Markets, policies and the environment in Thai agriculture: is an environmentally-friendly agricultural transition possible?

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Summary

The growth of Thailand’s economy and the transformation of its agricultural sector has been remarkably rapid. In many upland and highland areas, the shift from remoteness to market integration, from subsistence to commercialization, has taken place over barely two decades. In spite of increasing land scarcity and ever-higher returns to most agricultural enterprises, however, private investments in soil conservation have lagged far behind the pace of agricultural growth, suggesting that many, if not most, farmers in affected areas are either unwilling or unable to undertake such investments. To resolve the serious problems of land degradation and erosion requires an understanding of factors that guide and constrain farmers’ decisions.

In this proposal I argue that to gain such an understanding requires the identification both of ‘macro’ (largely economic and policy) influences as well as ‘micro’ (predominantly local and institutional) constraints. These two sets of phenomena jointly govern the overall profitability of agriculture and farmers’ land use and soil conservation decisions, yet their influence and interactions are seldom carefully distinguished or studied in an integrated way. I propose to address this by means of two linked research activities. First, I will obtain econometric estimates of the short and long run impacts of aggregate economic growth and of key policy reforms on resource allocation in upland and highland agriculture. Second, I will use these estimates to evaluate the land use and environmental impacts of economic growth and policy reforms, within an analytical framework integrating local economic and institutional conditions based on data gathered at selected field sites. An important objective of the research will be to be able to propose changes in policy and project design that will lead both to improvement in the overall economic welfare of agricultural communities and to maintenance of the quality of their environmental resource base.
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Motivation

In this research we propose to examine some interactions between economic growth, policies and the environment in Thailand. Thailand’s extraordinarily rapid economic growth has been much more closely based on resource industries, and especially agriculture, than was the case in the East Asian NICs. In recent years increasing concern has been expressed over the environmental and resource costs of a strategy in which agriculture plays such a prominent role. Rapid depletion of forest, soil and water resources may diminish the prospect of sustained long-term growth, in addition to contributing to less easily quantified phenomena such as the loss of biodiversity and recreational amenities.

Part of the explanation for Thailand’s rapid economic growth lies with policies pursued by its governments, and in particular to reforms that over time have tended to create a more open trading economy. Trade policy has been substantially liberalized while domestic taxation and price policies have been used to address a range of objectives, including the promotion of infant industry sectors and regional industrialization (Warr and Nidhiprabha 1995). Reform of the tax and tariff system is likely to remain an important economic policy issue for a long time—especially in the wake of the 1997 economic crisis, since this has given renewed emphasis to the need for greater efficiency and transparency in business and administration. Moreover, commitments made under the Uruguay Round of the GATT and the AFTA accord will require continued liberalization. Concurrently, growing concern with environmental quality has generated interest in the relationship between growth, tax and trade policies and environmental degradation, and in particular in the question of whether economic liberalization could produce so-called ‘win-win’ outcomes, in which reforms promote economic growth without increasing rates of environmental and natural resource degradation.

While the interaction of growth and the environment is an issue in many sectors, we plan to focus initially on the important topic of agricultural resource degradation. Rapid agricultural expansion and land conversion, intensification of chemical and inorganic fertilizer inputs, conflicts over property rights to both land and water, erosion externalities and a range of distortionary trade and pricing policies ensure that the interface of environmental and policy questions is a rich and relevant area for research (Mingsarn and Pednekar 1996; Nipon et al. 1995; Christensen et al. 1994). In an era of rapid growth and sometimes far-reaching policy reform, little is known about the short and long-run economic and environmental implications of growth and policy changes affecting the structure of agricultural production, input demand, and land use. This is so in part because of the data and analytical demands of the task: in order to understand agricultural resource allocation it is necessary to integrate analyses of aggregate information about market and policy trends with careful empirical investigations of behavior and technology in agriculture, especially among poor, small farmers.

