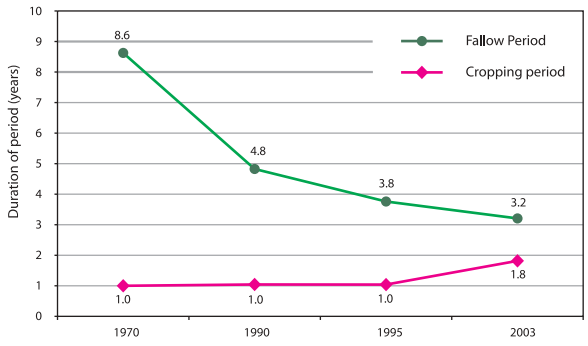
All the farmers interviewed identified an increase in the area cleared for annual crops and a lack of soil cover as the main causes of soil erosion. This was backed up by other surveys, which confirmed that the area used for annual crops had indeed increased and that annual cropping had become a more widespread practice. In fact, the percentage of households growing annual crops had increased from around 70% in 1970 to 100% in 2003.

Moreover, 85% of the farmers interviewed said that their yields had declined over the past 15 years. This was confirmed by the results of a survey on upland rice yields, which showed that yields in 1995 and 2003 were around 22% lower than in 1990. It also showed that this drop in yields had occurred despite the fact that, between 1995 and 2003, the average number of people working on each hectare of land had risen by 27% and the number of days worked per year by 14%.

The study also identified other changes in the farming system that have a bearing on land degradation. Fallow periods, for example, fell steadily from an average of 8.6 years in 1970 to only 3.2 years in 2003, while cropping periods (the length of time a plot is cropped for before being rested) rose sharply after 1995 (Fig. 4).

Researchers concluded that labor use had intensified because farmers were trying to compensate for falling yields by investing more effort in weeding and tillage. However, experience from this and other areas suggests that this type of 'labor-led' intensification—without investing capital in conserving the soil and replenishing soil fertility—is unlikely to be sustainable (see Box 3).

Figure 4. Changes in the average fallow and cropping periods in upland fields used for growing annual crops between 1970 and 2003.



Box 3. The problems of shorter fallows: more weeds, lower soil fertility, lower crop yields, and increased workloads

Shorter fallows mean that less vegetation is able to regenerate between cropping periods. In turn, this means less protection for the soil, and thus greater potential for run-off erosion. Plus, because less vegetation has regenerated, there is less to burn at the end of the fallow. As a result, less carbon and fewer nutrients are returned to the soil after the burn, which leads to lower fertility.

Shorter fallows also mean that more weed seeds remain viable than would be the case after a long period under a dense cover of vegetation. So, farmers often have to spend extra time weeding their fields after burning. This can delay sowing and increase run-off erosion, because the soil is left bare. Weed problems can also occur when crops are growing. And, if this happens, farmers have to invest yet more labor in weeding because weeds compete with crops and reduce yields. Both scenarios increase the risk of tillage erosion, as farmers often use hoes to weed steep slopes. Also, more frequent cropping can favor the appearance of hardier weed species able to tolerate disturbance—which makes weeding even harder.

Finally, disturbance and water and tillage erosion all cause loss of soil organic matter—the soil's storehouse of nutrients. Soil fertility therefore declines, as do crop yields.

Root causes of degradation: policy changes

The study found that the main drivers of agricultural change were population pressure and shortages of agricultural land. This change actually occurred in two distinct phases—both triggered by policy. The first phase began before 1990 and lasted until 1995, a period during which the community was forced to adapt to new population pressures and land shortages caused by the resettlement policy. During this phase, the area used for tree plantations and to grow annual crops expanded slightly. Much more important at this point with regard to land degradation was the fact that fallow periods were shortened.

The second phase began when land reforms were introduced in 1995, and involved far more change. The decline in soil fertility which had begun in the

previous phase was boosted by land reclassification, which in a single year slashed the area of farmland available to the average household by one-third—from 3.9 ha to 2.7 ha.

Coupled with natural population growth, the resettlement policy and the land reclassification policy have caused a 10-fold increase in population density per unit of agricultural land over the last 25 years (Fig. 1). By far the largest share of this jump in population density was caused by the land reclassification policy. In fact, in one year, this policy had the same effect on per capita arable land availability as natural population growth and resettlement had over a ten-year period.

Ban Lak Sip—an overview

Breaking the cycle

So, taking the broad view encouraged by the integrative multi-scale approach used in Ban Lak Sip, how should decision makers go about breaking the cycles of soil degradation that well-meaning policies have caused in similar areas (Fig. 2)?

Revising policy

One option is to change or reverse past policies. Moving residents out of the area to ease the pressure placed on resources is probably not a viable policy option. However, reconsidering the land-classification scheme, and the way it is implemented, may be. At the very least, understanding the impacts that resettlement and land-use policies have had on land degradation in Ban Lak Sip should guide the development of policy for other areas in the future.

Introducing new agricultural technologies

Another way forward is offered by encouraging farmers to adopt farming technologies which are better adapted to the new farming conditions. Careful thought should be given to this option, however, as it may sometimes involve treating a symptom rather than the cause of the problem.

In addition, care would have to be taken to ensure that any system introduced is not only appropriate to the target area, but also feasible within the context of the economic conditions (local and national) likely to affect it in the future. In Ban Lak Sip, for example, terracing systems might at first seem a viable option, as they have worked in other areas with similar population densities. However, they might not work if applied in Ban Lak Sip, because they require secure land tenure and capital inputs, which are simply not available to the villagers at present.

Reducing the pressure on available farmland

Another option is to reduce the amount of pressure on the agricultural land available, by making local people less dependent on it for their livelihoods. Encouraging off-farm work is one solution—handicraft production, trading, and seasonal factory work, for example, are activities that some villagers are already involved in. A shift to more labor-intensive crops such as vegetables is another alternative, as these can be sold to provide a cash income, and there is a gradually expanding market in the nearby town of Luang Prabang. Vegetables and herbs such as coriander, lettuce, onions, cabbage, watercress and mint are already being grown on the lower slopes of the village's land, where soils are deeper and less prone to erosion.

Understanding how such processes can be helped along—for example through increased education, improved transport networks or market development consistent with Laos' now more open economic environment—may also provide relief.

An upland rice field before harvest
Photo credit: MSEC

Water Policy Briefing Series

The ***Water Policy Briefing*** Series translates peer-reviewed research findings into useful information for policymakers and planners. It is published several times yearly, with the goal of bringing new and practical approaches to water management and planning into the policy recommendation process.

The series is put out by the International Water Management Institute (IWMI) in collaboration with national and international research organizations. It is free of charge to development professionals.

The Water Policy Briefings are also available online: **http://www.iwmi.cgiar.org/waterpolicybriefing/index.asp**
You can sign up to receive the publications by email or post.

Comments and questions are welcome. Please send correspondence to:

The Editor, Water Policy Briefing
International Water Management Institute
P.O. Box 2075, Colombo, Sri Lanka
Telephone: 94 11 2787404
Fax: 94 11 2786854
Email: waterpolicybriefing@cgiar.org

About IWMI

IWMI is a non-profit scientific organization funded by the Consultative Group on International Agricultural Research (CGIAR). IWMI's research agenda is organized around four priority themes covering key issues relating to land, water, livelihoods, health and environment:

Theme 1: Basin Water Management: *understanding water productivity*
Theme 2: Land , Water and Livelihoods: *improving livelihoods for the rural poor*
Theme 3: Agriculture, Water and Cities: *making an asset out of wastewater*
Theme 4: Water Management and Environment: *balancing water for food and nature*

The Institute concentrates on water and related land management challenges faced by poor rural communities in Africa and Asia. The challenges are those that affect their nutrition, income and health, as well as the integrity of environmental services on which food and livelihood security depends. IWMI works through collaborative research with partners in the North and South, to develop tools and practices to help developing countries eradicate poverty and better manage their water and land resources. The immediate target groups of IWMI's research include the scientific community, policy makers, project implementers and individual farmers.

For further information see www.iwmi.org

IWMI
International
Water Management
Institute

Editor: Sharni Jayawardena; Writers: Dr Sandy Williams & Dr Jim Weale; Layout Nimal Attanayake *(http://www.scriptoria.co.uk)*.