The paradox of land degradation in a rapidly growing economy

While the tension between economic growth and the environment is palpable everywhere in Thailand, in certain areas—upland and highland agricultural zones, forest margins and some coastal fisheries in particular—these have interacted with poverty to create uniquely difficult situations. Under pressure of poverty, or uncertainty about tenure, or due to inability to insure against crop or market failure, farmers and other resource managers may take decisions which, while arguably appropriate to their own situation, are often regarded as detrimental in a broader social or economic setting. Deforestation and the cultivation of land-degrading, erosive crops in uplands and highlands are obvious examples in which the welfare of a household or village is increased at a cost to society.
In very poor countries and in relatively land-abundant areas, it is not surprising to observe farmers mining the soil, either in pursuit of basic household food security or because the abundance of land makes soil-conserving investments unprofitable. About a generation ago, Northern Thai agricultural areas were indeed characterized by poverty and relative land-abundance. Both appear to be declining rapidly as urbanization, infrastructural development and non-agricultural income growth have steadily reduced dependence on agriculture for subsistence, even in remote highland areas, at the same time as population growth has rendered good agricultural land relatively scarce.

Theory suggests that commercialization and increasing population pressure would both tend to raise the value of agricultural land, and therefore to increase returns to investments in soil conservation. In spite of this, rapid land degradation continues. The paradox is that the rapid growth of non-agricultural incomes—wages and remittances—simultaneously reduces both the incentive to degrade agricultural land and the value of investments directed at conserving it. Changes in the prices of agricultural products may similarly increase or reduce the incentive to invest in land quality (Clarke 1992). It is not clear whether Thailand’s economic and agricultural transformation will ultimately increase or reduce incentives to preserve land—hence the question in the title of this proposal.

Agriculture in Thailand’s Upper North vividly illustrates this paradox. To travel in the region is to witness the transformation of a rural economy. Just two decades ago, the agricultural census shows that upland food cultivation consisted almost exclusively of rice, corn and minor vegetable crops, all grown primarily for subsistence. In a typical province like Chiang Rai, more than ninety per cent of the rural population derived their income exclusively or primarily from agriculture. For more than three-quarters of farm families, animal-drawn carts were their only means of transport over roads that were frequently impassable during the rainy season. Poverty was endemic and average levels of educational attainment were extremely low. Today, most agriculture is commercially oriented; remote households that once produced only subsistence staples (and perhaps opium) are now able to grow a much wider range of crops—notably fruits and vegetables—for distant urban markets, taking advantage of paved roads, pick-up trucks, and cellular phones. Farm households, and especially their children, derive an increasing fraction of their income from seasonal or even permanent participation in off-farm and urban labor markets. These structural changes have been accompanied by a demographic transition in which the average number of children per rural family has fallen by approximately half in a single generation. For the typical farm family, all these changes have raised real income and reduced its variability across seasons and years.

With increasing (and increasingly diversified) income, and with fewer food security concerns, one might expect to find increasingly widespread adoption of soil-conserving practices in a land-scarce economy. Yet there is no broad evidence of such a trend. In uplands, field crops such as corn, cassava and soybean have expanded in total area and as a fraction of cultivated area (Nipon et al 1995; Coxhead and Jiraporn 1997). Grown continuously, using conventional tillage and land management techniques on fragile upland soils, these crops rapidly deplete soil nutrients and are major causes of erosion. More intriguingly, in some highland areas agricultural land use seems to be following divergent paths, even within very small and geographically homogeneous areas. Isolated farms and some small groups have indeed adopted physical conservation practices such as grass strips and hedgerows; others have switched crops from corn and upland rice to tree crops or pasture; others still have specialized in cabbage and other commercial vegetable crops. Under most conditions, perennial crops conserve soil quality and minimize erosion; physical structures such as grass strips and hedgerows with annual crops planted between are moderately effective, and intensively cultivated vegetable crops are highly damaging. Therefore, these practices in highlands all have very different implications for land quality.

Some of this heterogeneity in land use and land management arises because households face different constraints and norms imposed by culture, geography, poverty
and legal status (Townsend 1995). We hypothesize, however, that market and policy trends in the national economy also play a major role in influencing farmers’ land use and technology adoption decisions, and thus ultimately affect the quality of the land resource. Over the past decade, rising labor costs have reduced the profitability of labor-intensive activities. A new quantitative study of the sources of recent declines in aggregate agricultural land and labor demand clearly shows that price and wage trends caused by the investment boom outside agriculture are the primary influences (Coxhead and Jiraporn 1997). Economic growth has created a context in which adoption of labor-saving crops and technologies, and possibly even land retirement, are likely to accelerate.¹ Other growth-related trends may influence land use, perhaps in contradictory ways. For example, urbanization and changing consumer preferences have caused sharp rises in the prices of temperate-climate vegetables such as potato and cabbage. Agricultural policy shifts over the same period have benefited producers of field crops, and in particular corn and soybean (Nipon et al. 1995). Thus divergent patterns of highland agricultural development may reflect different relative influences of prices, policies, local market development and institutional or household welfare constraints.

A full understanding of how farmers’ decisions are reached thus requires a clear appreciation not only of ‘micro’ institutional and economic conditions but also of how markets and policies in the broader economy contribute to the creation of conditions conducive to, or discouraging of, soil-conserving crops and technologies. Only by examining micro and macro factors and their interactions together can the paradox of land-degrading practices in a rapidly growing economy be resolved.

Does economic liberalization promote land degradation?
In a rapidly growing economy, investment ‘booms’ in non-agricultural sectors tend to reduce overall agricultural growth rates by reducing relative prices and raising input costs, especially wages. Income growth also raises the prices of non-tradables, including those agricultural goods facing little or no international competition. These trends have fairly predictable effects on agricultural land use—at least at the aggregate level. What is less clear is the role played by policies, especially those policies whose reform appears to be an integral part of the growth process.

In Thailand as in most developing countries, price, trade and exchange rate policies have historically had direct and indirect effects that discriminate against agriculture as a sector, and against export crops in particular (Ammar and Suthad 1990; Krueger et al. 1988). As a result, trade and exchange rate reform and related policies have brought about major improvements in agricultural incentives in the past decade. What are the possible implications of this process of liberalization for land degradation?

A large, if informal literature has grown up around this question. The case for a ‘win-win’ outcome of faster economic growth together with reduced land degradation rests primarily on two observations: that prevailing price policies discriminate in favor of relatively more erosive food crops and against relatively benign perennial export crops, and that capital market interventions have denied affordable investment funds to farmers (Repetto 1989; Cruz and Repetto 1992). Critics of this view respond that market reforms alone, unaccompanied by institutional reforms directed at lengthening farmers’ planning horizons and reducing their rates of time discount, may have adverse environmental impacts: "better farm prices now, if they work as intended, will encourage 'soil mining' for quick, big crops now" (Lipton 1987:209). More formal analyses demonstrate the potential for accelerated resource depletion if the opening of resource-intensive sectors to trade is not accompanied by reforms securing property rights (Lopez and Niklitschek 1991).

Past Thai agricultural trade policies discriminated against rice, which is produced mainly in lowlands, and perennial crops such as rubber and coffee, which compete with

¹ In fact, total agricultural has declined by about 10% since 1990 (Coxhead and Jiraporn 1997), but surprisingly little land retirement has occurred in upland or highland areas.
annual crops for upland and highland land use. In addition, manufacturing sector protection imposed an implicit tax on all agricultural sectors. Moreover, protection, by raising the relative prices of imports and import-competing goods, induced consumer substitution effects that also raised the profitability of non-traded goods. Protection thus conferred benefits on producers of upland and highland annual crops that were effectively non-traded—some by virtue of perishability and transport costs, others (like cabbage and potatoes) because of import restrictions. Finally, by favoring relatively capital-intensive activities, protection contributed to slower non-agricultural employment growth (other things equal) and this may have reduced the rate of out-migration from agriculture in general and from uplands/highlands in particular. Therefore, the thrust of past Thai trade policy was probably to promote the growth of land-degrading, soil-eroding forms of upland and highland agriculture. It follows that trade liberalization, by reversing many of the effects just described, could diminish the depletion rate of upland and highland agricultural resources and the delivery of sediments and polluted water to lowlands.

However, this result could be easily be reversed, for example if trade liberalization in industry were accompanied by increases in some forms of agricultural protectionism. The net tax on agriculture in Thailand has been declining for 2 decades from its peak in the late 1970s (see figure). Experience in the OECD indicates that agricultural protectionism tends to rise as the economic importance of the sector declines faster than its political influence. If protection for highly erosive crops such as corn and temperate vegetables is maintained or increased while demand continues to grow, then their relative producer prices will rise and area planted will expand, with likely negative erosion and water quality impacts.

Rapid depreciation of the exchange rate, as took place in late 1997, is another major influence on relative agricultural prices; its effects are closely related to those of an increase in protection. On its own, the fall in the baht raises profitability in exportable sectors such as rice and rubber, and this should draw labor and other resources out of other agricultural sectors. However the devaluation also makes competing imports more expensive. To the
extent that Thai vegetables compete with imports from Yunnan, Laos and elsewhere, a depreciation of the baht relative to the currencies of these countries promotes domestic production. Thus currency reform, and trade liberalization in manufactures without corresponding reforms in agricultural trade policy, could in some circumstances contribute to an acceleration of upland and highland land degradation.

Finally, the interaction of policy reform with economic growth is complex, and its local effects cannot be predicted from aggregate data. Growth and reform occurring simultaneously may reinforce or have contradictory effects on existing land use and agricultural development trends. Separating the two is an important empirical task.

In this introduction I have argued that to understand the problem of upland and highland agricultural land degradation in a rapidly changing economy such as Thailand’s requires clear comprehension both of the conditions of village economies and of the broader political economy from which market signals emanate. However, there is little current research on land use and the environment that attempts rigorously to close the gap between these two fields. The perils of neglecting economic context (in the case of micro studies) or the heterogeneity of conditions faced by resource managers (as in most macro studies) are clear. In Thailand today, much project design for “sustainable” use of agricultural and forest resources by individuals and communities is innocent of likely interactions with broader economic changes; similarly, much economic policy is implemented without regard to its potential environmental impacts. There is scope for improvement in both kinds of endeavor.

**Goals and research questions**

The design and implementation of effective projects and policies for agricultural development with environmental protection requires empirical information on the structure of agricultural production, resource use and investment, and also on the consistency of proposed policy reforms with other economic and political objectives. This study is intended to generate basic knowledge about the influence of economic growth in general, and major trade and tax policies in particular, on Thai agricultural production and resource allocation, and to combine that knowledge with primary data on agricultural constraints and choices by resource managers in selected study areas to yield a more searching analysis of the microeconomic and environmental implications of present and proposed project and policy reforms. Specifically, the study will address the following three questions:

1. How do overall economic transformation and policy reforms affect land expansion and land use in Thai agriculture, and particularly in highland areas?

2. How do upland and highland farmers respond to changing wages, prices, and policy signals from the broader economy, and what are the likely environmental implications of their responses?

3. What are the policy and programmatic paths most likely to promote both improved welfare and the maintenance of environmental quality in highland areas?

**Methodology**

Addressing these research questions requires a combination of econometric estimation, analytical modeling and empirical investigation. Although we will propose some specific hypotheses regarding the aggregate data, the methodological approach is intended to provide flexibility in the sense that as more becomes known about decision-making at household and village level, the theoretical framework may be subject to review and
revision. Thus if the data suggest a different way of thinking about how village economies work—a modification of theory—then in the long run this finding may be at least as useful for improved policy design as the empirical results themselves.

1. Explaining trends in agricultural land and labor use

The analysis of aggregate agricultural data is intended to explain broad changes in land allocation and input use in terms of prices, policies and the fixed resources of the agricultural and nonagricultural sectors. The econometric method assumes, for each observational unit (e.g. region), the existence of a representative producer whose decisions on what to produce and what technology to use are guided by profit maximization. The results of this analysis provide answers to a question such as: if producers behave on average in the way assumed by this model, what land use and labor demand responses would we expect to find following an investment boom in non-agriculture? What if non-agricultural wages increased by ten per cent?²

Preliminary estimates using regional data from 1961 to 1995 (Coxhead and Jiraporn 1997) confirm some strong suppositions and suggest some surprising new interpretations. They strongly suggest that it is capital accumulation and price trends outside agriculture that are the key determinants of agricultural labor availability and land use. These trends, which affect agriculture through wage rises and relative agricultural price declines, have been especially strong over the decade to 1995. Given the very rapid growth of the economy over this period, the model predicts not only the overall decline of agriculture, with the least profitable land being first to go out of production, but also a land use shift towards less labor-intensive crops and technologies, and towards production of non-traded crops (mainly fruit and vegetables) for the booming domestic market. However, a comparison of the results obtained using regional data with trends in individual provinces shows that although the aggregate agricultural land area has declined substantially, the area planted in predominantly upland and highland provinces has continued to expand. Moreover, while the provincial data confirm some predicted changes—such as the increasing area devoted to fruit and vegetables—they also reveal some province-level land use shifts that seem to go against the trend. Analyzed in more detail, these departures from the predictions of the regional econometric model should help us to identify environmental or institutional constraints and to build hypotheses about how these might condition individual behavior—an example of new theory from the investigation of data as described above.

Another important limitation of the aggregate approach, for our purposes, is the impracticality of deriving detailed environmental outcomes from observed patterns of land

² The impending recession in Thailand raises some other important questions that the proposed study will be able to illuminate. The recent massive contraction in garments, textiles, footwear and similar sectors has thrown thousands of unskilled or semi-skilled workers out of work. In late 1997 the Thai press reported huge increases in unemployment and predicted widespread movement of labor ‘back to the farm’.

The rapid transfer of labor from agriculture to other sectors in the past decade appears to indicate an extraordinarily high degree of intersectoral labor mobility in Thailand. The recession, however, may well reveal that this mobility is much greater in one direction (away from the farm) than the other. There are two possible reasons for this asymmetry. First, even with high and rising open unemployment, the expected wage in non-agriculture may still exceed the reservation price of migrant labor. The second reason may have to do with the nature and rate of agricultural investment in recent years. National stocks of labor-replacing equipment—large and small tractors in particular—have grown exponentially during the period of very rapid intersectoral labor transfer. At the same time, stocks of buffalo, used as a very labor-intensive source of draft power, have fallen sharply. These data suggest that even if labor were to return to the farm, sunk agricultural investments in labor-replacing equipment may mean that the creation of new farm jobs, if it takes place at all, will do so only with a long lag. Thus the nature of capital accumulation in agriculture may mean that even with open unemployment and declining real wages of unskilled labor in urban areas, there will be little movement of labor back to agriculture. This in turn would imply that the land area response to the crisis may also be limited.
allocation and input use. It makes no more sense to talk of a ‘representative’ land unit than it does to impute the same behavioral characteristics to all producers. Again, however, the prediction of broad shifts in agricultural production and input use is necessary to supply the context for more detailed analysis of field data.

The analysis of aggregate data as just described has already made substantial progress, with support from UW and the Thailand Development Research Institute Foundation (TDRIF). This analysis has many applications beyond the goals of this project and stands alone as a contribution to deeper understanding of Thai economic development.

2. Resource managers’ responses and environmental implications

It has just been suggested that land use trends predicted from aggregate data are in some cases contradicted at lower levels of aggregation, e.g., by provincial data. For the analysis of household welfare and environmental outcomes, the unit of analysis needs to be much smaller—either households or small groups with strong common characteristics. This change of scale implies primary data collection, and has other costs as well as benefits. Environmental, economic and cultural variability is very high; but these are precisely the sources of variation that we anticipate might explain departures of observed land use trends from the aggregate predictions. Thus the ‘micro’ core of this project will be constructed from economic, institutional and demographic data drawn from focus groups and farmer interviews in several selected upland and highland sites in Northern Thailand. The goal will be to obtain insights into how highland farmers respond to economic signals and to infer the broad environmental implications of their responses. These are exactly the kinds of detailed information cannot be obtained by the analysis of aggregate data.

Our method requires the construction of a data set having time depth in order to make possible the analysis of temporal variation in markets and prices. Having selected appropriate sites, we will use recall and records to construct land use histories and to explain these in terms of a combination of micro and macro variables including local environmental and infrastructural conditions; household wealth and income, price and wage trends, the diffusion of market and technical information, and relevant local events (e.g., construction of a bridge, or the presence of an NGO).

Having obtained farm-level and village-level information and combined it with the appropriate aggregate data, we will begin by using standard quantitative methods such as tobit/probit analysis to explain local land use patterns in terms both of ‘macro’ trends and of ‘micro’ conditions. At this stage of analysis we should be able to begin to answer the first part of the second research question on p.5, for example by identifying factors influencing crop or technology adoption decisions. However, the household data should also support the application of models of farm resource allocation and soil-conserving investments of the kind pioneered by McConnell (1993) and Clarke (1992) that will enable us to address the environmental question raised in the second part of the question. In recent empirical work on the farm-level economics of crop rotation and soil conservation among U.S. corn farmers, Kim et al. (1997) develop and apply quantitative methods that integrate economic and environmental data in ways that should prove very suitable in the Thai context.

Site, sample and survey. The rural population of Northern Thailand is highly heterogeneous, as is apparent from the wide variation in crop choice and land management regimes within very small areas in the highlands. The survey will not be able to control for all sources of variation, nor will we be able to claim complete generality for our empirical findings. However, by judicious design and careful analysis we anticipate being able to isolate at least the main factors conditioning farmers’ responses to market signals. To control for variation in market-related variables, villages will be selected at a range of distances and travel times from a market or transport hub such as Chiang Mai or Chiang Rai cities. Distance will likely be associated also with variation in some agro-climatic variables; to control for these variables we will consult with local soils and meteorological experts on the identification of fairly homogeneous agro-climatic areas. We will then attempt to stratify the village samples by other key variables, which may include duration of
settlement, initial wealth and its growth, and ethnicity. Within each village, the household sample should be large enough to support statistical comparisons among villages (about 15-20 per village, depending on relative village size). For best results a good strategy may be to choose 3-5 villages along each of three roads leading into a single market center. This implies a total sample size (households) of between 135 and 300 respondents.

Where available, records held by local government, traders, and others will be useful sources. For individual recall data (e.g., on land use) we will use a combination of structured and unstructured interview techniques. Strong precedents for these methods and their efficacy can be found in the reports of similar studies elsewhere in the developing world. Barham, Carter and Sigelko’s work on adoption of non-traditional export crops in the highlands of Guatemala relied on farmers’ recall of ten years’ land use data (Barham et al, 1995). In continuing work in the southern Philippine highlands have found that farmers recall at least five years’ land use with little difficulty. At each site, survey work will be preceded by discussions with key figures and with focus groups to explain the rationale for the study and to acquire basic demographic, historical and economic data. A sample of farmers will then be drawn and these respondents will be asked additional questions about the history of their land use, technology and soil quality trends on their farms, their present practices, and plans for the future contingent on a range of possible changes (prices, non-farm employment opportunities, and so on).

Although we intend to be able to draw meaningful conclusions about the environmental implications of observed land uses and trends, it is not our intent to model environmental outcomes directly (although to do so might be a fruitful exercise for a future project). Secondary data about the nutrient demand and soil erosion propensity of common upland and highland crops grown under a range of management techniques are widely available (Repetto (1989) summarizes some of these data). These can be used with a high degree of confidence to extrapolate from observed land use and technology patterns to broad categories of environmental outcome.

In addition to the PI and a graduate research assistant, the field work and subsequent analysis will benefit greatly from collaboration with a suitably qualified Thai counterpart researcher and her or his institution. The choice of such a collaborator and host institution will be an early task for the project.

**Outputs and expected impacts**

In this project we argue that to understand the welfare and environmental implications of economic growth and policy reform requires the identification both of ‘macro’ (largely economic and policy) influences as well as ‘micro’ (predominantly, though not exclusively, infrastructural and institutional) constraints on resource managers’ actions. The influence and interactions of ‘micro’ and ‘macro’ phenomena are seldom studied in an integrated way. If successful, this project will shed light on some key environmental implications of current and anticipated economic growth and reforms in Thailand, and suggest practical ways in which amendments to policy and project design might lead both to improvements in the economic welfare of agricultural communities and to maintenance of the quality of their environmental resource base.

Outputs from the project will take the form of empirical and analytical findings that will be subjected to peer review in regional and international publications. However, since reaching policy makers and their advisors will be an important target (indeed, a criterion of our success) we will also disseminate our findings in appropriate forms and fora—policy briefings, specialized conferences and newsletters.

As one of the Southeast Asia’s fastest-growing economies, Thailand provides a vivid illustration of the economic and environmental stresses associated with rapid agricultural transformation. Its experience thus provides an excellent guide to future challenges that will be faced by resource managers and policy makers in several other regional economies,
most notably Laos, the Philippines and Vietnam. In packaging and disseminating the results of our research we will seek to work with existing regional networks and to give special emphasis to those findings that appear to have broad regional applicability.

Research activities

- Secondary data gathering and analysis: regional patterns and trends of land use and their relationship with prices and policies (UW and TDRI, began September 1997; duration about 9 months);
- Site selection and primary data gathering (UW & Thai collaborators) from March 1998, duration 12 months.
- Discussion paper integrating preliminary field findings with results of econometric analysis, September-December 1998.
- Analysis and interpretation of field data, return trips as necessary, and write-up (UW & Thai collaborators): January 1999 - February 2000.
- Development and dissemination of regional/sectoral/national policy analyses and recommendations (UW/TDRI/Thai collaborator) from ca. March 1999, duration 12 months.
- Total project: about 31 months from September 1997 (Ford Foundation support to begin March 1998).

Personnel

Principal investigators:

Dr. Ian Coxhead, Associate Professor, Department of Agricultural and Applied Economics and faculty member of the Center for Southeast Asian Studies, University of Wisconsin-Madison. I am a development economist specializing in trade, environment and agricultural policy, with 14 years’ experience conducting research in Southeast Asia. Current research addresses both ‘micro’ and ‘macro’ (as defined in this document) issues of economic development and environmental management. It includes quantitative time series analyses of soil quality and soil-conserving technology in the U.S. and adoption of new crops and technologies in highland areas of the Southern Philippines; and econometric, applied general equilibrium and theoretical modeling and analysis of ‘macro’ scale issues in Thailand, the Philippines, Sri Lanka and developing countries in general (see reference list).

Dr. Mingsarn Kaosa-ard, TDRI Foundation and Chiang Mai University. Dr. Kaosa-ard is a senior Thai economist and Vice-President for Natural Resources and the Environment in the TDRI Foundation. She specializes in natural resource, environmental and policy issues and has published extensively on these in the Thai setting.

Both Dr. Coxhead and Dr. Kaosa-ard will be assisted by graduate research assistants, one employed at UW and the other at Chiang Mai University.

At TDRI, a senior researcher will assist with data management and analysis for both the secondary and primary data components of the project.
Budget (US Dollars)

(Contact project staff for details)
References


Coxhead, I., and Jiraporn Plangpraphan. 1997. Thai economic growth and agricultural development: recent trends and implications (manuscript, University of Wisconsin, December)


